FOREST GROVE OREGON

SENIOR CENTER KITCHEN REHABILITATION PROJECT CDBG #8209

BID DOCUMENTS

OCTOBER 2017

PROJECT MANUAL

CITY OF FOREST GROVE
SENIOR CENTER KITCHEN REHABILITATION
Project CDBG #8209

September 27, 2017

Owner
CITY OF FOREST GROVE
Office of Economic Development
P.O. Box 326
Forest Grove, OR 97116
Contact: Jeffrey King, Project Manager
Ph 503-992-3293

Client/User
FOREST GROVE SENIOR CENTER
2037 Douglas Street
Forest Grove, OR 97116
Contact: Raean Johnston, Executive Director
Ph. 503-357-2021

Food Service Consultant
HALLIDAY ASSOCIATES, INC.
656 NW Norwood Street
Camas, WA 98607
Ph 360-834-6657
Fax 360-834-5453
Contact: Laura Bourland

Architect
BRIAN C. JACKSON ARCHITECT, LLC
13545 NW Logie Trail Road
Hillsboro, OR 97124
Ph 503-310-8707
Contact: Brian C. Jackson, AIA

Mechanical Engineer
MKE & ASSOCIATES
6915 SW Macadam Avenue, Ste. 200
Portland, OR 97219
Ph 503-892-1188
Fax 503-892-1190
Contact: Allen Crisanaz

Electrical Engineer
MKE & ASSOCIATES
6915 SW Macadam Avenue, Ste. 200
Portland, OR 97219
Ph 503-892-1188
Fax 503-892-1190
Contact: Hank Barleen

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INVITATION TO BID
CITY OF FOREST GROVE
WASHINGTON COUNTY, OREGON

SENIOR CENTER KTTCHEN REHABILITATION PROJECT
CDBG #8209

Sealed bids for the **Senior Center Kitchen Rehabilitation Project,** will be received at the office of the City Recorder for the City of Forest Grove, 1924 Council Street, P.O. Box 326, Forest Grove, OR 97116, until **BID CLOSING at 10:00 AM, local time, on Tuesday, November 07, 2017. No bids will be received after the BID CLOSING time**. Bids will be publicly opened and read at the above mentioned location and date at 2:00 PM local time.

This is a Forest Grove Senior Center Kitchen Rehabilitation project. Work is to upgrade and expand kitchen including removing/replacing walls, replace floor, counter tops, shelves, plumbing upgrade and installing new equipment.

Plans and specifications may be examined online at the City of Forest Grove http://forestgrove-or.gov/rfps 1928 Council Street, Forest Grove, OR 97116 or at the Daily Journal of Commerce Plans Center http://djcoregon.com/projectcenter/.

Each proposal must be submitted on the prescribed form and accompanied by a certified check or bid bond payable to the City of Forest Grove, in an amount not less than five percent (5%) of the amount bid. No bids will be received or considered unless the proposal is properly completed and signed. An optional pre-bid conference will be held on Wedensday, October 25 at 10:00 AM at the Forest Grove Senior Center, 2037 Douglas Center, Forest Grove, Oregon.

The successful bidder will be required to furnish both a Performance/Payment Bond and Labor/Material Payment Bond each (separately) in the full amount of the Contract price.

Attention is called to the following:

"The project described in this Invitation to Bid is being funded in whole or in part with funding from the U.S. Department of Housing and Urban Development through the Washington County Office of Community Development CDBG program. Minority or Women Business Enterprise MBE/WBE contractors are encouraged to submit a proposal." The contract will be subject to regulations of the Departments of Labor and Housing and Urban Development.

Attention is called to the Federal Provisions for Equal Employment opportunity, HUD Section 3 Requirements, and the minimum wages as set forth in the contract documents.

Contractor, its subcontractors, if any, and all employers working under the Contract are subject employers under the Oregon Workers' Compensation Law and shall comply with ORS 656.017, which requires them to provide workers' compensation coverage for all their subject workers.

Contractor and all subcontractors must be registered with the Oregon Construction Contractors Board (in compliance with ORS 701.055) **prior to bid opening.**

Construction Contractors Board
700 Summer Street, NE, Suite #300
Salem, OR 97310-0151
(503) 378-4621

Award shall be made only to responsible contractors that possess the potential ability to perform successfully under the terms and conditions of the contract. Consideration shall be given to contractor integrity, compliance with public policy, record of past performance, and financial and technical resources.

The City of Forest Grove and or the Washington County Office of Community Development reserves the right in its/their sole discretion to reject any and all proposals or to accept any proposal which appears to serve the best interest of the City.

For more information regarding this project, contact Jeffrey King, Project Manager, at 503-992-3293.

Paul Downey, Administrative Services Director
City of Forest Grove

Published: Daily Journal of Commerce – October 16, 18, 2017
EL Latino de Hoy – October 18, 2017

BID PROPOSAL

TO: Anna D. Ruggles, City Recorder
City of Forest Grove Administration Building
1924 Council Street (PO Box 326)
Forest Grove, Oregon 97116

The undersigned, hereinafter called the Bidder, declares that the only persons or parties interested in this Proposal are those named herein; that this Proposal is, in all respects, fair and without fraud; that it is made without collusion with any official of the Owner; and that the Proposal is made without any connection or collusion with any person making another proposal on this Contract.

The Bidder further declares that he has carefully examined the Contract Documents; that he has personally inspected the site; that he has satisfied himself as to the quantities involved, including materials and equipment, and conditions of work involved, including the fact that the description of the quantities of work and materials, as included herein, is brief and is intended only to indicate the general nature of the work and to identify the same quantities with the detailed requirements of the Contract Documents; and that this Proposal is made according to the provisions and under the terms of the Contract Documents, which Documents are hereby made a part of this Proposal.

The Bidder further agrees that he has exercised his own judgement regarding the interpretation of surface and subsurface information and has utilized all data which he believes pertinent from the Engineer, Owner, and other sources in arriving at his conclusions.

The Bidder further agrees that all of the applicable provisions of Oregon Law relating to public contracts (ORS Chapter 279) are, by this reference, incorporated in and made a part of this proposal.

The Bidder further agrees that if this Proposal is accepted, he shall, if requested by the Engineer, submit a statement of qualifications in a form adopted by the State of Oregon Public Contract Review Board and/or a list of names of subcontractors he intends to utilize in the execution of the contract, within twenty-four (24) hours of the request.

The Bidder further agrees that if this Proposal is accepted, he will, within ten (10) calendar days after notification of acceptance, execute the Contract with the Owner on the form of Contract annexed hereto; and will, at the time of execution of the Contract, deliver to the Owner the Performance Bond and the Labor and Material Payment Bond both required herein; and will, to the extent of his Proposal, furnish all machinery, tools, apparatus, and other means of construction and do the work and furnish all materials necessary to complete the work in the manner, in the time, and according to the methods as specified in the Contract Documents and required by the Engineer thereunder.

The Bidder further agrees to furnish the Owner, before commencing the work under this contract, the certificate of insurance as specified in these documents.

The Bidder further agrees to commence work following the issuance of a "Notice to Proceed" by the Owner and fully complete the project within **150 calendar days**.

Once the Contractor has moved onto the project site, work shall commence and continue, uninterrupted, until fully complete and accepted by the City.

In the event the Bidder is awarded the contract and shall fail to complete the work within the time limit or extended time limit agreed upon, as more particularly set forth in the Contract Documents, the Bidder further agrees to pay liquidated damages, until the work is finished, as specified in these Documents.

The Bidder further proposes to accept as full payment for the work proposed herein the amount computed under the provisions of the Contract Documents and based on the following unit price amounts, it being expressly understood that the unit prices are independent of the quantities involved, that said unit prices represent a true measure of the labor and material required to perform the specified unit of work, including all allowance for overhead and profit for each type and unit of work called for in these Contract Documents.

The amounts shown shall be shown in both words and figures. In case of a discrepancy, the amount shown in words shall govern.

It is agreed that if the Bidder is awarded the Contract for the work herein proposed and shall fail or refuse to execute the Contract and furnish the specified Performance Bond and the Labor and Material Payment Bond within ten (10) calendar days after receipt of notification of acceptance of his Proposal, then, in that event, the Proposal Guaranty deposited herewith according to the conditions of the Invitation for bids and General Conditions shall be retained by the Owner as liquidated damages; and it is agreed that the said sum is a fair measure of the amount of damage the Owner will sustain in case the Bidder shall fail or refuse to enter into the Contract for the said work and to furnish the Performance Bond and the Labor and Material Payment Bond as specified in the Contract Documents. Proposal Guaranty in the form of a certified check shall be subject to the same requirements as a bid bond.

If the Bidder is awarded a construction Contract on this Proposal, the Surety who will provide the Performance Bond and the Labor and Material Payment Bond will be _____ whose address is:

_____(Street)
(City) (State)

The name of the Bidder who is submitting this Proposal is _____ doing business at:

_____
(Street) (City) (State)

which is the address to which all communications concerned with this Proposal and with the Contract shall be sent.

The names of the principal officers of the corporation submitting this Proposal, or of the partnership, or of all persons interested in this Proposal as principals are as follows:

_____

_____

_____

(If Corporation)

In Witness whereof the undersigned corporation has caused this instrument to be executed and its seal affixed by its duly authorized officers that _____ day of _____ 20___.

Name of Corporation

_____

By

_____

Title

_____

Attest

(If Sole Proprietor or Partnership)

In Witness hereto the undersigned has set his (its) hand this _____ day of _____, 20 __.

_____

Signature of Bidder

_____

Title

Oregon Construction Contractors Board Registration No. _____
and/or
Oregon Landscape Contractors Board Registration No. _____

CITY OF FOREST GROVE
SENIOR CENTER KITCHEN REHABILITATION
CDBG #8209

BID PROPOSAL FORM

ITEM	UNIT OF MEASURE	WRITTEN LUMP SUM PRICE
1. Kitchen Rehabilitation	LS	$_____
2. Lump Sum and Itemized Cost of Food Service Equipment identified as Owner Furnished Contractor Installed.	LS	$_____

Include itemized cost of equipment provided by Owner and installed by the Contractor on Page 2. Provide separate pricing for each item to equal lump sum above. Refer to Food Service Equipment Plan on sheet FS1.1.

TOTAL COST
IN WRITING: _____

TOTAL COST
IN FIGURES $_____

CONTRACT DURATION/SCHEDULE: Include both number of days proposed and estimated completion date.

Number of days: _____

Date of Substantial Completion: _____

Itemized List of Food Service Equipment Installation provided by Owner and Installed by the Contractor.

Item	Description	Quantity	Cost
6	Hand wash sink	2	$
7	Work Table	1	$
17	Support Work Table	1	$
22	Vegetable Prep Sink Table	1	$
23	Reach-In Refrigerator	1	$
24	Cook's Support Work Table	1	$
30	Convection Steamer w/Stand	1	$
31	36" Griddle	1	$
32	6-Open Burner Range	1	$
34	Ware-washer w/Booster Heater	1	$
37	Drop-in Hot Wells	1	$
39	Drop-in Sink	1	$

BID BOND

KNOW ALL MEN BY THESE PRESENTS, THAT _____, hereinafter called the Principal, and _____, a corporation duly organized under the laws of the State of _____, having its principal place of business at _____, in the State of _____and authorized to do business in the State of Oregon, as Surety, are held and firmly bound unto the _____, hereinafter called the Obligee in the penal sum of _____ Dollars. ($_____), for the payment of which, well and truly to be made, we bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

The condition of this Bond is such that, whereas, the Principal herein is herewith submitting his or its Bid Proposal for _____ said Bid Proposal, by reference thereto, being hereby made a part hereof.

NOW, THEREFORE, if the said Bid Proposal submitted by the said Principal be accepted, and the Contract be awarded to said Principal, and if the said Principal shall execute the proposed Contract and shall furnish the Performance Bond and Payment Bond as required by the Bidding and Contract Documents within the time fixed by said Documents, then this obligation shall be void, otherwise to remain in full force and effect.

_____
Principal

_____
Surety

Countersigned:

By: _____
Attorney-In-Fact

Resident Agent

FIRST-TIER SUBCONTRACTOR DISCLOSURE FORM

Project Name: ***Senior Center Kitchen Rehabilitation Project***

No.: ***CDBG #8209***

Bid Closing: ***Date:*** ***November 07, 2017*** ***Time:*** ***10:00*** ***am***

Disclosure Deadline: ***Date:*** ***November 07, 2017*** ***Time:*** ***12:00*** ***pm***

This form must be submitted within two (2) working hours of the advertised bid closing date and time; no later than the ***DISCLOSURE DEADLINE*** stated above.

☐ *CHECK THIS BOX IF YOU WILL NOT BE USING ANY FIRST-TIER SUBCONTRACTORS.*

List below the Name, Address, Dollar Value, Construction Contractor Board (CCB) number if required, Contact Name and Telephone Number of each subcontractor that will be furnishing labor or materials that are required to be disclosed. Enter "NONE" if there are no subcontractors that need to be disclosed. ***(If needed, attach additional sheets).***

Name: _____
Address: _____
Contact: _____ ***Phone No.:*** _____
Dollar Value: _____ ***CCB No.:*** _____

Name: _____
Address: _____
Contact : _____ ***Phone No.:*** _____
Dollar Value: _____ ***CCB No.:*** _____

Name: _____
Address: _____
Contact : _____ ***Phone No.:*** _____
Dollar Value: _____ ***CCB No.:*** _____

The above listed first-tier subcontractor(s) are providing labor and/or materials with a Dollar Value equal to or greater than:

a) 5% of the total Contract Price, but at least $15,000 (including all alternates). IF the Dollar Value is less than $15,000 do not list the subcontractor above; or
b) $350,000 regardless of the percentage of the total Contract Price.

FAILURE TO SUBMIT THIS FORM BY THE DISCLOSURE DEADLINE WILL RESULT IN A BID SUBMITTED BECOMING NON-RESPONSIVE, AND SUCH BIDS SHALL NOT BE CONSIDERED FOR AWARD!

Bids which are submitted by Bid Closing, but for which the separate disclosure submittal has not been made by the specified deadline, are not Responsive and shall not be considered for Contract award.

Form Submitted By Bidder Name: _____

Contact Name: _____ ***Phone No.:*** _____

Deliver Form to Agency: _____

Person Designated to Receive Form: _____

Agency's Address: _____ ***Phone No.:*** _____

UNLESS OTHERWISE STATED IN THE ORIGINAL SOLICITATION, THIS DOCUMENT SHALL NOT BE FAXED. IT IS THE RESPONSIBILITY OF BIDDERS TO SEPARATELY SUBMIT THIS DISCLOSURE FORM AND ANY ADDITIONAL SHEETS, WITH THE BID NUMBER AND PROJECT NAME CLEARLY MARKED, AT THE LOCATION INDICATED BY THE SPECIFIED DISCLOSURE DEADLINE. SEE INSTRUCTIONS TO BIDDERS.

ACKNOWLEDGEMENT OF ADDENDA

Senior Center Kitchen Rehabilitation Project
CDBG #8209
Bid Date: 11/07/17

Addenda No.:	_____	***Date Received:***	_____
Addenda No.:	_____	***Date Received:***	_____
Addenda No.:	_____	***Date Received:***	_____
Addenda No.:	_____	***Date Received:***	_____
Addenda No.:	_____	***Date Received:***	_____
Addenda No.:	_____	***Date Received:***	_____

Company: _____

By: _____

Title: _____

Date: _____

CONTRACT FOR CONSTRUCTION

THIS CONTRACT, made and entered into this _____ day of _____, 20____, by and between CITY OF FOREST GROVE, hereinafter called the "Owner", and _____, hereinafter called the "Contractor".

WITNESSETH:

Said Contractor, in consideration of the sum to be paid him by the said Owner and of the covenants and agreements herein contained, hereby agrees at his own proper cost and expense to do all the work and furnish all the materials, tools, labor, and all appliances, machinery and appurtenances for the construction of:

Forest Grove Senior Center Kitchen Rehabilitation *Project*
CDBG #8209

to the extent of the Proposal made by the Contractor on the ____ day of _____, 2017 , all in full compliance with the Contract Documents referred to herein.

The signed copy of the Bid Proposal made by the Contractor on the xx day of November, 2017, the fully executed Performance Bond and Payment Bond, the General Conditions, the Standard and **Special Specifications**, entitled, **Forest Grove Senior Center Kitchen Rehabilitation Project CDBG #8209** , dated, _____**November 2017**, are hereby referred to and by reference made a part of this Contract (as fully and completely as if the same were fully set forth herein) and are mutually cooperative therewith.

In consideration of the Contractor's faithful performance of the work herein embraced, as set forth in these Contract Documents, and in accordance with the direction of the Engineer and to his satisfaction to the extent provided in the Contract Documents, the Owner agrees to pay to the Contractor the amount in writing and in numbers as may be adjusted in accordance with the Proposal as determined by the Contract Documents, or as otherwise herein provided, and based on the Proposal made by the Contractor, and to make such payments in the manner and at the times provided in the Contract Documents.

The Contractor agrees to meet with the Engineer for a pre-construction conference within seven (7) calendar days after the execution of this Contract to review and submit the Contractor's schedule of expected events, as specified in the General Conditions.

Time is of the essence with respect to the Contractor's prosecution of work. The Contractor agrees to complete the work within the time specified in the Bid Proposal and to accept as full payment hereunder the amounts computed as determined by the Contract Documents and based on the Proposal.

The Contractor agrees to indemnify and save harmless the Owner from any and all defects appearing to develop in the workmanship or materials performed or furnished under this Contract for a period of one (1) year after the date of the written notice from the Engineer recommending final acceptance of the entire project by the Owner.

In the event that the Contractor shall fail to complete the work within the time limit or the extended time limit agreed upon, as more particularly set forth in the Contract Documents, liquidated damages shall be paid as specified in the General Conditions. In the Owner's sole discretion, it may withhold any monies due the Contractor in an amount equal to that which Owner is due as liquidated damages.

In lieu of the General Conditions' claims procedures, and notwithstanding any contrary terms in the Contract Documents, all Contractor claims shall be referred to the Owner's Authorized Representative for review. All claims shall be made in writing to the Owner's Authorized Representative not more than ten days from the date of the occurrence of the event which gives rise to the claim or not more than ten days from the date that the Contractor knew or should have known of the problem. Unless the claim is made in accordance with these time requirements, it shall be waived.

All claims shall be submitted in writing and shall include a detailed, factual statement of the basis of the claim, pertinent dates, Contract provisions which support or allow the claim, reference to or copies of any documents which support the claim, the exact dollar value of the claim, and specific time extension requested for the claim. If the claim involves Work to be completed by Subcontractors, the Contractor will analyze and evaluate the merits of the Subcontractor claim prior to forwarding it and that analysis and evaluation to the Owner's Authorized Representative. The Owner's Authorized Representative and the Owner will not consider direct claims from Subcontractors, suppliers, manufacturers, or others not a party to this Contract.

The Owner's Authorized Representative will review all claims and take one or more of the following preliminary actions within ten days of receipt of a claim: (1) request additional supporting information from the Contractor; (2) inform the Contractor and Owner in writing of the time required for adequate review and response; (3) reject the claim in whole or in part and identify the reasons for rejection; (4) recommend approval of all or part of the claim; or (5) propose an alternate resolution.

The Owner's Authorized Representative's decision shall be final and binding on the Contractor unless appealed by written notice to the Owner within fifteen days of receipt of the decision. The Contractor must present written documentation supporting the claim within fifteen days of the notice of appeal. After receiving the appeal documentation, the Owner shall review the materials and render a decision within 30 days after receiving the appeal documents.

The decision of the Owner shall be final and binding unless the Contractor requests mediation within fifteen days of receipt of the Owner's decision. Both the Owner and the Contractor are

obligated to participate in the mediation process prior to either or both proceeding to litigation. The mediation process is non-binding.

Should the parties arrive at an impassé regarding any claims or disputed claims, it is agreed that the parties shall submit to mediation prior to the commencement of litigation. The mediator shall be an individual mutually acceptable to both parties, but in the absence of agreement, either party may apply to the Presiding Judge, Washington County Circuit for appointment of a mediator. Each party shall share equally in the fees and costs of the mediator. Each party shall be responsible for its own attorneys fees and other expert fees. Mediation will occur in Portland, Oregon unless the parties agree otherwise. Both parties agree to exercise their best effort in good faith to resolve all disputes in mediation. Participation in mediation is a mandatory requirement of both Owner and Contractor and failure to comply with this requirement is a material breach of the Contract. The schedule and time allowed for mediation will be mutually acceptable.

If the dispute is not resolved by mediation, either party may file a lawsuit to resolve the dispute in a court with proper jurisdiction located in Washington County, Oregon. Any trial shall be to the court without a jury. Each party shall be responsible for its own costs and attorneys and expert fees.

IN WITNESS WHEREOF, we, the parties hereto, each herewith subscribe the same this day of _____, A.D., 20_____.

CONTRACTOR:
By
Title

OWNER: CITY OF FOREST GROVE

By

Title: City Manager

PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS:

That
_____As Principal, and _____ duly authorized to transact Surety Business, in the State of Oregon, as Surety are held and firmly bound unto the City of Forest Grove, Oregon, hereinafter called the Obligee, in the penal sum of _____ Dollars ($_____). For the payment whereof Principal and Surety bind themselves, their heirs, executors, administrators, successors, and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS BOND IS AS FOLLOWS:

WHEREAS, The said Principal herein has made and entered into a certain Contract, a copy of which is attached hereto, with the City of Forest Grove, Oregon, which Contract, together with the applicable Plans, Specifications, and Bid Proposal, is by this reference made a part hereof, and is hereinafter referred to as the Contract.

This Performance Bond shall guarantee the improvement against defects in materials or workmanship for a period of one (1) year from the date of written acceptance by the City of Forest Grove.

NOW, THEREFORE, If the Principal herein shall faithfully and truly observe and comply with the terms of the Contract, in all respects, and shall well and truly and fully do and perform all matters and things by him undertaken to be performed under said Contract, upon the terms set forth therein and within the time prescribed therein, and shall indemnify and save harmless the City of Forest Grove, its officers, employees and agents, against any direct or indirect damages of every kind and description that shall be suffered or claimed to be suffered in connection with or arising out of the performance of the said Contract by the said Principal or his subcontractors and to all persons supplying to the prosecution of the work, or any part thereof, provided for in said Contract, and shall pay all contributions or amounts due the State Industrial Accident Fund and incurred in the performance of said Contract, and pay all sums of money withheld from the employees of said Principal and payable to the Department of Revenue, pursuant to ORS 315.757 or 316.575, and shall promptly as due, make payment to any persons, co-partnership, association, or corporation furnishing medical, surgical, and hospital care or attention incident to sickness or injury to the employees of such Principal; and shall pay all other just debts, dues and demands incurred in the performance of the said Contract and shall pay the City of Forest Grove such damages as may accrue to the City under said Contract and shall in all respects perform said Contract according to law, then this obligation is to be void, otherwise to remain in full force and effect.

This bond is given and received under the authority of Chapter 279C, Oregon Revised Statutes, the provisions of which are hereby incorporated into this bond and made a part hereof. Nonpayment of the bond premium will not invalidate this bond, nor shall the City of Forest Grove be obligated for its payment.

IN WITNESS WHEREOF, the seal and signature of the said Principal is hereto affixed and the corporate seal and name of the said Surety is hereto affixed and attested by its duly authorized attorney-in-fact and agent at:

this _____ day of _____, 20___.

By: _____
Principal

Witness of Attest:

By: _____
Attorney-In-Fact

Surety

Countersigned:

By:
Resident Agent

LABOR AND MATERIAL PAYMENT BOND

KNOW ALL MEN BY THESE PRESENTS:

That

As Principal, and
duly authorized to transact Surety Business, in the State of Oregon, as Surety are held and firmly bound unto the City of Forest Grove, Oregon, hereinafter called the Obligee, in the penal sum of _____ Dollars (_____). For the payment whereof Principal and Surety bind themselves, their heirs, executors, administrators, successors, and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS BOND IS AS FOLLOWS:

WHEREAS, The said Principal herein has made and entered into a certain Contract, a copy of which is attached hereto, with the City of Forest Grove, Oregon, which Contract, together with the applicable Plans, Specifications, and Schedule of Contract prices, is by this reference made a part hereof, and is hereinafter referred to as the Contract.

NOW, THEREFORE, If the Principal herein shall make payment promptly, as due to all subcontractors, equipment, supplies, labor or materials for the prosecution of the work, or any part thereof, provided for in said contract, and shall pay all contribution of amounts due its workers compensation carrier and the State Unemployment Compensation Trust Fund from such Contractor or subcontractors incurred in the performance of said contract, and pay all sums of money withheld from the Contractor's employees and payable to the Revenue Department; and shall pay all other just debts, dues and demands incurred in the performance of the said contract and shall pay the City of Forest Grove, such damages as may accrue to the City under said contract, then this obligation is to be void, otherwise to remain in full force and effect.

This bond is given and received under the authority of Chapter 279C, Oregon Revised Statutes, the provisions of which are hereby incorporated into this bond and made a part hereof. Nonpayment of the bond premium will not invalidate this bond, nor shall the City of Forest grove be obligated for its payment.

IN WITNESS WHEREOF, the seal and signature of the said Principal is hereto affixed and the corporate seal and name of the said Surety is hereto affixed and attested by its duly authorized attorney-in-fact and agent at:

this _____ day of _____, 20 _____.

By:

Principal

Witness of Attest:

By:

Attorney-In-Fact

Surety

Countersigned:

By:

Resident Agent

Contract Clauses Required in All Community Development Block Grant (CDBG) Construction Projects

This contract and the work it will carry out is being funded in whole or in part with funding from the U.S. Department of Housing and Urban Development through the Washington County Office of Community Development CDBG program.

1. Access to Records and Retention of Records

The Community Development Block Grant (CDBG) recipient, Washington County Office of Community Development, the U.S. Department of Housing and Urban Development (HUD), the Comptroller General of the United States, or any of their duly authorized representatives, shall have access to any books, documents, papers, and records of the contractor which are directly pertinent to this contract, for the purpose of making audit, examination, excerpts, and transcriptions. All required records must be maintained by the contractor for four years after the recipient makes final payments and all other pending matters are closed.

2. Section 3 of the Housing and Community Development Act
(Applicable to contracts/subcontracts of $100,000 or more AND when the funding recipient has received $200,000 or more in CDBG and/or other federal funding.)

A. The work to be performed under this contract is subject to the requirements of Section 3 of the Housing and Urban Development Act of 1968, as amended, 12 U.S.C. 1701u (Section 3). The purpose of Section 3 is to ensure that employment and other economic opportunities generated by HUD assistance or HUD-assisted projects covered by Section 3, shall, to the greatest extent feasible, be directed to low- and very low-income persons, particularly persons who are recipients of HUD assistance for housing.

B. The parties to this contract agree to comply with HUD's regulations in 24 CFR part 135, which implement Section 3. As evidenced by their execution of this contract, the parties to this contract certify that they are under no contractual or other impediment that would prevent them from complying with the part 135 regulations.

C. The contractor agrees to send to each labor organization or representative of workers with which the contractor has a collective bargaining agreement or other understanding, if any, a notice advising the labor organization or workers' representative of the contractor's commitments under this Section 3 clause, and will post copies of the notice in conspicuous places at the work site where both employees and applicants for training and employment positions can see the notice. The notice shall describe the Section 3 preference, shall set forth minimum number and job titles subject to hire, availability of apprenticeship and training positions, the qualifications for each; and the name and location of the person(s) taking applications for each of the positions; and the anticipated date the work shall begin.

D. The contractor agrees to include this Section 3 clause in every subcontract subject to compliance with regulations in 24 CFR part 135, and agrees to take appropriate action, as provided in an applicable provision of the subcontract or in this Section 3 clause, upon a finding that the subcontractor is in violation of the regulations in 24 CFR part 135. The contractor will not subcontract with any subcontractor where the contractor has notice or knowledge that the subcontractor has been found in violation of the regulations in 24 CFR part 135.

E. The contractor will certify that any vacant employment positions, including training positions, that are filled (1) after the contractor is selected but before the contract is executed, and (2) with persons other than those to whom the regulations of 24 CFR part 135 require employment opportunities to be directed, were not filled to circumvent the contractor's obligations under 24 CFR part 135.

F. Noncompliance with HUD's regulations in 24 CFR part 135 may result in sanctions, termination of this Contract for default, and debarment or suspension from future HUD assisted contracts.

G. With respect to work performed in connection with Section 3 covered Indian housing assistance, section 7(b) of the Indian Self-Determination and Education Assistance Act (25 U.S.C. 450e) also applies to the work to be performed under this contract. Section 7(b) requires that to the greatest extent feasible (i) preference and opportunities for training and employment shall be given to Indians, and (ii) preference in the award of contracts and subcontracts shall be given to Indian organizations and Indian-owned Economic Enterprises. Parties to this Contract that are subject to the provisions of Section 3 and section 7(b) agree to comply with Section 3 to the maximum extent feasible, but not in derogation of compliance with section 7(b).

3. Emerging-Small (ESB), Minority-owned (MBE) and Women-owned (WBE) Business Enterprises
(Applicable to contracts/subcontracts of $25,000 or more in CDBG and/or other funding.)

Affirmative steps must be taken to assure that emerging small, minority and women-owned businesses and firms located in labor surplus areas are used when possible as sources of supplies, equipment, construction and services. Affirmative steps shall include the following:

- ☐ Include any such qualified firms on solicitation lists.
- ☐ Assure that such firms are solicited whenever they are potential sources.
- ☐ When economically feasible, divide total requirements into smaller tasks or quantities so as to permit such firms maximum opportunities for participation through subcontracting.
- ☐ Where possible, establish delivery schedules which will encourage such participation.
- ☐ Use the services and assistance of the Small Business Administration, the Office of Minority, Women and Emerging Small Business (State of Oregon) and other sources when appropriate.

4. Prohibition on the Use of Federal Funds for Lobbying *(Applicable to federally funded contracts/subcontracts of $100,000+)*

The contractor hereby certifies that:
a. No federal funds have been paid or will be paid, by or on behalf of Washington County Office of Community Development, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any federal contract, grant, loan, or cooperative agreement.

b. If any funds other than federal funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this federal contract, grant, loan, or cooperative agreement, the local government shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

5. Lead-Based Paint

The use of lead-based paint on any interior or exterior surface is prohibited. For properties constructed prior to 1978, the construction work performed under this contract is subject to the Lead-Based Paint Regulations adopted by the Department of Housing and Urban Development (24 CFR Part 35) and by the State of Oregon (OAR 333.069).

6. Equal Employment Opportunity

Contractor shall comply with the requirements of Executive Order 11246, "Equal Employment Opportunity," as amended by Executive Orders 11375, "Amending Executive Order 11246 Relating to Equal Employment Opportunity," and as supplemented by regulations at 41 CFR Chapter 60, "Office of Federal Contract Compliance Programs, Equal Employment Opportunity, Department of Labor," which provide that no person shall be discriminated against on the basis of race, color, religion, sex or national origin in all phases of employment during the performance of federal or federally assisted construction contracts. Contractors and subcontractors on federal and federally assisted construction contracts shall take affirmative action to insure fair treatment in employment, upgrading, demotion, or transfer; recruitment or recruitment advertising.

7. Copeland "Anti-Kickback" Act

Contractor shall comply with the Copeland "Anti-Kickback" Act (18 USC 874), as supplemented by Department of Labor regulations (29 CFR part 3, "Contractors and Subcontractors on Public Building or Public Work Financed in Whole or in Part by Loans or Grants from the United States"). Contractor and all subcontractors shall be prohibited from inducing, by any means, any person employed in the construction, completion, or repair of public work, to give up any part of the compensation to which he is otherwise entitled.

8. Davis-Bacon Act *(Applicable to CDBG contracts for construction or rehabilitation of housing containing eight or more CDBG-assisted units; any public facility or public improvement contract exceeding $2,000; applicable to HOME contracts for construction of rehabilitation of twelve or more HOME-assisted units.)*
All laborers and mechanics employed by contractors or subcontractors on construction work assisted under this part shall be paid wages at rates not less than those prevailing on similar construction in the locality as determined by the Secretary of Labor in accordance with the Davis-Bacon Act, as amended (40 USC 276a-276a-5), and shall receive overtime compensation in accordance with and subject to the provisions of the Contract Work Hours and Safety Standards Act (40 USC 327-333), and the contractors and subcontractors shall comply with all regulations issued pursuant to these Acts and with other applicable Federal laws and regulations pertaining to labor standards.

9. Contract Work Hours and Safety Standards Act

In compliance with Sections 102 of the Contract Work Hours and Safety Standards Act (40 USC. 327–333), as supplemented by Department of Labor regulations (29 CFR part 5), each contractor/subcontractor shall compute the wages of every mechanic and laborer on the basis of a standard workweek of 40 hours. Work in excess of the standard workweek is permissible provided that the worker is compensated at a rate of not less than 1 ½ times the basic rate of pay for all hours worked in excess of 40 hours in the workweek. In compliance with Section 107 of the Act, no laborer or mechanic shall be required to work in surroundings or under working conditions which are unsanitary, hazardous or dangerous. These requirements do not apply to the purchases of supplies or materials or articles ordinarily available on the open market, or contracts for transportation or transmission of intelligence.

10. Clean Air Act and the Federal Water Pollution Control Act
(Applicable to federally-funded contracts and subcontracts in excess of $100,000)

This contract is subject to the requirements of the Clean Air Act, as amended, 42 USC 1857 et seq., the Federal Water Pollution Control Act, as amended, 33 USC 1857 et seq., and the regulations of the Environmental Protection Agency with respect thereto, at 40 CFR Part 15, as amended from time to time. Contractor and any of its subcontractors agree to the following requirements:

1) A stipulation by the contractor and subcontractors that any facility to be utilized in the performance of any nonexempt contract or subcontract is not listed on the List of Violating Facilities issued by the Environmental Protection Agency (EPA) pursuant to 40 CFR 32;

2) Agreement by the contractor to comply with all requirements of Section 114 of the Clean Air Act, as amended (42 USC 1857c-8) and Section 308 of the Federal Water Pollution Control Act, as amended, (33 USC 1318) relating to inspection, monitoring, entry, reports, and information, as well as all other requirements specified in said Section 114 and Section 308, and all regulations and guidelines thereunder;

3) A stipulation that as a condition for the award of the contract, prompt notice will be given of any notification received from the Director, Office of Federal Activities, EPA, indicating that a facility utilized or to be utilized for the contract is under consideration to be listed on the EPA list of Violating Facilities; and

4) Agreement by the contractor that he will include or cause to be included the criteria and requirements in paragraph (1) through (4) of this section in every non-exempt subcontract and requiring that the contractor will take such action as the government may direct as a means of enforcing such provisions. In no event shall any amount provided under this contract be utilized with respect to a facility which has given rise to a conviction under Section 113(c)(1) of the Clean Air Act or Section 309(c) of the Federal Water Pollution Control Act.

11. Debarment and Suspension

Contractor certifies that neither it nor any of its employees or subcontractors are parties listed on the General Services Administration's List of Parties Excluded from Federal Procurement or Nonprocurement Programs in accordance with Executive Orders 12549 and 12689, "Debarment and Suspension," as set forth at 24 CFR part 24. This list contains the names of parties debarred, suspended, or otherwise excluded by agencies, and contractors declared ineligible under statutory or regulatory authority other than E.O. 12549. Contractor must provide a current SAM registration and DUNS number.

12. Termination of Contract

12a. Termination by Owner:

1) Without Cause

This contract and the work it will carry out is being funded in whole or in part with funding from the U.S. Department of Housing and Urban Development through the Washington County Office of Community Development CDBG program.
The owner may terminate this contract:

1) In the event that the grant funds are rescinded in part or in whole; or
2) If the work is stopped under an order of any court, or other public authority, for a period of thirty (30) calendar days, through no act or fault of the owner, owner's employees, or legal representatives.

2) With Cause

The owner may terminate this contract if the contractor is in substantial breach of the provisions contained in the contract documents and/or repeatedly fails to:

- Comply with federal, state, and local laws and regulations;
- Provide for the safety of all occupants and public at large during the execution of the work;
- Properly pay subcontractors or suppliers for material or labor;
- Correct defective work; or

• Progress in a timely manner which demonstrates that the contractor can complete the project within the specified time-frame.

The contractor, upon receipt of written notice from the owner to terminate this contract, shall:

1) Cease operation in a manner that protects and preserves work already performed.
2) Instruct all subcontractors to cease work and cancel all special orders with suppliers.
3) Leave the work site in a condition that is free of hazards to occupants and the public.

If the owner terminates the contract, the contractor may be eligible to receive payment for all work completed, and for material orders already in progress and for which cancellation is not possible. Payment is contingent upon the same inspection and approval procedures by owner and grantor as specified for progress payments. If the owner terminates this contract with cause, the owner may withhold payment until all work is otherwise completed by reasonable means determined by owner. If the unpaid balance of this contract is not sufficient to cover reasonable costs incurred by the owner to complete the work, the contractor shall pay the difference to the owner. If the unpaid balance of this contract is in excess of the reasonable costs incurred by the owner to complete the work, then the owner shall pay the difference to the contractor. Reasonable costs include architect fees, administrative fees, and other expenses made necessary by the above causes.

12b. Termination by Contractor

Contractor may terminate this contract if:

• Work is stopped under an order of any court, or other public authority, for a period of thirty (30) calendar days, through no act or fault of the contractor, contractor's employees, subcontractors, or other persons or agents performing work under direct or indirect contract with the contractor;
• Work is stopped due to a declared state of emergency by government action;
• Owner fails to make payment within the time-frame and conditions stated in the Contract Documents;
• Owner repeatedly, through no fault of the contractor, contractor's employees, subcontractors, or other persons or agents performing work under direct or indirect contract with the contractor, causes delay of the work; and, such delay constitutes in excess of 100 percent of the total number of days scheduled for completion of the work specified in the Contract Documents.

12c. Termination by Mutual Consent

Both parties may terminate this contract by mutual written consent.

Applicability

The Project or Program to which the construction work covered by this contract pertains is being assisted by the United States of America and the following Federal Labor Standards Provisions are included in this Contract pursuant to the provisions applicable to such Federal assistance.

A. 1. (i) Minimum Wages. All laborers and mechanics employed or working upon the site of the work, will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR Part 3), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics. Contributions made or costs reasonably anticipated for bona fide fringe benefits under Section I(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of 29 CFR 5.5(a)(1)(iv); also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs, which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period.

Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in 29 CFR 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: Provided, That the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under 29 CFR 5.5(a)(1)(ii) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible, place where it can be easily seen by the workers.

(ii) (a) Any class of laborers or mechanics which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. HUD shall approve an additional classification and wage rate and fringe benefits therefor only when the following criteria have been met:

(1) The work to be performed by the classification requested is not performed by a classification in the wage determination; and

(2) The classification is utilized in the area by the construction industry; and

(3) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(b) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and HUD or its designee agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by HUD or its designee to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, D.C. 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise HUD or its designee or will notify HUD or its designee within the 30-day period that additional time is necessary. (Approved by the Office of Management and Budget under OMB control number 1215-0140.)

(c) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and HUD or its designee do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), HUD or its designee shall refer the questions, including the views of all interested parties and the recommendation of HUD or its designee, to the Administrator for determination. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise HUD or its designee or will notify HUD or its designee within the 30-day period that additional time is necessary. (Approved by the Office of Management and Budget under OMB Control Number 1215-0140.)

(d) The wage rate (including fringe benefits where appropriate) determined pursuant to subparagraphs (1)(ii)(b) or (c) of this paragraph, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

(iii) Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

(iv) If the contractor does not make payments to a trustee or other third person, the contractor may consider as part

of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, Provided, That the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program. (Approved by the Office of Management and Budget under OMB Control Number 1215-0140.)

2. Withholding. HUD or its designee shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld from the contractor under this contract or any other Federal contract with the same prime contractor, or any other Federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract In the event of failure to pay any laborer or mechanic, including any apprentice, trainee or helper, employed or working on the site of the work, all or part of the wages required by the contract, HUD or its designee may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased. HUD or its designee may, after written notice to the contractor, disburse such amounts withheld for and on account of the contractor or subcontractor to the respective employees to whom they are due. The Comptroller General shall make such disbursements in the case of direct Davis-Bacon Act contracts.

3. (i) Payrolls and basic records. Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work. Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in Section l(b)(2)(B) of the Davis-bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5 (a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in Section l(b)(2)(B) of the Davis-Bacon Act, the contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs. (Approved by the Office of Management and Budget under OMB Control Numbers 1215-0140 and 1215-0017.)

(ii) (a) The contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to HUD or its designee if the agency is a party to the contract, but if the agency is not such a party, the contractor will submit the payrolls to the applicant sponsor, or owner, as the case may be, for transmission to HUD or its designee. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i) except that full social security numbers and home addresses shall not be included on weekly transmittals. Instead the payrolls shall only need to include an individually identifying number for each employee (e.g., the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH-347 is available for this purpose from the Wage and Hour Division Web site at *http://www.dol.gov/esa/whd/forms/wh347instr.htm* or its successor site. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to HUD or its designee if the agency is a party to the contract, but if the agency is not such a party, the contractor will submit the payrolls to the applicant sponsor, or owner, as the case may be, for transmission to HUD or its designee, the contractor, or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this subparagraph for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to HUD or its designee. (Approved by the Office of Management and Budget under OMB Control Number 1215-0149.)

(b) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

(1) That the payroll for the payroll period contains the information required to be provided under 29 CFR 5.5 (a)(3)(ii), the appropriate information is being maintained under 29 CFR 5.5(a)(3)(i), and that such information is correct and complete;

(2) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in 29 CFR Part 3;

(3) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

(c) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by subparagraph A.3.(ii)(b).

(d) The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under Section 1001 of Title 18 and Section 231 of Title 31 of the United States Code.

(iii) The contractor or subcontractor shall make the records required under subparagraph A.3.(i) available for inspection, copying, or transcription by authorized representatives of HUD or its designee or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, HUD or its designee may, after written notice to the contractor, sponsor, applicant or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

4. Apprentices and Trainees.

(i) Apprentices. Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship Training, Employer and Labor Services, or with a State Apprenticeship Agency recognized by the Office, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Office of Apprenticeship Training, Employer and Labor Services or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event the Office of Apprenticeship Training, Employer and Labor Services, or a State Apprenticeship Agency recognized by the Office, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(ii) Trainees. Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant ',to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by

the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(iii) Equal employment opportunity. The utilization of apprentices, trainees and journeymen under 29 CFR Part 5 shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR Part 30.

5. Compliance with Copeland Act requirements. The contractor shall comply with the requirements of 29 CFR Part 3 which are incorporated by reference in this contract

6. Subcontracts. The contractor or subcontractor will insert in any subcontracts the clauses contained in subparagraphs 1 through 11 in this paragraph A and such other clauses as HUD or its designee may by appropriate instructions require, and a copy of the applicable prevailing wage decision, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in this paragraph.

7. Contract termination; debarment. A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

8. Compliance with Davis-Bacon and Related Act Requirements. All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR Parts 1, 3, and 5 are herein incorporated by reference in this contract

9. Disputes concerning labor standards. Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR Parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and HUD or its designee, the U.S. Department of Labor, or the employees or their representatives.

10. (i) Certification of Eligibility. By entering into this contract the contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of Section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1) or to be awarded HUD contracts or participate in HUD programs pursuant to 24 CFR Part 24.

(ii) No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of Section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1) or to be awarded HUD contracts or participate in HUD programs pursuant to 24 CFR Part 24.

(iii) The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001. Additionally, U.S. Criminal Code, Section 1 01 0, Title 18, U.S.C., "Federal Housing Administration transactions", provides in part: "Whoever, for the purpose of . . . influencing in any way the action of such Administration..... makes, utters or publishes any statement knowing the same to be false..... shall be fined not more than $5,000 or imprisoned not more than two years, or both."

11. Complaints, Proceedings, or Testimony by Employees. No laborer or mechanic to whom the wage, salary, or other labor standards provisions of this Contract are applicable shall be discharged or in any other manner discriminated against by the Contractor or any subcontractor because such employee has filed any complaint or instituted or caused to be instituted any proceeding or has testified or is about to testify in any proceeding under or relating to the labor standards applicable under this Contract to his employer.

B. Contract Work Hours and Safety Standards Act. The provisions of this paragraph B are applicable where the amount of the prime contract exceeds $100,000. As used in this paragraph, the terms "laborers" and "mechanics" include watchmen and guards.

(1) Overtime requirements. No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which the individual is employed on such work to work in excess of 40 hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of 40 hours in such workweek.

(2) Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the clause set forth in subparagraph (1) of this paragraph, the contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in subparagraph (1) of this paragraph, in the sum of $10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of 40 hours without payment of the overtime wages required by the clause set forth in sub paragraph (1) of this paragraph.

(3) Withholding for unpaid wages and liquidated damages. HUD or its designee shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contract, or any other Federally-assisted contract subject to the Contract Work Hours and Safety Standards Act which is held by the same prime contractor such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in subparagraph (2) of this paragraph.

(4) Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses set forth in subparagraph (1) through (4) of this paragraph and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in subparagraphs (1) through (4) of this paragraph.

C. Health and Safety. The provisions of this paragraph C are applicable where the amount of the prime contract exceeds $100,000.

(1) No laborer or mechanic shall be required to work in surroundings or under working conditions which are unsanitary, hazardous, or dangerous to his health and safety as determined under construction safety and health standards promulgated by the Secretary of Labor by regulation.

(2) The Contractor shall comply with all regulations issued by the Secretary of Labor pursuant to Title 29 Part 1926 and failure to comply may result in imposition of sanctions pursuant to the Contract Work Hours and Safety Standards Act, (Public Law 91-54, 83 Stat 96). 40 USC 3701 et seq.

(3) The contractor shall include the provisions of this paragraph in every subcontract so that such provisions will be binding on each subcontractor. The contractor shall take such action with respect to any subcontractor as the Secretary of Housing and Urban Development or the Secretary of Labor shall direct as a means of enforcing such provisions.

PREVAILING WAGE RATES

for

Public Works Contracts in Oregon

BOLI

OREGON BUREAU OF LABOR AND INDUSTRIES

Brad Avakian
Commissioner
Bureau of Labor and Industries

Effective: July 1, 2017

BRAD AVAKIAN
COMMISSIONER

CHRISTIE HAMMOND
DEPUTY COMMISSIONER

BUREAU OF LABOR AND INDUSTRIES

July 1, 2017

In January and July of each year, the Bureau of Labor and Industries publishes the prevailing wage rates that are required to be paid to workers on non-residential public works projects in the state of Oregon. Quarterly updates are published in April and October.

A separate publication, entitled "*Definitions of Covered Occupations for Public Works Contracts in Oregon*," provides occupational definitions used to classify the duties performed on public works projects.

These publications are available electronically on the bureau's website at www.oregon.gov/boli. In order to contain costs and preserve limited budget resources, BOLI is no longer automatically mailing copies of these publications to contracting agencies, contractors, and other interested parties. Those on the agency's mailing list will receive an email notification whenever the publications are amended in the future. One complimentary hard copy of each PWR publication is available upon request by emailing BOLI at pwremail@boli.state.or.us or calling 971-673-0838. Additional copies are available at cost, plus postage.

Also available on the bureau's website is a link to the federal Davis-Bacon rates. This link is posted in order to assist contractors and public agencies in determining which rates to pay on projects in Oregon subject to BOTH the state PWR and federal Davis-Bacon Act. The higher of the wage rates must be paid on such projects.

Unless specifically exempted by state law, prevailing wage rates are the minimum wages that must be paid to all workers employed on all public works. These rates are determined using data collected from a statewide construction industry wage survey of occupations and crafts performing commercial building and heavy and highway construction in 14 geographic regions of the state.

ORS 279C.830 requires that the applicable wage rates be incorporated into all bid specifications for public works contracts subject to the PWR law. A statement incorporating the applicable prevailing wage rate publication and any amendments thereto or Davis-Bacon wage rate determination into the specifications *by reference* will satisfy these requirements. Such reference must include the title of the applicable wage rates publication or determination and the date of the publication or determination as well as the date of any applicable amendments. A provision that prevailing wage rates must be paid must also appear in the contract.

Generally, the rates in effect at the time the bid specifications are first advertised are those that apply for the duration of the project. There are some exceptions to this rule. For example, if during the bidding process, the prevailing wage rates change, the public agency has the option of amending the bid specifications to reflect such changes. If a Construction Manager/General Contractor (CM/GC) is used on the project, the rates in effect at the time the CM/GC contract becomes a public works contract are the applicable rates to be used for the duration of the project. (See OAR 839-025-0020 for more information.) Note that the applicable rates for purposes of compliance with the federal Davis-Bacon Act may be different than the applicable rates for purposes of compliance with Oregon's prevailing wage rate laws. The effective federal rates will be those as determined under 29 CFR 1.6.

If you have any questions regarding application of the state PWR law or the applicable rates to be paid on any project, contact the bureau's Prevailing Wage Coordinator in Portland at (971) 673-0839.

B. Avakian

Brad Avakian
Commissioner
Bureau of Labor and Industries

800 NE Oregon St., Suite 1045 Portland OR 97232-2180 Telephone (971) 673-0761 TDD (971) 673-0766

REGION #2
Clackamas, Multnomah and Washington Counties

Using the booklet, Definitions of Covered Occupations, find the definition that most closely matches the actual work being performed by the worker.

OCCUPATION	BASIC HOURLY RATE	FRINGE RATE
Asbestos Worker/Insulator	See Appendix	See Appendix
Boilermaker	$33.92	$23.34
Bricklayer/Stonemason	See Appendix	See Appendix
Bridge & Highway Carpenter (See Carpenter Group 5)	See Appendix	See Appendix
Carpenter Group 1 & 2	See Appendix	See Appendix
Cement Mason	See Appendix	See Appendix
Diver	See Appendix	See Appendix
Diver Tender	See Appendix	See Appendix
Dredger	$39.81	$13.93
Drywall, Lather, Acoustical Carpenter & Ceiling Installer	See Appendix	See Appendix
Drywall Taper (See Painter & Drywall Taper)	See Appendix	See Appendix
Electrician	See Appendix	See Appendix
Elevator Constructor, Installer and Mechanic	See Appendix	See Appendix
Fence Constructor (Non-metal)	$23.96	$10.46
Fence Erector (Metal)	$20.50	$5.09
Flagger (See Laborer Group 3)	See Appendix	See Appendix
Glazier	See Appendix	See Appendix
Hazardous Materials Handler/Mechanic	$20.16	$8.43
Highway and Parking Striper	$26.11	$8.20
Ironworker	See Appendix	See Appendix
Laborer Group 1	See Appendix	See Appendix
Laborer Group 2	See Appendix	See Appendix
Laborer Group 3	See Appendix	See Appendix
Landscape Laborer/Technician	$17.16	$4.17
Limited Energy Electrician	See Appendix	See Appendix
Line Constructor	See Appendix	See Appendix
Marble Setter	$24.15	$18.58
Millwright Group 1 & 2	$29.32	$10.68
Painter	$21.36	$8.27
Piledriver (See Carpenter Group 6)	See Appendix	See Appendix
Plasterer and Stucco Mason	See Appendix	See Appendix
Plumber/Pipefitter/Steamfitter	See Appendix	See Appendix
Power Equipment Operator Group 1	See Appendix	See Appendix
Power Equipment Operator Group 1A	See Appendix	See Appendix
Power Equipment Operator Group 1B	See Appendix	See Appendix
Power Equipment Operator Group 2	See Appendix	See Appendix
Power Equipment Operator Group 3	See Appendix	See Appendix
Power Equipment Operator Group 4	See Appendix	See Appendix
Power Equipment Operator Group 5	See Appendix	See Appendix
Power Equipment Operator Group 6	See Appendix	See Appendix

REGION #2
Clackamas, Multnomah, and Washington Counties

Using the booklet, Definitions of Covered Occupations, find the definition that most closely matches the actual work being performed by the worker.

OCCUPATION	BASIC HOURLY RATE	FRINGE RATE
Roofer	See Appendix	See Appendix
Sheet Metal Worker	See Appendix	See Appendix
Soft Floor Layer	$24.29	$10.91
Sprinkler Fitter	See Appendix	See Appendix
Tender to Mason Trades (Brick and Stonemason, Mortar Mixer, Hod Carrier)	See Appendix	See Appendix
Tender to Plasterer and Stucco Mason	See Appendix	See Appendix
Testing, Adjusting, and Balancing (TAB) Technician	$31.17	$10.12
Tilesetter/Terrazzo Worker: Hard Tilesetter	See Appendix	See Appendix
Tile, Terrazzo, and Marble Finisher	See Appendix	See Appendix
Truck Driver – All Groups	$20.54	$7.16

TRADE	BASIC HOURLY RATE	HOURLY FRINGE

CARPENTER

Zone A (Base Rate)

Group 1	**36.63**	**16.25**
Group 2	**36.78**	**16.25**
Group 3	**37.16**	**16.25**
Group 4	**37.34**	**16.25**
Group 5	**37.16**	**16.25**
Group 6	**37.70**	**16.25**

Zone Differential for Carpenters
(Add to Zone A Base Rate)

Zone B	**1.25** per hour
Zone C	**1.70** per hour
Zone D	**2.00** per hour
Zone E	**3.00** per hour
Zone F	**5.00** per hour
Zone G	**10.00** per hour

Zone A: Projects located within 30 miles of the respective city hall of the cities listed.
Zone B: More than 30 miles but less than 40 miles.
Zone C: More than 40 miles but less than 50 miles.
Zone D: More than 50 miles but less than 60 miles.
Zone E: More than 60 miles but less than 70 miles.
Zone F: More than 70 miles but less than 100 miles.
Zone G: More than 100 miles.

Reference Cities for Group 1 and 2 Carpenters

Albany	Goldendale	Madras	Roseburg
Astoria	Grants Pass	Medford	Salem
Baker City	Hermiston	Newport	The Dalles
Bend	Hood River	Ontario	Tillamook
Brookings	Klamath Falls	Pendleton	Vancouver
Burns	La Grande	Portland	
Coos Bay	Lakeview	Port Orford	
Eugene	Longview	Reedsport	

Group 3 (Millwright Group-I)
Group 4 (Millwright Group-II)

Zones for Groups 3 and 4 Carpenter are determined by the distance between the project site and **either**

1) The worker's residence; ***or***

2) City Hall of a reference city listed for the appropriate group shown, whichever is closer

Reference Cities for Group 3 and 4 Carpenters

Eugene	Medford	Portland	Vancouver
Longview	North Bend	The Dalles	

CARPENTER (continued)

Group 5 (Bridge & Highway Carpenter)
Group 6 (Piledriver)

Zones for Groups 5 and 6 Carpenter are determined by the distance between the project site and **either**

1) The worker's residence; ***or***

2) City Hall of a reference city listed for the appropriate group shown, whichever is closer

Reference Cities for Group 5 and 6 Carpenters

Bend	Longview	North Bend
Eugene	Medford	Portland

Note: All job or project locations shall be computed (determined) on the basis of road miles and in the following manner. A mileage measurement will start at the entrance to the respective city hall, facing the project (if possible), and shall proceed by the normal route (shortest time, best road) to the geographical center on the highway, railroad, and street construction projects (end of measurement). On all project contracts, the geographical center where the major portion of the construction is located, shall be considered the center of the project (end measurement).

Welders receive $1.75/hour above their group's rate.

When working with creosote and other toxic, treated wood and steel material, workers shall receive $.25/hour premium pay for minimum of eight (8) hours.

When working in sheet pile coffer dams or cells up to the external water level, Group 6 workers shall receive $.15/hour premium pay for minimum of eight (8) hours

GLAZIER **36.32** **19.98**

(Add $1.00 to base rate if safety belt is required by State safety regulations)

(Add $4.00 to base rate for work done from a non-motorized single-man bosun chair)

TRADE	BASIC HOURLY RATE	HOURLY FRINGE

HIGHWAY/PARKING STRIPER

	34.87	**11.46**

Shift Differential

(Add $1.85 to base rate for shifts that start between 3:00pm and 4:00am)

PAINTER & DRYWALL TAPER

DRYWALL TAPER

Zone A (Base Rate)

	36.98	**14.44**

Zone Differential for Drywall Taper
(Add to Zone A Base Rate)

Zone B	**.85** per hour
Zone C	**1.25** per hour
Zone D	**1.70** per hour
Zone E	**2.00** per hour
Zone F	**3.00** per hour
Zone G	**5.00** per hour

Reference Cities and Dispatch Points for Drywall Taper

Astoria	Burns	Medford	The Dalles
Bend	Longview	Pendleton	

Local #10
11105 NE Sandy Blvd.
Portland, OR 97220

Local #24
2659 Commercial St. SE
Salem, OR 97302

Local #1277
541 Willamette, Suite 105
Eugene, OR 97402

TRUCK DRIVER

Zone A (Base Rate)

Group 1	**27.94**	**14.37**
Group 2	**28.06**	**14.37**
Group 3	**28.19**	**14.37**
Group 4	**28.46**	**14.37**
Group 5	**28.68**	**14.37**
Group 6	**28.85**	**14.37**
Group 7	**29.05**	**14.37**

TRUCK DRIVER (continued)

Zone differential for Truck Drivers
(Add to Zone A Base Rate)

Zone B	**.65** per hour
Zone C	**1.15** per hour
Zone D	**1.70** per hour
Zone E	**2.75** per hour

Zone A: Projects within 30 miles of the cities listed.
Zone B: More than 30 miles but less than 40 miles.
Zone C: More than 40 miles but less than 50 miles.
Zone D: More than 50 miles but less than 80 miles.
Zone E: More than 80 miles.

Reference Cities

Albany	Eugene	Madras	Reedsport
Astoria	Goldendale	Medford	Roseburg
Baker	Grants Pass	McMinnville	Salem
Bend	Hermiston	Newport	The Dalles
Bingen	Hood River	Ontario	Tillamook
Brookings	Klamath Falls	Oregon City	Vancouver
Burns	LaGrande	Pendleton	
Coos Bay	Lakeview	Portland	
Corvallis	Longview	Port Orford	

Note: All job or project locations shall be computed (determined) on the basis of road miles and in the following manner. A mileage measurement will start at the entrance to the respective city hall, facing the project (if possible), and shall proceed by the normal route (shortest time-best road) to the geographical center on the highway, railroad, and street construction projects (end of measurement). On all other project contracts, the geographical center where the major portion of the construction is located, shall be considered the center of the project (end measurement).

General Decision Number: OR170031 09/29/2017 OR31

Superseded General Decision Number: OR20160031

State: Oregon

Construction Type: Building

County: Washington County in Oregon.

BUILDING CONSTRUCTION PROJECTS (does not include single family homes or apartments up to and including 4 stories).

Note: Under Executive Order (EO) 13658, an hourly minimum wage of $10.20 for calendar year 2017 applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2015. If this contract is covered by the EO, the contractor must pay all workers in any classification listed on this wage determination at least $10.20 (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in calendar year 2017. The EO minimum wage rate will be adjusted annually. Additional information on contractor requirements and worker protections under the EO is available at www.dol.gov/whd/govcontracts.

Modification Number	Publication Date
0	01/06/2017
1	01/13/2017
2	02/03/2017
3	03/10/2017
4	03/31/2017
5	05/05/2017
6	05/19/2017
7	06/16/2017
8	06/30/2017
9	07/07/2017
10	07/21/2017
11	09/01/2017
12	09/22/2017
13	09/29/2017

BROR0001-014 06/01/2017

	Rates	Fringes
BRICK FINISHER	$ 23.13	12.70
BRICKLAYER	$ 36.03	20.81
TILE FINISHER	$ 23.13	12.62
TILE SETTER	$ 30.55	17.07

CARP0001-025 06/01/2012

	Rates	Fringes
Carpenters:		
Hardwood floors and batt insulation	$ 32.76	14.44

Including metal stud installation, from work and scaffold building	$ 32.61	14.44

CARP9001-003 06/01/2012

	Rates	Fringes
Acoustical Ceiling Installer & Drywall Hanger	$ 32.90	14.15
LATHER	$ 31.02	16.03

ELEC0048-018 01/01/2017

	Rates	Fringes
ELECTRICIAN	$ 40.20	22.18

ELEC0048-019 01/01/2017

	Rates	Fringes
ELECTRICIAN		
Computer Installation, telephone installation, HVAC temperature control installation, Electrical low voltage wiring installer and sound technician only	$ 24.48	16.58
Electrical installer alarms and Low voltage wiring for alarms only	$ 32.78	19.70

ENGI0701-022 01/01/2017

	Rates	Fringes
POWER EQUIPMENT OPERATOR		
GROUP 1	$ 39.90	14.10
GROUP 1A	$ 41.90	14.10
GROUP 1B	$ 43.89	14.10
GROUP 2	$ 37.99	14.10
GROUP 3	$ 36.84	14.10
GROUP 4	$ 35.76	14.10
GROUP 5	$ 34.52	14.10
GROUP 6	$ 31.30	14.10

POWER EQUIPMENT OPERATORS CLASSIFICATIONS

GROUP 1: CRANE: Helicopter Operator, when used in erecting work; Whirley Operator, 90 ton and over; LATTICE BOOM CRANE: Operator 200 tons through 299 tons, and/or over 200 feet boom; HYDRAULIC CRANE: Hydraulic Crane Operator 90 tons through 199 tons with luffing or tower attachments

GROUP 1A: HYDRAULIC CRANE: Hydraulic Operator, 200 tons and over (with luffing or tower attachment); LATTICE BOOM CRANE: Operator, 200 tons through 299 tons, with over 200 feet boom;

GROUP 1B: LATTICE BOOM CRANE: Operator, 300 tons through 399 tons with over 200 feet boom; Operator 400 tons and over

GROUP 2: CRANE: Cableway Operator, 25 tons and over; HYDRAULIC CRANE: Hydraulic crane operator 90 tons through 199 tons (without luffing or tower attachment); TOWER/WHIRLEY OPERATOR: Tower Crane Operator; Whirley Operator, under 90 tons; LATTICE BOOM CRANE: 90 through 199 tons and/or 150 to 200 feet boom; HYDRAULIC CRANE: Hydraulic crane operator, 50 tons through 89 tons (with luffing or tower attachment); Rubber tired scraper with tandom scrapers, multi-engineTrenching Machine-Wheel Operator; Excavator over 130,000 lbs; Loader 120,000 lbs and above; BLADE: Auto Grader; Blade Operator-Robotic

GROUP 3: HYDRAULIC CRANE: Hydraulic crane operator, 50 tons through 89 tons (without luffing or tower attachment); LATTICE BOOM CRANES: Lattice Boom Crane-50 through 89 tons (and less than 150 feet boom); Rubber Tired Scraper: with tandom scrapers; self loading, paddle wheel, auger type, finish and/or 2 or more units; Excavator over 80,000 lbs through 130,000; Loader 60,000 lbs and less than 120,000 lbs.

GROUP 4: CRANE: Hydraulic Crane Operator, under 50 tons; LATTICE BOOM CRANE OPERATOR: Lattice Boom Crane Operator, under 50 tons; TRACKHOE/EXCAVATOR-ROBOTIC: up to and including 20,0000 lbs. with any or all attachments; Excavator Operator over 20,000 lbs through 80,000 lbs.; BLADE: Blade Operator; Tractor operator with boom attachment; DRILLING: Churm Drill and Earth Boring Machine Operator; Directional Drill Operator over 20,000 lbs pullback; CRANE: Chicago boom and similar types; Boom type lifting device, 5 ton capacity or less; HYDRAULIC HOES: Robotic Hydraulic backhoe operator, track and wheel type up to and including 20,0000 lbs. with any or all attachments; Asphalt Paver; Screed Operator; Rubber-Tired Scraper, single engine, single scraper; Compactor-Self Propelled; Trenching Machine, digging capacity over 3 ft Depth; Excavator over 20,000 lbs through 80,000 lbs; Loaders 25,000 lbs and less than 60,000 lbs

GROUP 5: TRACKHOE/EXCAVATOR-HYDRAULIC: up to and including 20,000 lbs.; Boom truck operator; DRILLING: Churm Drill and Earth Boring Machine Operator; Directional Drill Operator less than 20,000 lbs pullback; HYDRAULIC HOES: Hydraulic Backhoe Operator, wheel type (Ford, John Deere, Case type); Hydraulic Backhoe Operator track type up to and including 20,000 lbs.; Concrete Pumper; Concrete Paver: Compactor; Loaders, rubber tired type , less than 25,00 lbs; Forklift over 5 ton, Man Lift/Outside Elevator

GROUP 6: LOADERS: (less than 1 cu yd.); Roller (Non-Asphalt); Oiler; Bobcat/Skid Loader; Grade Checker; Crane oiler; Forklift

Zone Differential (add to Zone 1 rates):
Zone 2 - $3.00
Zone 3 - $6.00

For the following metropolitan counties: MULTNOMAH; CLACKAMAS; MARION; WASHINGTON; YAMHILL; AND COLUMBIA; CLARK; AND COWLITZ COUNTY, WASHINGTON WITH MODIFICATIONS AS INDICATED:

All jobs or projects located in Multnomah, Clackamas and Marion Counties, West of the western boundary of Mt. Hood National Forest and West of Mile Post 30 on Interstate 84 and West of Mile Post 30 on State Highway 26 and West of Mile Post 30 on Highway 22 and all jobs or projects located in Yamhill County, Washington County and Columbia County and all jobs or porjects located in Clark & Cowlitz County, Washington except that portion of Cowlitz County in the Mt. St. Helens "Blast Zone" shall receive Zone I pay for all classifications.

All jobs or projects located in the area outside the identified boundary above, but less than 50 miles from the Portland City Hall shall receive Zone II pay for all classifications.

All jobs or projects located more than 50 miles from the Portland City Hall, but outside the identified border above, shall receive Zone III pay for all classifications.

For the following cities: ALBANY; BEND; COOS BAY; EUGENE; GRANTS PASS; KLAMATH FALLS; MEDFORD; ROSEBURG

All jobs or projects located within 30 miles of the respective city hall of the above mentioned cities shall receive Zone I pay for all classifications.

All jobs or projects located more than 30 miles and less than 50 miles from the respective city hall of the above mentioned cities shall receive Zone II pay for all classifications.

All jobs or projects located more than 50 miles from the respective city hall of the above mentioned cities shall receive Zone III pay for all classifications.

IRON0029-011 07/01/2015

	Rates	Fringes
IRONWORKER (Ornamental, Reinforcing, and Structural).....	$ 34.12	23.04

LABO0737-005 06/01/2017

	Rates	Fringes
Laborers: (Mason Tender-Cement/Concrete).....	$ 28.89	13.85

LABO0737-006 06/01/2017

	Rates	Fringes

Laborers: (Mason Tender-Brick)...$ 28.89 13.85

LABO0737-007 06/01/2017

	Rates	Fringes
Laborers: (Mason Tender-Stone)...	$ 28.89	13.85

LABO0737-015 06/01/2017

	Rates	Fringes
Laborers:		
GROUP 1.....	$ 28.86	13.85
GROUP 2.....	$ 29.94	13.85

LABORER CLASSIFICATIONS

GROUP 1: Form-Stripping; Demolition, General Laborer, Power Tool Operator

GROUP 2: Vibrating Plate, Grade Checker, Pipelayer, Asphalt Raker

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PAIN0055-021 07/01/2017

	Rates	Fringes
DRYWALL FINISHER/TAPER.....	$ 36.98	14.44

PAIN0055-022 07/01/2017

	Rates	Fringes
PAINTER		
BRUSH, ROLLER AND SPRAY.....	$ 23.02	11.02

PAIN0740-002 07/01/2017

	Rates	Fringes
GLAZIER.....	$ 39.08	17.22

PAIN1236-007 07/01/2017

	Rates	Fringes
FLOOR LAYER: Vinyl Flooring.....	$ 29.27	14.97

PLAS0082-004 07/01/2017

	Rates	Fringes
PLASTERER		
Including Stucco.....	$ 28.79	18.58

PLAS0555-006 06/01/2017

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER	$ 31.50	17.62

PLUM0290-010 04/01/2017

	Rates	Fringes
PLUMBER	$ 43.82	28.28

PLUM0290-011 04/01/2017

	Rates	Fringes
PIPEFITTER HVAC Pipe Installation only	$ 43.82	28.28

* ROOF0049-004 07/01/2017

	Rates	Fringes
ROOFER	$ 30.88	17.47
Excluding Metal Roof	$ 28.53	14.67

SFOR0669-002 04/01/2017

	Rates	Fringes
SPRINKLER FITTER Fire Sprinklers	$ 37.66	15.84

SHEE0016-015 07/01/2017

	Rates	Fringes
Sheet Metal Worker Including HVAC Duct Installation	$ 38.77	19.16

SUOR2009-029 11/09/2009

	Rates	Fringes
LABORER: Landscape	$ 12.38	0.00
MILLWRIGHT	$ 17.62	3.19
TRUCK DRIVER: Dump Truck	$ 20.30	5.25
TRUCK DRIVER: Water Truck	$ 18.11	5.05

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the

Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at www.dol.gov/whd/govcontracts.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (ii)).

The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of "identifiers" that indicate whether the particular rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than "SU" or "UAVG" denotes that the union classification and rate were prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

Survey Rate Identifiers

Classifications listed under the "SU" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that

classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

Survey wage rates are not updated and remain in effect until a new survey is conducted.

Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

* an existing published wage determination
* a survey underlying a wage determination
* a Wage and Hour Division letter setting forth a position on a wage determination matter
* a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour Regional Office for the area in which the survey was conducted because those Regional Offices have responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations
Wage and Hour Division

U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

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END OF GENERAL DECISION

SUMMARY

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Work covered by the Contract Documents.
2. Type of the Contract.
3. Work under other contracts.
4. Owner-furnished products.
5. Specification formats and conventions.

1.2 WORK COVERED BY CONTRACT DOCUMENTS

A. Existing building description:

The original building was constructed 1978, then received renovations and additions in 1981 and 2003. It is a wood framed structure that functions as a senior center and community center for the City of Forest Grove. As part of its mission, the Kitchen is a key component of the program to serve meals to the senior population, low income residents, and meals on wheels programs. The facility does not have fire sprinklers or fire alarm, but the total gross building area is 9,865 SF and it has numerous exits directly to the outside and short travel distances.

B. Proposed project description:

Interior renovation of existing commercial kitchen and support spaces with in the existing senior center. All work proposed is within the existing building and no new square footage will be added. The project includes new kitchen food service equipment, new finishes at the floors, walls, and ceiling, new lighting, upgrades to the power systems, and all new HVAC mechanical and plumbing systems, including a new grease interceptor that treats all sewer water from the kitchen area.

1.3 TYPE OF CONTRACT

A. See Division 00 for City of Forest Grove contract form and related requirements.

1.4 WORK UNDER OTHER CONTRACTS

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

SUMMARY

B. Concurrent Work: Owner intends to award separate contract(s) for the following construction operations at Project site. Those operations will be conducted simultaneously with work under this Contract.

1. Removal of existing kitchen food service equipment, appliances and shelving that is not currently built-in.

2. The Owner intends to purchase and deliver all new kitchen equiment directly from the manufacturer and/or distributor and provide to the General Contractor for installation.

1.5 OWNER-FURNISHED PRODUCTS

A. Owner will furnish products indicated. The Work includes providing support systems and installation labor and materials to receive and install Owner's equipment.

1. Owner will arrange and pay for delivery of Owner-furnished items according to Contractor's Construction Schedule.

2. After delivery, Owner will inspect delivered items for damage. Contractor shall be present for and assist in Owner's inspection.

3. If Owner-furnished items are damaged, defective, or missing, Owner will arrange for replacement.

4. Owner will arrange for manufacturer's field services and for delivery of manufacturer's warranties to Contractor.

5. Owner will furnish Contractor the earliest possible delivery date for Owner-furnished products. Using Owner-furnished earliest possible delivery dates, Contractor shall designate delivery dates of Owner-furnished items in Contractor's Construction Schedule.

6. Contractor is responsible for receiving, unloading, and handling Owner-furnished items at Project site.

7. Contractor is responsible for protecting Owner-furnished items from damage during storage and handling, including damage from exposure to the elements.

8. If Owner-furnished items are damaged as a result of Contractor's operations, Contractor shall repair or replace them.

9. Contractor shall install and otherwise incorporate Owner-furnished items into the Work.

B. Owner-Furnished Contractor Installed Products:

SUMMARY

1. The Contractor shall assist the Owner in the coordination and scheduling of all Owner Furnished products listed, including all food service equipment requiring attachment to the floors, walls, and ceilings.

2. The Food Service drawings identify all food service equipment that is provided by the Owner and installed by the Contractor.

3. The kitchen exhaust hood and related ducting and the walk-in refrigerated are provided and installed by the Contractor. They are not Owner furnished.

1.6 SPECIFICATION FORMATS AND CONVENTIONS

A. Specification Format: The Specifications are organized into Divisions and Sections using the CSI/CSC's 2004 "MasterFormat" numbering system.

1. Section Identification: The Specifications use Section numbers and titles to help cross-referencing in the Contract Documents. Sections in the Project Manual are in numeric sequence; however, the sequence is incomplete because all available Section numbers are not used. Consult the table of contents at the beginning of the Project Manual to determine numbers and names of Sections in the Contract Documents.

2. Division 1: Sections in Division 1 govern the execution of the Work of all Sections in the Specifications.

B. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:

1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural, and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.

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

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

END OF SECTION

PROJECT MANAGEMENT AND COORDINATION

PART 1 – GENERAL

1.1 SUMMARY

A. This Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:

1. Coordination Drawings.

2. Administrative and supervisory personnel.

3. Project meetings.

B. Related Sections include the following:

1. Division 1 Section "Construction Progress Documentation" for preparing and submitting Contractor's Construction Schedule.

2. Division 1 Section "Field Engineering" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.

3. Division 1 Section "Closeout Procedures" for coordinating closeout of the Contract.

1.2 DEFINITIONS

A. RFI: Request from Contractor seeking interpretation or clarification of the Contract Documents.

1.3 COORDINATION

A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.

2. Coordinate installation of different components to ensure maximum accessibility for required maintenance, service and repair.

B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

PROJECT MANAGEMENT AND COORDINATION

1. Preparation of Contractor's Construction Schedule.

2. Preparation of the Schedule of Values.

3. Installation and removal of temporary facilities and controls.

4. Delivery and processing of submittals.

5. Progress meetings.

6. Preinstallation conferences.

7. Project closeout activities.

8. Startup and adjustment of systems.

9. Project closeout activities.

D. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.

1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. Refer to other Sections for disposition of salvaged materials that are designated as Owner's property.

1.4 ADMINISTRATIVE AND SUPERVISORY PERSONNEL

A. General: In addition to Project superintendent, provide other administrative and supervisory personnel as required for proper performance of the Work.

1.5 PROJECT MEETINGS

A. General: Schedule and conduct meetings and conferences at Project site, unless otherwise indicated.

1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.

2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.

3. Minutes: Record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within **three** days of the meeting.

B. Preconstruction Conference: Schedule a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than **15** days after execution of the Agreement. Hold the conference at Project site or another convenient location. Conduct the meeting to review responsibilities and personnel assignments.

PROJECT MANAGEMENT AND COORDINATION

1. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.

2. Agenda: Discuss items of significance that could affect progress, including the following:

    a. Tentative construction schedule.

    b. Critical work sequencing and long-lead items.

    c. Designation of key personnel and their duties.

    d. Procedures for processing field decisions and Change Orders.

    e. Procedures for RFIs.

    f. Procedures for testing and inspecting.

    g. Procedures for processing Applications for Payment.

    h. Submittal procedures.

    i. Preparation of Record Documents.

    j. Use of the premises and work restrictions.

    k. Owner's occupancy requirements.

    l. Responsibility for temporary facilities and controls.

    m. Parking availability.

    n. Site access restrictions.

    o. Equipment and material deliveries and priorities.

    p. First aid.

    q. Security.

    r. Progress cleaning.

    s. Working hours.

3. Minutes: Record and distribute meeting minutes.

PROJECT MANAGEMENT AND COORDINATION

C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction or as otherwise required by the Specifications.

1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates.

2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration.

3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.

4. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.

D. Progress Meetings: Conduct progress meetings at **weekly** intervals. Coordinate dates of meetings with preparation of payment requests.

1. Attendees: Owner, Architect and Contractor shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.

2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

(1) Review schedule for next period.

b. Review present and future needs of each entity present, including the following:

(1) Interface requirements.

(2) Sequence of operations.

(3) Status of submittals.

(4) Deliveries.

(5) Off-site fabrication.

PROJECT MANAGEMENT AND COORDINATION

(6) Access.

(7) Site utilization.

(8) Temporary facilities and controls.

(9) Work hours.

(10) Hazards and risks.

(11) Progress cleaning.

(12) Quality and work standards.

(13) Status of correction of deficient items.

(14) Field observations.

(15) RFIs.

(16) Status of proposal requests.

(17) Pending changes.

(18) Status of Change Orders.

(19) Pending claims and disputes.

(20) Documentation of information for payment requests.

3. Minutes: Record the meeting minutes.

4. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.

5. Schedule Updating: Revise Contractor's Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

E. Coordination Meetings: Conduct Project coordination meetings at weekly intervals. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.

1. Attendees: Contractor, each subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.

PROJECT MANAGEMENT AND COORDINATION

2. Agenda: Review and correct or approve minutes of the previous coordination meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

3. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

1.6 REQUESTS FOR INTERPRETATION (RFI)

A. Procedure: Immediately on discovery of the need for interpretation of the Contract Documents, and if not possible to request interpretation at Project meeting, prepare and submit an RFI in the form specified**.**

1. RFIs shall originate with Contractor. RFIs submitted by entities other than Contractor will be returned with no response.

2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.

3. The RFI process is not intended to answer questions regarding information that can be found in the Contract Documents. RFIs received from the Contractor, that can be answered by information contained in the Contract Documents without further interpretation by the Architect, will be returned without response.

B. Content of the RFI: Include a detailed, legible description of item needing interpretation and the following:

1. Project name.

2. Date.

3. Name of Contractor.

4. Name of Architect.

5. RFI number, numbered sequentially.

6. Specification Section number and title and related paragraphs, as appropriate.

7. Drawing number and detail references, as appropriate.

8. Field dimensions and conditions, as appropriate.

9. Contractor's suggested solution(s). If Contractor's solution(s) impact the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.

10. Contractor's signature.

11. Attachments:

a. Include drawings, descriptions, measurements, photos, Product Data, Shop Drawings, and other information necessary to fully describe items needing interpretation.

b. Supplementary drawings prepared by Contractor shall include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments.

C. Hard-Copy RFIs: Contractor's standard form subject to Architect's approval. Identify each page of attachments with the RFI number and sequential page number.

D. Software-Generated RFIs: Software-generated form with substantially the same content as indicated above. Attachments shall be electronic files in Adobe Acrobat PDF format.

E. Architect's Action: Architect will review each RFI, determine action required, and return it. Allow **seven** working days for Architect's response for each RFI. RFIs received after 1:00 p.m. will be considered as received the following working day.

1. The following RFIs will be returned without action:

a. Requests for approval of submittals.

b. Requests for approval of substitutions.

c. Requests for coordination information already indicated in the Contract Documents.

d. Requests for adjustments in the Contract Time or the Contract Sum.

e. Requests for interpretation of Architect's actions on submittals.

f. Incomplete RFIs or RFIs with numerous errors.

2. Architect's action may include a request for additional information, in which case Architect's time for response will start again.

3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Division 1 Section "Contract Modification Procedures."

4. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within **10** days of receipt of the RFI response.

F. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within **seven** days if Contractor disagrees with response.

G. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly. Include the following:

PROJECT MANAGEMENT AND COORDINATION

1. Project name.

2. Name and address of Contractor.

3. Name and address of Architect.

4. RFI number including RFIs that were dropped and not submitted.

5. RFI description.

6. Date the RFI was submitted.

7. Date Architect's response was received.

8. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.

9. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.

END OF SECTION

SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

B. Related Sections include the following:

1. Division 1 Section "Project Management and Coordination" for submitting and distributing meeting and conference minutes and for submitting Coordination Drawings.

2. Division 1 Section "Construction Progress Documentation" for submitting schedules and reports, including Contractor's Construction Schedule and the Submittals Schedule.

3. Division 1 Section "Quality Control" for submitting test and inspection reports.

4. Division 1 Section “Product Requirements” for submitting product information.

5. Division 1 Section "Closeout Procedures" for submitting warranties.

6. Division 1 Section "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.

7. Division 1 Section "Operation and Maintenance Data" for submitting operation and maintenance manuals.

8. Divisions 2 through 33 Sections for specific requirements for submittals in those Sections.

1.2 DEFINITIONS

A. Action Submittals: Written and graphic information that requires Architect's responsive action.

B. Informational Submittals: Written information that does not require Architect's responsive action. Submittals may be rejected for not complying with requirements.

1.3 SUBMITTAL PROCEDURES

A. General: Use of Contract Documents in electronic media format will be permitted upon receipt of signed and dated "Agreement Between Contractor and Architect Concerning Use of Electronic Media" (form included in Division 0).

B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.

SUBMITTAL PROCEDURES

2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.

   a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

C. Submittals Schedule: Comply with requirements in Division 1 Section "Construction Progress Documentation" for list of submittals and time requirements for scheduled performance of related construction activities.

D. Processing Time: Allow enough time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.

   1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.

   2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.

   3. Resubmittal Review: Allow 15 days for review of each resubmittal.

   4. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow 21 days for initial review of each submittal.

E. Identification: Place a permanent label or title block on each submittal for identification.

   1. Indicate name of firm or entity that prepared each submittal on label or title block.

   2. Provide a space approximately 6 by 8 inches on label or beside title block to record Contractor's review and approval markings and action taken by Architect.

   3. Include the following information on label for processing and recording action taken:

      a. Project name.

      b. Date.

      c. Name and address of Architect.

      d. Name and address of Contractor.

      e. Name and address of subcontractor.

      f. Name and address of supplier.

SUBMITTAL PROCEDURES

g. Name of manufacturer.

h. Submittal number or other unique identifier, including revision identifier.

(1) Submittal number shall use Specification Section number followed by a decimal point and then a sequential number (e.g., 06 10 00.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., 06 10 00.01.A).

i. Number and title of appropriate Specification Section.

j. Drawing number and detail references, as appropriate.

k. Location(s) where product is to be installed, as appropriate.

l. Other necessary identification.

F. Deviations: Highlight, encircle**,** or otherwise specifically identify deviations from the Contract Documents on submittals. Contract Document deviations on submittals do not constitute a request for a change to Contract Documents and Contract Documents cannot be revised by the submittal process.

G. Additional Copies: Unless additional copies are required for final submittal, and unless Architect observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.

1. Submit one copy of submittal to concurrent reviewer in addition to specified number of copies to Architect.

2. Additional copies submitted for maintenance manuals will not be marked with action taken and will be returned.

H. Transmittal: Package each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect will return submittals, without review**,** received from sources other than Contractor.

1. Transmittal Form: Use AIA Document G810 or other form containing similar information.

2. Transmittal Form: Provide locations on form for the following information:

a. Project name.

b. Date.

c. Destination (To:).

d. Source (From:).

SUBMITTAL PROCEDURES

e. Names of subcontractor, manufacturer, and supplier.

f. Category and type of submittal.

g. Submittal purpose and description.

h. Specification Section number and title.

i. Drawing number and detail references, as appropriate.

j. Transmittal number**,** numbered consecutively.

k. Submittal and transmittal distribution record.

l. Remarks.

m. Signature of transmitter.

3. On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same label information as related submittal.

I. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.

1. Note date and content of previous submittal.

2. Note date and content of revision in label or title block and clearly indicate extent of revision.

3. Resubmit submittals until they are marked "No Exception Taken," or "Make Corrections Noted."

J. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

K. Use for Construction: Use only final submittals with mark indicating "Reviewed for Conformance With Design Concepts, No Exception Taken," or Reviewed for Conformance With Design Concepts, Make Corrections Noted."

PART 2 - PRODUCTS

2.1 ACTION SUBMITTALS

A. General: Prepare and submit Action Submittals required by individual Specification Sections.

SUBMITTAL PROCEDURES

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

1. If information must be specially prepared for submittal because standard printed data are not suitable for use, submit as Shop Drawings, not as Product Data.

2. Mark each copy of each submittal to show which products and options are applicable.

3. Include the following information, as applicable:

a. Manufacturer's written recommendations.

b. Manufacturer's product specifications.

c. Manufacturer's installation instructions.

d. Standard color charts.

e. Manufacturer's catalog cuts.

f. Wiring diagrams showing factory-installed wiring.

g. Mill reports.

h. Standard product operation and maintenance manuals.

i. Compliance with specified referenced standards.

j. Testing by recognized testing agency.

k. Application of testing agency labels and seals.

l. Notation of coordination requirements.

4. Submit Product Data before or concurrent with Samples.

5. Review comments of the Architect will be shown on one set of product data when it is returned to the Contractor. The Contractor may make and distribute such copies as required for his purposes.

6. Number of Copies: Submit four copies of Product Data, unless otherwise indicated. Architect**,** will return two copies. Mark up and retain one returned copy as a Project Record Document.

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.

1. Preparation: Fully illustrate requirements of the Contract Documents. Include the following information, as applicable:

SUBMITTAL PROCEDURES

a. Dimensions.

b. Identification of products.

c. Fabrication and installation drawings.

d. Roughing-in and setting diagrams.

e. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring.

f. Shopwork manufacturing instructions.

g. Templates and patterns.

h. Schedules.

i. Design calculations.

j. Compliance with specified standards.

k. Notation of coordination requirements.

l. Notation of dimensions established by field measurement.

m. Relationship to adjoining construction clearly indicated.

n. Seal and signature of professional engineer if specified.

o. Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring.

2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches but no larger than 30 by 40 inches.

3. Review comments of the Architect will be shown on one set of prints when it is returned to the Contractor. The Contractor may make and distribute such copies as required for his purposes.

a. Review comments may be submitted electronically on electronically submitted shop drawings.

4. Number of Copies: Submit four opaque copies of each submittal, unless copies are required for operation and maintenance manuals. Submit five copies where copies are required for operation and maintenance manuals. Architect will retain two copies; remainder will be returned**.** Mark up and retain one returned copy as a Project Record Drawing.

SUBMITTAL PROCEDURES

a. Contractor's Option: Submit shop drawings electronically in format acceptable to the Owner.

D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.

1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.

2. Identification: Attach label on unexposed side of Samples that includes the following:

a. Generic description of Sample.

b. Product name and name of manufacturer.

c. Sample source.

d. Number and title of appropriate Specification Section.

3. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.

a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of Substantial Completion.

b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.

4. Samples for Initial Selection:

a. Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.

b. Number of Samples: Submit two full sets of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return one set with options selected.

5. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.

a. Number of Samples: Submit three sets of Samples. Architect will retain one Sample set; remainder will be returned.

(1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.

(2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least two sets of paired units that show approximate limits of variations.

E. Contractor's Construction Schedule: Comply with requirements specified in Division 1 Section "Construction Progress Documentation" for Construction Manager's action.

F. Submittals Schedule: Comply with requirements specified in Division 1 Section "Construction Progress Documentation."

G. Application for Payment: Comply with requirements specified in Division 1 Section "Payment Procedures."

H. Schedule of Values: Comply with requirements specified in Division 1 Section "Payment Procedures."

I. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:

1. Name, address, and telephone number of entity performing subcontract or supplying products.

2. Number and title of related Specification Section(s) covered by subcontract.

3. Drawing number and detail references, as appropriate, covered by subcontract.

4. Number of Copies: Submit three copies of subcontractor list, unless otherwise indicated. Architect will return two copies. Mark up and retain one returned copy as a Project Record Document.

2.2 INFORMATIONAL SUBMITTALS

A. General: Prepare and submit Informational Submittals required by other Specification Sections.

1. Number of Copies: Submit two copies of each submittal, unless otherwise indicated. Architect will not return copies.

2. Certificates and Certifications: Provide a notarized statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.

SUBMITTAL PROCEDURES

3. Test and Inspection Reports: Comply with requirements specified in Division 1 Section "Quality Control."

B. Coordination Drawings: Comply with requirements specified in Division 1 Section "Project Management and Coordination."

C. Contractor's Construction Schedule: Comply with requirements specified in Division 1 Section "Construction Progress Documentation."

D. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

E. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification (WPS) and Procedure Qualification Record (PQR) on AWS forms. Include names of firms and personnel certified.

F. Installer Certificates: Prepare written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.

G. Manufacturer Certificates: Prepare written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.

H. Product Certificates: Prepare written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

I. Material Certificates: Prepare written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

J. Material Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.

K. Product Test Reports: Prepare written reports indicating current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

L. Research/Evaluation Reports: Prepare written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:

1. Name of evaluation organization.

2. Date of evaluation.

SUBMITTAL PROCEDURES

3. Time period when report is in effect.

4. Product and manufacturers' names.

5. Description of product.

6. Test procedures and results.

7. Limitations of use.

M. Schedule of Tests and Inspections: Comply with requirements specified in Division 1 Section "Quality Control."

N. Compatibility Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.

O. Field Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

P. Maintenance Data: Prepare written and graphic instructions and procedures for operation and normal maintenance of products and equipment. Comply with requirements specified in Division 1 Section "Operation and Maintenance Data."

Q. Design Data: Prepare written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

R. Manufacturer's Instructions: Prepare written or published information that documents manufacturer's recommendations, guidelines, and procedures for installing or operating a product or equipment. Include name of product and name, address, and telephone number of manufacturer. Include the following, as applicable:

1. Preparation of substrates.

2. Required substrate tolerances.

3. Sequence of installation or erection.

4. Required installation tolerances.

5. Required adjustments.

6. Recommendations for cleaning and protection.

S. Insurance Certificates and Bonds: Prepare written information indicating current status of insurance or bonding coverage. Include name of entity covered by insurance or bond, limits of coverage, amounts of deductibles, if any, and term of the coverage.

2.3 DELEGATED DESIGN

A. Performance and Design Criteria:

1. Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

2. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

B. Delegated-Design Submittal:

1. In addition to Shop Drawings, Product Data, and other required submittals, submit two copies of a statement, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.

2. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

A. Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.

B. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 ARCHITECT'S ACTION

A. General: Architect will not review submittals that do not bear Contractor's approval stamp and will return them without action.

B. Action Submittals: Architect will review each submittal, make marks to indicate corrections or modifications required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action taken, as follows:

SUBMITTAL PROCEDURES

1. No Exception Taken;

2. Make Corrections Noted; or

3. Nonconforming Resubmit.

C. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.

D. Partial submittals are not acceptable, will be considered nonresponsive, and will be returned without review.

E. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

END OF SECTION

REFERENCES

PART 1 GENERAL

1.1 DEFINITIONS

A. General: Basic Contract definitions are included in the Conditions of the Contract.

B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.

C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."

D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."

E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.

F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

G. "Install": Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.

H. "Provide": Furnish and install, complete and ready for the intended use.

I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.2 INDUSTRY STANDARDS

A. Applicability of Standards: Except to the extent more explicit of more stringent requirements are written directly into the contract documents or are required by governing regulations, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents. Such standards are made a part of the Contract Documents by reference. In case of a conflict between the referenced standard and the project specifications, the project specifications shall govern.

B. Referenced Standards: Industry standards which are referenced in the contract documents have precedence over non-referenced standards which are, nevertheless, seen to be intended by their producers for application to work similar to that required for this project.

REFERENCES

C. Non-Referenced Standards: Industry standards which are not specifically referenced in the contract documents for applicability to the work, including standards produced by those associations and agencies listed in this section (but not referenced elsewhere), are applicable as a general measurement of whether the performed work complies with recognized standards of the construction industry.

D. Publication Dates: In each instance, comply with the standard or trade association publications which was in effect at the date of the contract documents, except where specifically indicated to comply with a publication of another date. References in the specifications have generally omitted the date indicator which frequently accompanies the identification number for the standards and publications indicated. Submit requests for approval of standards or publications of a different date. Substantial changes in the work which result from approval of standards or publications of a different date shall be processed as change orders in conjunction with such approval, at no change in price.

E. Copies of Standards: In connection with the requirements (specified elsewhere in the contract documents) that each entity performing the work be expert in the portion of work being performed, each such entity is hereby also required to be familiar with recognized industry standards applicable to that portion of work. In general, copies of applicable standards have not been bound with the contract documents. Where copies of standards are needed for proper performance of the work, the Contractor is required to obtain such copies directly from the publication source. Although certain copies needed for enforcement of the requirements may be specified as required submittals, the Owners Representative reserves the right to require the Contractor to submit copies of additional applicable standards as needed for enforcement of the requirements.

1.3 ABBREVIATIONS AND ACRONYMS

A. Abbreviations and Acronyms for Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the organizations responsible for the standards and regulations in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

ADA	Dept. of Justice ADA Regulations Dept. of Justice 2010 ADA Standards for Accessible Design Accessibility Guidelines for Buildings and Facilities Available from U. S. Access Board www.access-board.gov	(800) 872-2253
CFR	Code of Federal Regulations Available from Government Printing Office www.gpoaccess.gov/cfr/index.html	(866) 512-1800 (202) 512-1800
DOD	Department of Defense Military Specifications and Standards Available from Department of Defense Single Stock Point http://dodssp.daps.dla.mil	(215) 697-6257

REFERENCES

DSCC	Defense Supply Center Columbus (See FS)	
FED-STD	Federal Standard (See FS)	
FS	Federal Specification Available from Department of Defense Single Stock Point http://dodssp.daps.dla.mil	(215) 697-6257
	Available from Defense Standardization Program www.dps.dla.mil	
	Available from General Services Administration www.gsa.gov	(202) 619-8925
	Available from National Institute of Building Sciences www.nibs.org	(202) 289-7800
FTMS	Federal Test Method Standard (See FS)	
MIL	(See MILSPEC)	
MIL-STD	(See MILSPEC)	
MILSPEC	Military Specification and Standards Available from Department of Defense Single Stock Point http://dodssp.daps.dla.mil	(215) 697-6257
UFAS	Uniform Federal Accessibility Standards Available from Access Board www.access-board.gov	(800) 872-2253 (202) 272-0080

1.4 ABBREVIATIONS AND ACRONYMS

A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Thomson Gale's "Encyclopedia of Associations" or in Columbia Books' "National Trade & Professional Associations of the U.S."

B. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

AA	Aluminum Association, Inc. (The) www.aluminum.org	(703) 358-2960

REFERENCES

AAADM	American Association of Automatic Door Manufacturers www.aaadm.com	(216) 241-7333
AABC	Associated Air Balance Council www.aabchq.com	(202) 737-0202
AAMA	American Architectural Manufacturers Association www.aamanet.org	(847) 303-5664
AASHTO	American Association of State Highway and Transportation Officials www.transportation.org	(202) 624-5800
AATCC	American Association of Textile Chemists and Colorists (The) www.aatcc.org	(919) 549-8141
ABAA	Air Barrier Association of America www.airbarrier.org	(866) 956-5888
ABMA	American Bearing Manufacturers Association www.abma-dc.org	(202) 367-1155
ACI	ACI International (American Concrete Institute) www.aci-int.org	(248) 848-3700
ACPA	American Concrete Pipe Association www.concrete-pipe.org	(972) 506-7216
AEIC	Association of Edison Illuminating Companies, Inc. (The) www.aeic.org	(205) 257-2530
AF&PA	American Forest & Paper Association www.afandpa.org	(800) 878-8878 (202) 463-2700
AGA	American Gas Association www.aga.org	(202) 824-7000
AGC	Associated General Contractors of America (The) www.agc.org	(703) 548-3118
AHA	American Hardboard Association (Now part of CPA)	
AHAM	Association of Home Appliance Manufacturers www.aham.org	(202) 872-5955

REFERENCES

AI	Asphalt Institute www.asphaltinstitute.org	(859) 288-4960
AIA	American Institute of Architects (The) www.aia.org	(800) 242-3837 (202) 626-7300
AISC	American Institute of Steel Construction www.aisc.org	(800) 644-2400 (312) 670-2400
AISI	American Iron and Steel Institute www.steel.org	(202) 452-7100
AITC	American Institute of Timber Construction www.aitc-glulam.org	(303) 792-9559
ALCA	Associated Landscape Contractors of America (Now PLANET - Professional Landcare Network)	
ALSC	American Lumber Standard Committee, Incorporated www.alsc.org	(301) 972-1700
AMCA	Air Movement and Control Association International, Inc. www.amca.org	(847) 394-0150
ANSI	American National Standards Institute www.ansi.org	(202) 293-8020
AOSA	Association of Official Seed Analysts, Inc. www.aosaseed.com	(505) 522-1437
APA	APA - The Engineered Wood Association www.apawood.org	(253) 565-6600
APA	Architectural Precast Association www.archprecast.org	(239) 454-6989
API	American Petroleum Institute www.api.org	(202) 682-8000
ARI	Air-Conditioning & Refrigeration Institute www.ari.org	(703) 524-8800
ARMA	Asphalt Roofing Manufacturers Association www.asphaltroofing.org	(202) 207-0917
ASCE	American Society of Civil Engineers	(800) 548-2723

REFERENCES

	www.asce.org	(703) 295-6300
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers www.ashrae.org	(800) 527-4723 (404) 636-8400
ASME	ASME International (The American Society of Mechanical Engineers International) www.asme.org	(800) 843-2763 (973) 882-1170
ASSE	American Society of Sanitary Engineering www.asse-plumbing.org	(440) 835-3040
ASTM	ASTM International (American Society for Testing and Materials International) www.astm.org	(610) 832-9585
AWCI	AWCI International (Association of the Wall and Ceiling Industry International) www.awci.org	(703) 534-8300
AWCMA	American Window Covering Manufacturers Association (Now WCSC)	
AWI	Architectural Woodwork Institute www.awinet.org	(800) 449-8811 (571) 323-3636
AWPA	American Wood-Preservers' Association www.awpa.com	(334) 874-9800
AWS	American Welding Society www.aws.org	(800) 443-9353 (305) 443-9353
AWWA	American Water Works Association www.awwa.org	(800) 926-7337 (303) 794-7711
BHMA	Builders Hardware Manufacturers Association www.buildershardware.com	(212) 297-2122
BIA	Brick Industry Association (The) www.bia.org	(703) 620-0010
BICSI	BICSI www.bicsi.org	(800) 242-7405 (813) 979-1991
BIFMA	BIFMA International (Business and Institutional Furniture Manufacturer's	(616) 285-3963

REFERENCES

	Association International) www.bifma.com	
BISSC	Baking Industry Sanitation Standards Committee www.bissc.org	(866) 342-4772
CCC	Carpet Cushion Council www.carpetcushion.org	(203) 637-1312
CDA	Copper Development Association www.copper.org	(800) 232-3282 (212) 251-7200
CEA	Canadian Electricity Association www.canelect.ca	(613) 230-9263
CFFA	Chemical Fabrics & Film Association, Inc. www.chemicalfabricsandfilm.com	(216) 241-7333
CGA	Compressed Gas Association www.cganet.com	(703) 788-2700
CIMA	Cellulose Insulation Manufacturers Association www.cellulose.org	(888) 881-2462 (937) 222-2462
CISCA	Ceilings & Interior Systems Construction Association www.cisca.org	(630) 584-1919
CISPI	Cast Iron Soil Pipe Institute www.cispi.org	(423) 892-0137
CLFMI	Chain Link Fence Manufacturers Institute www.chainlinkinfo.org	(301) 596-2583
CPA	Composite Panel Association www.pbmdf.com	(301) 670-0604
CPPA	Corrugated Polyethylene Pipe Association www.cppa-info.org	(800) 510-2772 (202) 462-9607
CRI	Carpet & Rug Institute (The) www.carpet-rug.com	(800) 882-8846 (706) 278-3176
CRSI	Concrete Reinforcing Steel Institute www.crsi.org	(847) 517-1200
CSA	CSA International (Formerly: IAS - International Approval Services) www.csa-international.org	(866) 797-4272 (416) 747-4000

REFERENCES

CSI	Cast Stone Institute www.caststone.org	(770) 972-3011
CSI	Construction Specifications Institute (The) www.csinet.org	(800) 689-2900 (703) 684-0300
CSSB	Cedar Shake & Shingle Bureau www.cedarbureau.org	(604) 820-7700
CTI	Cooling Technology Institute (Formerly: Cooling Tower Institute) www.cti.org	(281) 583-4087
CTIOA	Ceramic Tile Institute of America www.ctioa.org	(310) 574-7800
EIA	Electronic Industries Alliance www.eia.org	(703) 907-7500
EIMA	EIFS Industry Members Association www.eima.com	(800) 294-3462 (770) 968-7945
EJCDC	Engineers Joint Contract Documents Committee www.ejdc.org	(703) 295-5000
EJMA	Expansion Joint Manufacturers Association, Inc. www.ejma.org	(914) 332-0040
ESD	ESD Association www.esda.org	(315) 339-6937
FIBA	Federation Internationale de Basketball Amateur (The International Basketball Federation) www.fiba.com	41 22 545 00 00
FIVB	Federation Internationale de Volleyball (The International Volleyball Federation) www.fivb.ch	41 21 345 35 35
FMG	FM Global (Formerly: FM - Factory Mutual System) www.fmglobal.com	(401) 275-3000
FMRC	Factory Mutual Research (Now FMG)	

REFERENCES

FRSA	Florida Roofing, Sheet Metal & Air Conditioning Contractors Association, Inc. www.floridaroof.com	(407) 671-3772
FSA	Fluid Sealing Association www.fluidsealing.com	(610) 971-4850
FSC	Forest Stewardship Council www.fsc.org	49 228 367 66 0
GA	Gypsum Association www.gypsum.org	(202) 289-5440
GANA	Glass Association of North America www.glasswebsite.com	(785) 271-0208
GRI	(Now GSI)	
GS	Green Seal www.greenseal.org	(202) 872-6400
GSI	Geosynthetic Institute www.geosynthetic-institute.org	(610) 522-8440
HI	Hydraulic Institute www.pumps.org	(888) 786-7744 (973) 267-9700
HI	Hydronics Institute www.gamanet.org	(908) 464-8200
HMMA	Hollow Metal Manufacturers Association (Part of NAAMM)	
HPVA	Hardwood Plywood & Veneer Association www.hpva.org	(703) 435-2900
HPW	H. P. White Laboratory, Inc. www.hpwhite.com	(410) 838-6550
IAS	International Approval Services (Now CSA International)	
IBF	International Badminton Federation www.intbadfed.org	(6-03) 9283-7155
ICEA	Insulated Cable Engineers Association, Inc. www.icea.net	(770) 830-0369

REFERENCES

ICRI	International Concrete Repair Institute, Inc. www.icri.org	(847) 827-0830
IEC	International Electrotechnical Commission www.iec.ch	41 22 919 02 11
IEEE	Institute of Electrical and Electronics Engineers, Inc. (The) www.ieee.org	(212) 419-7900
IESNA	Illuminating Engineering Society of North America www.iesna.org	(212) 248-5000
IEST	Institute of Environmental Sciences and Technology www.iest.org	(847) 255-1561
IGCC	Insulating Glass Certification Council www.igcc.org	(315) 646-2234
IGMA	Insulating Glass Manufacturers Alliance www.igmaonline.org	(613) 233-1510
ILI	Indiana Limestone Institute of America, Inc. www.iliai.com	(812) 275-4426
ISO	International Organization for Standardization www.iso.ch	41 22 749 01 11
	Available from ANSI www.ansi.org	(202) 293-8020
ISSFA	International Solid Surface Fabricators Association www.issfa.net	(877) 464-7732 (702) 567-8150
ITS	Intertek www.intertek.com	(800) 345-3851 (713) 407-3500
ITU	International Telecommunication Union www.itu.int/home	41 22 730 51 11
KCMA	Kitchen Cabinet Manufacturers Association www.kcma.org	(703) 264-1690
LMA	Laminating Materials Association (Now part of CPA)	
LPI	Lightning Protection Institute www.lightning.org	(800) 488-6864 (804) 314-8955

REFERENCES

MBMA	Metal Building Manufacturers Association www.mbma.com	(216) 241-7333
MFMA	Maple Flooring Manufacturers Association, Inc. www.maplefloor.org	(847) 480-9138
MFMA	Metal Framing Manufacturers Association www.metalframingmfg.org	(312) 644-6610
MH	Material Handling (Now MHIA)	
MHIA	Material Handling Industry of America www.mhia.org	(800) 345-1815 (704) 676-1190
MIA	Marble Institute of America www.marble-institute.com	(440) 250-9222
MPI	Master Painters Institute www.paintinfo.com	(888) 674-8937
MSS	Manufacturers Standardization Society of The Valve and Fittings Industry Inc. www.mss-hq.com	(703) 281-6613
NAAMM	National Association of Architectural Metal Manufacturers www.naamm.org	(312) 332-0405
NACE	NACE International (National Association of Corrosion Engineers International) www.nace.org	(800) 797-6623 (281) 228-6200
NADCA	National Air Duct Cleaners Association www.nadca.com	(202) 737-2926
NAGWS	National Association for Girls and Women in Sport www.aahperd.org/nagws/	(800) 213-7193, ext. 453
NAIMA	North American Insulation Manufacturers Association www.naima.org	(703) 684-0084
NBGQA	National Building Granite Quarries Association, Inc. www.nbgqa.com	(800) 557-2848
NCAA	National Collegiate Athletic Association (The) www.ncaa.org	(317) 917-6222

REFERENCES

NCMA	National Concrete Masonry Association www.ncma.org	(703) 713-1900
NCPI	National Clay Pipe Institute www.ncpi.org	(262) 248-9094
NCTA	National Cable & Telecommunications Association www.ncta.com	(202) 775-3550
NEBB	National Environmental Balancing Bureau www.nebb.org	(301) 977-3698
NECA	National Electrical Contractors Association www.necanet.org	(301) 657-3110
NeLMA	Northeastern Lumber Manufacturers' Association www.nelma.org	(207) 829-6901
NEMA	National Electrical Manufacturers Association www.nema.org	(703) 841-3200
NETA	InterNational Electrical Testing Association www.netaworld.org	(888) 300-6382 (303) 697-8441
NFHS	National Federation of State High School Associations www.nfhs.org	(317) 972-6900
NFPA	NFPA (National Fire Protection Association) www.nfpa.org	(800) 344-3555 (617) 770-3000
NFRC	National Fenestration Rating Council www.nfrc.org	(301) 589-1776
NGA	National Glass Association www.glass.org	(866) 342-5642 (703) 442-4890
NHLA	National Hardwood Lumber Association www.natlhardwood.org	(800) 933-0318 (901) 377-1818
NLGA	National Lumber Grades Authority www.nlga.org	(604) 524-2393
NOFMA	NOFMA: The Wood Flooring Manufacturers Association (Formerly: National Oak Flooring Manufacturers Association) www.nofma.org	(901) 526-5016
NRCA	National Roofing Contractors Association	(800) 323-9545

REFERENCES

	www.nrca.net	(847) 299-9070
NRMCA	National Ready Mixed Concrete Association www.nrmca.org	(888) 846-7622 (301) 587-1400
NSF	NSF International (National Sanitation Foundation International) www.nsf.org	(800) 673-6275 (734) 769-8010
NSSGA	National Stone, Sand & Gravel Association www.nssga.org	(800) 342-1415 (703) 525-8788
NTMA	National Terrazzo & Mosaic Association, Inc. (The) www.ntma.com	(800) 323-9736 (540) 751-0930
NTRMA	National Tile Roofing Manufacturers Association (Now TRI)	
NWFA	National Wood Flooring Association www.woodfloors.org	
NWWDA	National Wood Window and Door Association (Now WDMA)	
OPL	Omega Point Laboratories, Inc. (Acquired by ITS - Intertek) www.opl.com	(800) 966-5253 (210) 635-8100
PCI	Precast/Prestressed Concrete Institute www.pci.org	(312) 786-0300
PDCA	Painting & Decorating Contractors of America www.pdca.com	(800) 332-7322 (314) 514-7322
PDI	Plumbing & Drainage Institute www.pdionline.org	(800) 589-8956 (978) 557-0720
PGI	PVC Geomembrane Institute http://pgi-tp.ce.uiuc.edu	(217) 333-3929
PLANET	Professional Landcare Network (Formerly: ACLA - Associated Landscape Contractors of America) www.landcarenetwork.org	(800) 395-2522 (703) 736-9666
PTI	Post-Tensioning Institute www.post-tensioning.org	(602) 870-7540
RCSC	Research Council on Structural Connections www.boltcouncil.org	(800) 644-2400 (312) 670-2400

REFERENCES

RFCI	Resilient Floor Covering Institute www.rfci.com	(301) 340-8580
RIS	Redwood Inspection Service www.calredwood.org	(888) 225-7339 (415) 382-0662
RTI	(Formerly: NTRMA - National Tile Roofing Manufacturers Association) (Now TRI)	
SAE	SAE International www.sae.org	(877) 606-7323 (724) 776-4841
SDI	Steel Deck Institute www.sdi.org	(847) 458-4647
SDI	Steel Door Institute www.steeldoor.org	(440) 899-0010
SEFA	Scientific Equipment and Furniture Association www.sefalabs.com	(516) 294-5424
SGCC	Safety Glazing Certification Council www.sgcc.org	(315) 646-2234
SIA	Security Industry Association www.siaonline.org	(703) 683-2075
SIGMA	Sealed Insulating Glass Manufacturers Association (Now IGMA)	
SJI	Steel Joist Institute www.steeljoist.org	(843) 626-1995
SMA	Screen Manufacturers Association www.smacentral.org	(561) 533-0991
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association www.smacna.org	(703) 803-2980
SMPTE	Society of Motion Picture and Television Engineers www.smpte.org	(914) 761-1100
SPFA	Spray Polyurethane Foam Alliance (Formerly: SPI/SPFD - The Society of the Plastics	(800) 523-6154

REFERENCES

	Industry, Inc.; Spray Polyurethane Foam Division) www.sprayfoam.org	
SPIB	Southern Pine Inspection Bureau (The) www.spib.org	(850) 434-2611
SPRI	Single Ply Roofing Industry www.spri.org	(781) 647-7026
SSINA	Specialty Steel Industry of North America www.ssina.com	(800) 982-0355 (202) 342-8630
SSPC	SSPC: The Society for Protective Coatings www.sspc.org	(877) 281-7772 (412) 281-2331
STI	Steel Tank Institute www.steeltank.com	(847) 438-8265
SWI	Steel Window Institute www.steelwindows.com	(216) 241-7333
SWRI	Sealant, Waterproofing, & Restoration Institute www.swrionline.org	(816) 472-7974
TCNA	Tile Council of North America, Inc. www.tileusa.com	(864) 646-8453
TIA/EIA	Telecommunications Industry Association/Electronic Industries Alliance www.tiaonline.org	(703) 907-7700
TMS	The Masonry Society www.masonrysociety.org	(303) 939-9700
TPI	Truss Plate Institute, Inc. www.tpinst.org	(703) 683-1010
TPI	Turfgrass Producers International www.turfgrasssod.org	(847) 649-5555
TRI	Tile Roofing Institute (Formerly: RTI - Roof Tile Institute) www.tileroofing.org	(312) 670-4177
UL	Underwriters Laboratories Inc. www.ul.com	(877) 854-3577 (847) 272-8800
UNI	Uni-Bell PVC Pipe Association	(972) 243-3902

REFERENCES

	www.uni-bell.org	
USAV	USA Volleyball www.usavolleyball.org	(888) 786-5539 (719) 228-6800
USGBC	U.S. Green Building Council www.usgbc.org	(202) 828-7422
USITT	United States Institute for Theatre Technology, Inc. www.usitt.org	(800) 938-7488 (315) 463-6463
WASTEC	Waste Equipment Technology Association www.wastec.org	(800) 424-2869 (202) 244-4700
WCLIB	West Coast Lumber Inspection Bureau www.wclib.org	(800) 283-1486 (503) 639-0651
WCMA	Window Covering Manufacturers Association (Now WCSC)	
WCSC	Window Covering Safety Council (Formerly: WCMA - Window Covering Manufacturers Association) www.windowcoverings.org	(800) 506-4636 (212) 297-2109
WDMA	Window & Door Manufacturers Association (Formerly: NWWDA - National Wood Window and Door Association) www.wdma.com	(800) 223-2301 (847) 299-5200
WI	Woodwork Institute (Formerly: WIC - Woodwork Institute of California) www.wicnet.org	(916) 372-9943
WIC	Woodwork Institute of California (Now WI)	
WMMPA	Wood Moulding & Millwork Producers Association www.wmmpa.com	(800) 550-7889 (530) 661-9591
WSRCA	Western States Roofing Contractors Association www.wsrca.com	(800) 725-0333 (650) 570-5441
WWPA	Western Wood Products Association www.wwpa.org	(503) 224-3930

REFERENCES

C. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

BOCA	BOCA International, Inc. (See ICC)	
IAPMO	International Association of Plumbing and Mechanical Officials www.iapmo.org	(909) 472-4100
ICBO	International Conference of Building Officials (See ICC)	
ICBO ES	ICBO Evaluation Service, Inc. (See ICC-ES)	
ICC	International Code Council www.iccsafe.org	(888) 422-7233 (703) 931-4533
ICC-ES	ICC Evaluation Service, Inc. www.icc-es.org	(800) 423-6587 (562) 699-0543
SBCCI	Southern Building Code Congress International, Inc. (See ICC)	

D. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

CE	Army Corps of Engineers www.usace.army.mil	
CPSC	Consumer Product Safety Commission www.cpsc.gov	(800) 638-2772 (301) 504-7923
DOC	Department of Commerce www.commerce.gov	(202) 482-2000
DOD	Department of Defense http://.dodssp.daps.dla.mil	(215) 697-6257
DOE	Department of Energy www.energy.gov	(202) 586-9220
EPA	Environmental Protection Agency www.epa.gov	(202) 272-0167

REFERENCES

FAA	Federal Aviation Administration www.faa.gov	(866) 835-5322
FCC	Federal Communications Commission www.fcc.gov	(888) 225-5322
FDA	Food and Drug Administration www.fda.gov	(888) 463-6332
GSA	General Services Administration www.gsa.gov	(800) 488-3111
HUD	Department of Housing and Urban Development www.hud.gov	(202) 708-1112
LBL	Lawrence Berkeley National Laboratory www.lbl.gov	(510) 486-4000
NCHRP	National Cooperative Highway Research Program (See TRB)	
NIST	National Institute of Standards and Technology www.nist.gov	(301) 975-6478
OSHA	Occupational Safety & Health Administration www.osha.gov	(800) 321-6742 (202) 693-1999
PBS	Public Building Service (See GSA)	
PHS	Office of Public Health and Science www.osophs.dhhs.gov/ophs	(202) 690-7694
RUS	Rural Utilities Service (See USDA)	(202) 720-9540
SD	State Department www.state.gov	(202) 647-4000
TRB	Transportation Research Board www.nas.edu/trb	(202) 334-2934
USDA	Department of Agriculture www.usda.gov	(202) 720-2791
USPS	Postal Service	(202) 268-2000

REFERENCES

www.usps.com

END OF SECTION

QUALITY CONTROL

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.

1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.

2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.

3. Requirements for Contractor to provide quality-assurance and -control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

C. Related Sections include the following:

1. Divisions 2 through 33 Sections for specific test and inspection requirements.

1.2 DEFINITIONS

A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.

B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect.

C. Mockups: Full-size, physical assemblies that are constructed on-site. Mockups are used to verify selections made under sample submittals, to demonstrate aesthetic effects and, where indicated, qualities of materials and execution, and to review construction, coordination, testing, or operation; they are not Samples. Approved mockups establish the standard by which the Work will be judged.

D. Laboratory Mockups: Full-size, physical assemblies that are constructed at testing facility to verify performance characteristics.

QUALITY CONTROL

E. Preconstruction Testing: Tests and inspections that are performed specifically for the Project before products and materials are incorporated into the Work to verify performance or compliance with specified criteria.

F. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with industry standards.

G. Source Quality-Control Testing: Tests and inspections that are performed at the source, i.e., plant, mill, factory, or shop.

H. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

I. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

J. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.

1. Using a term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to tradespeople of the corresponding generic name.

K. Experienced: When used with an entity, "experienced" means having successfully completed a minimum of 10 previous projects similar in size and scope to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.3 CONFLICTING REQUIREMENTS

A. General: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to Architect for a decision before proceeding.

B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.4 SUBMITTALS

A. Submit the following in accordance with Division 1 Section "Submittal Procedures."

QUALITY CONTROL

B. Qualification Data: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

C. Schedule of Tests and Inspections: Prepare in tabular form and include the following:

1. Specification Section number and title.

2. Description of test and inspection.

3. Identification of applicable standards.

4. Identification of test and inspection methods.

5. Number of tests and inspections required.

6. Time schedule or time span for tests and inspections.

7. Entity responsible for performing tests and inspections.

8. Requirements for obtaining samples.

9. Unique characteristics of each quality-control service.

D. Reports: Prepare and submit certified written reports that include the following:

1. Date of issue.

2. Project title and number.

3. Name, address, and telephone number of testing agency.

4. Dates and locations of samples and tests or inspections.

5. Names of individuals making tests and inspections.

6. Description of the Work and test and inspection method.

7. Identification of product and Specification Section.

8. Complete test or inspection data.

9. Test and inspection results and an interpretation of test results.

10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.

11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.

12. Name and signature of laboratory inspector.

13. Recommendations on retesting and reinspecting.

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

1.5 QUALITY ASSURANCE

A. General: Qualifications paragraphs in this Article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

C. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

D. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar to those indicated for this Project in material, design, and extent.

F. Specialists: Certain sections of the Specifications require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.

1. Requirement for specialists shall not supersede building codes and regulations governing the Work.

G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 548; and with additional qualifications specified in individual Sections; and where required by authorities having jurisdiction, that is acceptable to authorities.

1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.

2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.

QUALITY CONTROL

H. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

I. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:

1. Contractor responsibilities include the following:

a. Provide test specimens representative of proposed products and construction.

b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.

c. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.

d. Build site-assembled test assemblies and mockups using installers who will perform same tasks for Project.

e. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.

f. When testing is complete, remove test specimens, assemblies, mockups, and laboratory mockups; do not reuse products on Project.

2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

J. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:

1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect.

2. Notify Architect seven days in advance of dates and times when mockups will be constructed.

3. Demonstrate the proposed range of aesthetic effects and workmanship.

4. Obtain Architect's approval of mockups before starting work, fabrication, or construction.

a. Allow seven days for initial review and each re-review of each mockup.

QUALITY CONTROL

5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.

6. Demolish and remove mockups when directed, unless otherwise indicated.

K. Laboratory Mockups: Comply with requirements of preconstruction testing and those specified in individual Sections in Divisions 2 through 33.

1.6 QUALITY CONTROL

A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.

1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.

2. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor**,** and the Contract Sum will be adjusted by Change Order.

B. Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.

1. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.

2. Notify testing agencies at least two days in advance of time when Work that requires testing or inspecting will be performed.

3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.

4. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.

5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

C. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Division 1 Section "Submittal Procedures."

QUALITY CONTROL

D. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.

E. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.

2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.

3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.

4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.

5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.

6. Do not perform any duties of Contractor.

F. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:

1. Access to the Work.

2. Incidental labor and facilities necessary to facilitate tests and inspections.

3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.

4. Facilities for storage and field curing of test samples.

5. Delivery of samples to testing agencies.

6. Preliminary design mix proposed for use for material mixes that require control by testing agency.

7. Security and protection for samples and for testing and inspecting equipment at Project site.

G. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting. Schedule times for tests, inspections, obtaining samples, and similar activities.

QUALITY CONTROL

H. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents. Submit schedule within 30 days of date established for the Notice to Proceed.

1. Distribution: Distribute schedule to Owner, Architect, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

1.7 SPECIAL TESTS AND INSPECTIONS

A. Special Tests and Inspections: Owner will engage a qualified testing agency to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner, and as follows:

1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviewing the completeness and adequacy of those procedures to perform the Work.

2. Notifying Architect and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.

3. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect with copy to Contractor and to authorities having jurisdiction.

4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.

5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.

6. Retesting and reinspecting corrected work.

B. Special Tests and Inspections include, but are not limited to:

1. Structural fill.

2. Structural poured-in-place concrete and rebar placement.

3. Structural bolting.

4. Concrete block masonry.

5. Drilled structural anchors.

6. All items noted on the Special Inspections Schedule located on the structural drawings.

END OF SECTION

PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; product substitutions; and comparable products.

B. Related Sections include the following:

1. Division 1 Section "References" for applicable industry standards for products specified.

2. Division 1 Section "Closeout Procedures" for submitting warranties for Contract closeout.

3. Divisions 2 through 33 Sections for specific requirements for warranties on products and installations specified to be warranted.

1.2 DEFINITIONS

A. Products: Items purchased for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.

2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.

3. Comparable Product: Product that is demonstrated and approved through submittal process, or where indicated as a product substitution, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

B. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.

C. Basis-of-Design Product Specification: Where a specific manufacturer's product is named including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other named manufacturers.

1.3 SUBMITTALS

PRODUCT REQUIREMENTS

A. Substitution Requests: Submit one copy of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Substitution Request Form: Use facsimile of CSI Northwest Region Substitution Request Form provided at end of Section.

2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:

a. Statement indicating why specified material or product cannot be provided.

b. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors, that will be necessary to accommodate proposed substitution.

c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.

d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.

e. Samples, where applicable or requested.

f. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.

g. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.

h. Research/evaluation reports evidencing compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.

i. Detailed comparison of Contractor's Construction Schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating lack of availability or delays in delivery.

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

k. Contractor's certification that proposed substitution complies with requirements in the Contract Documents and is appropriate for applications indicated.

l. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within 7 days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or 7 days of receipt of additional information or documentation, whichever is later.

a. Form of Acceptance: Change Order.

b. Use product specified if Architect cannot make a decision on use of a proposed substitution within time allocated.

B. Comparable Product Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Architect will notify Contractor of approval or rejection of proposed comparable product request within 15 days of receipt of request, or 7 days of receipt of additional information or documentation, whichever is later.

a. Form of Approval: As specified in Division 1 Section "Submittal Procedures."

b. Use product specified if Architect cannot make a decision on use of a comparable product request within time allocated.

C. Basis-of-Design Product Specification Submittal: Comply with requirements in Division 1 Section "Submittal Procedures." Show compliance with requirements.

1.4 QUALITY ASSURANCE

A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, product selected shall be compatible with products previously selected, even if previously selected products were also options.

1. Each contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors.

2. If a dispute arises between contractors over concurrently selectable but incompatible products, Architect will determine which products shall be used.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft. Comply with manufacturer's written instructions.

PRODUCT REQUIREMENTS

B. Delivery and Handling:

1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.

2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.

3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.

4. Inspect products on delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.

C. Storage:

1. Store products to allow for inspection and measurement of quantity or counting of units.

2. Store materials in a manner that will not endanger Project structure.

3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.

4. Store cementitious products and materials on elevated platforms.

5. Store foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.

6. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.

7. Protect stored products from damage and liquids from freezing.

1.6 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

1. Manufacturer's Warranty: Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.

2. Special Warranty: Written warranty required by or incorporated into the Contract Documents, either to extend time limit provided by manufacturer's warranty or to provide more rights for Owner.

PRODUCT REQUIREMENTS

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution. Submit a draft for approval before final execution.

1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.

2. Specified Form: When specified forms are included with the Specifications, prepare a written document using appropriate form properly executed.

3. Refer to Divisions 2 through 33 Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Division 1 Section "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

A. Comply with specified industry standards. If no standards are specified, comply with the product's industry standards as a minimum requirement. Provide materials in size, type, and quality indicated and specified, unless variations are accepted by Architect in writing.

B. Specifying a manufacturer and manufactured product shall not constitute a waiver of any requirements of the Contract Documents, and products furnished by the listed manufacturer shall conform to such requirements.

C. No materials or products containing asbestos are to be used in the construction of this Project. If any material or product specified in this Project Manual is known to contain asbestos, it shall be brought to the attention of the Architect before ordering or fabricating the material or product.

D. General Product Requirements:

1. Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, that are new at time of installation.

2. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.

3. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.

4. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.

5. Where products are accompanied by the term "as selected," Architect will make selection.

6. Where products are accompanied by the term "match sample," sample to be matched is Architect's.

PRODUCT REQUIREMENTS

7. Descriptive, performance, and reference standard requirements in the Specifications establish "salient characteristics" of products.

8. Or Equal: Where products are specified by name and accompanied by the term "or equal" or "or approved equal" or "or approved," comply with provisions in Part 2 "Comparable Products" Article to obtain approval for use of an unnamed product.

E. Product Selection Procedures:

1. Product: Where Specifications name a single product and manufacturer, provide the named product that complies with requirements.

2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements.

3. Available Products: Where Specifications include a list of names of both products and manufacturers, provide one of the products listed that complies with requirements. Comply with provisions in Part 2 "Comparable Products" Article for consideration of an unnamed product.

4. Available Manufacturers: Where Specifications include a list of manufacturers, provide a product by one of the manufacturers listed that complies with requirements. Comply with provisions in Part 2 "Comparable Products" Article for consideration of an unnamed product.

5. Specifying a manufacturer and manufactured product shall not constitute a waiver of any requirements of the Contract Documents, and products furnished by the listed manufacturer shall conform to such requirements.

6. Product Options: Where Specifications indicate that sizes, profiles, and dimensional requirements on Drawings are based on a specific product or system, provide the specified product or system. Comply with provisions in Part 2 "Product Substitutions" Article for consideration of an unnamed product or system.

7. Basis-of-Design Product: Where Specifications name a product and include a list of manufacturers, provide the specified product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with provisions in Part 2 "Comparable Products" Article for consideration of an unnamed product by the other named manufacturers.

8. Visual Matching Specification: Where Specifications require matching an established Sample, select a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.

   a. If no product available within specified category matches and complies with other specified requirements, comply with provisions in Part 2 "Product Substitutions" Article for proposal of product.

PRODUCT REQUIREMENTS

9. Visual Selection Specification: Where Specifications include the phrase "as selected from manufacturer's colors, patterns, textures" or a similar phrase, select a product that complies with other specified requirements.

   a. Standard Range: Where Specifications include the phrase "standard range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, density, or texture from manufacturer's product line that does not include premium items.

   b. Full Range: Where Specifications include the phrase "full range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 PRODUCT SUBSTITUTION PROCEDURES

A. Submit substitution requests on the CSI Substitution Request form bound in this Project Manual. If the Substitution Request form is reproduced, the terms and conditions of the Substitution Request bound in this Project Manual shall apply to the request.

B. Each substitution request shall include a complete description of the proposed substitute, the name of the material, service, or equipment for which it is to be substituted, drawings, cuts, performance and test data, samples illustrating color, texture and pattern, and any other data or information required to make a valid comparison. Product catalogs containing multiple products shall be marked to indicate which products and product options are being submitted for substitution. Substitution requests submitted with unmarked catalogs will not be reviewed.

C. Consideration of Substitution Requests Prior to Bid Date: Submit Substitution Requests 7 days prior to bid date. If, in the Architect's opinion, the proposed product is acceptable in lieu of the one or more specified, the Architect will include it in a written addendum which will be issued to bidders. Acceptance of a Substitution Request does not relieve the requestor from meeting the requirements, procedures, and warranties as set forth in this specification. Only those manufacturers, materials, services, and equipment approved in these Specifications or by Addendum will be acceptable for use on this construction project.

D. Consideration of Substitution Requests After Contract Award:

   1. Requests for substitution of specified products after the construction Contract is signed, will be considered only in accordance with paragraphs 2.2.A. and 2.2.B., above. If, in the Architect's opinion, the proposed product is acceptable in lieu of the one or more specified, the Architect will issue a Supplemental Instruction, when Contract Sum or Contract Time is not affected, or a Construction Change Directive or Change Order, when Contract Sum or Contract Time is affected.

   2. Substitution requests occasioned by the Contractor's failure to order specified material in a timely manner shall not be considered and delays in construction caused by such an event shall not be waived.

   3. One or more of the following five conditions must also be documented:

PRODUCT REQUIREMENTS

a. The substitution must be required for compliance with final interpretation of code requirements or insurance regulations.

b. The substitution must be due to the unavailability of the specified products, through no fault of the Contractor.

c. The substitution may be requested when subsequent information discloses the inability of the specified products to perform properly or to fit in the designated space.

d. The substitution may be due to the manufacturer's or fabricator's refusal to certify or guarantee performance of the specified product as required.

e. The substitution may be requested when it is clearly seen, in the judgment of the Architect that a substitution, would be substantially to the Owner's best interests in terms of cost or time.

2.3 COMPARABLE PRODUCTS

A. Conditions: Architect shall consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with the requirements:

1. Evidence the proposed product does not require extensive revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.

2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.

3. Evidence that proposed product provides specified warranty.

4. List of similar installations for completed projects with project names and addresses; and names and addresses of architects and owners, if requested.

END OF SECTION

SUBSTITUTION REQUEST

The Construction Specifications Institute
Northwest Region

TO: _____

PROJECT: _____

SPECIFIED ITEM:

_____	_____	_____	_____
Section No.	**Page**	**Paragraph**	**Description**

PROPOSED SUBSTITUTION: _____

Attached data includes product description, specifications, drawings, photographs, performance and test data adequate for evaluation of request including identifying applicable portions.

Attached data also includes description of changes to Contract Documents that proposed substitution requires for proper installation.

Undersigned certifies that the following items, unless modified by attachments, are correct:

1. Proposed substitution does not affect dimensions shown on Drawings.
2. Undersigned pays for changes to building design, including engineering design, detailing and construction costs caused by proposed substitution.
3. Proposed substitution has no adverse effect on other trades, construction schedule, or specified warranty requirements.
4. Maintenance and service parts are available locally or are readily obtainable for proposed substitution.

Undersigned further certifies that function, appearance, and quality of proposed substitution are equivalent or superior to specified item.

Undersigned agrees that, if this page is reproduced, terms and conditions for substitutions found in Bidding Documents apply to this proposed substitution.

Submitted by

_____
Name (Print)

_____
Signature

_____
Firm Name

_____
Address

_____
City, State, Zip

_____
Date

_____
Telephone Fax

_____
General Contractor (if after award of Contract)

For use by A/E:

____ Approved ____ Approved as Noted

____ Not Approved ____ Received Too Late

_____
By

_____
Date

_____
Remarks

Attachments

1999 Edition

FIELD ENGINEERING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes general procedural requirements governing execution of the Work including, but not limited to, the following:

1. Construction layout.
2. Field engineering and surveying.
3. General installation of products.
4. Coordination of Owner-installed products.
5. Progress cleaning.
6. Starting and adjusting.
7. Protection of installed construction.
8. Correction of the Work.

B. Related Sections include the following:

1. Division 1 Section "Project Management and Coordination" for procedures for coordinating field engineering with other construction activities.
2. Division 1 Section "Submittal Procedures" for submitting surveys.
3. Division 1 Section "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.

1.2 SUBMITTALS

A. Qualification Data for land surveyor.

B. Certificates: Submit certificate signed by land surveyor certifying that location and elevation of improvements comply with requirements.

C. Certified Surveys: Submit one copy signed by land surveyor.

D. Final Property Survey: Submit 3 copies showing the Work performed and record survey data.

1.3 QUALITY ASSURANCE

FIELD ENGINEERING

A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Existing Conditions: The existence and location of site improvements, utilities, and other construction indicated as existing are not guaranteed. Before beginning work, investigate and verify the existence and location of mechanical and electrical systems and other construction affecting the Work.

1. Before construction, verify the location and points of connection of utility services.

B. Existing Utilities: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities and other construction affecting the Work.

1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; and underground electrical services.

2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

C. Acceptance of Conditions: Examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

1. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:

a. Description of the Work.

b. List of detrimental conditions, including substrates.

c. List of unacceptable installation tolerances.

d. Recommended corrections.

2. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

3. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.

4. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.

5. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Existing Utility Information: Furnish information to local utility that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Architect. Include a detailed description of problem encountered, together with recommendations for changing the Contract Documents.

3.3 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect promptly.

B. General: Engage a land surveyor to lay out the Work using accepted surveying practices.

1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.

2. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.

3. Inform installers of lines and levels to which they must comply.

4. Check the location, level and plumb, of every major element as the Work progresses.

5. Notify Architect when deviations from required lines and levels exceed allowable tolerances.

6. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.

C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and invert elevations.

D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.

E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect.

3.4 FIELD ENGINEERING

A. Identification: Owner will identify existing benchmarks, control points, and property corners.

B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.

1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect before proceeding.

2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.

C. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.

1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.

2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.

3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.

D. Certified Survey: On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and sitework.

E. Final Property Survey: Prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by professional engineer, that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey.

1. Show boundary lines, monuments, streets, site improvements and utilities, existing improvements and significant vegetation, adjoining properties, acreage, grade contours, and the distance and bearing from a site corner to a legal point.

2. Recording: At Substantial Completion, have the final property survey recorded by or with authorities having jurisdiction as the official "property survey."

3.5 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

1. Make vertical work plumb and make horizontal work level.

2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.

3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.

4. Maintain minimum headroom clearance of 8-feet in spaces without a suspended ceiling.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

E. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

F. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

G. Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.

1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.

2. Allow for building movement, including thermal expansion and contraction.

3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

H. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

I. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.6 OWNER-INSTALLED PRODUCTS

A. Site Access: Provide access to Project site for Owner's construction forces.

B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction forces.

1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.

2. Preinstallation Conferences: Include Owner's construction forces at preinstallation conferences covering portions of the Work that are to receive Owner's work. Attend preinstallation conferences conducted by Owner's construction forces if portions of the Work depend on Owner's construction.

3.7 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. Enforce requirements strictly. Dispose of materials lawfully.

1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.

2. Do not hold materials more than 7 days during normal weather or 3 days if the temperature is expected to rise above 80 deg F.

3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.

1. Remove liquid spills promptly.

2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

G. Waste Disposal: Burying or burning waste materials on-site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.

H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.8 STARTING AND ADJUSTING

A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

B. Adjust operating components for proper operation without binding. Adjust equipment for proper operation.

C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

FIELD ENGINEERING

D. Manufacturer's Field Service: If a factory-authorized service representative is required to inspect field-assembled components and equipment installation, comply with qualification requirements in Division 1 Section "Quality Requirements."

3.9 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Comply with manufacturer's written instructions for temperature and relative humidity.

3.10 CORRECTION OF THE WORK

A. Repair or remove and replace defective construction. Restore damaged substrates and finishes. Comply with requirements in Division 1 Section "Cutting and Patching."

1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.

B. Restore permanent facilities used during construction to their specified condition.

C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.

D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.

E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION

CUTTING AND PATCHING

PART 1 - GENERAL

1.1 SUMMARY

A. Provide all labor and materials necessary to execute cutting and patching of defective Work and areas of remodel where new construction joins existing finishes.

B. Match each patch material with kind, grade, size and quality identical to patched material.

C. Related Sections:

1. Divisions 21, 22, and 23, Mechanical: Cutting and patching required exclusively for mechanical work.

2. Division 26, 27 and 28, Electrical: Cutting and patching required exclusively for electrical work.

1.2 DEFINITIONS

A. Cutting:

1. Removal of in-place construction necessary to permit installation or performance of other Work.

2. Removal of defective Work.

B. Patching:

1. Fitting and repair work required to restore surfaces to original conditions after installation of other Work. Include patch and repair that is implied or consequential to other trades to achieve the intended results.

2. Replacing defective Work with Work that conforms to Contract Documents.

1.3 SUBMITTALS

A. Cutting and Patching Proposal: Submit a proposal describing procedures at least 10 days before the time cutting and patching will be performed, requesting approval to proceed. Include the following information:

1. Extent: Describe cutting and patching, show how they will be performed, and indicate why they cannot be avoided.

2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building's appearance and other significant visual elements.

3. Products: List products to be used and firms or entities that will perform the Work.

CUTTING AND PATCHING

4. Dates: Indicate when cutting and patching will be performed.

5. Utility Services and Mechanical/Electrical Systems: List services/systems that cutting and patching procedures will disturb or affect. List services/systems that will be relocated and those that will be temporarily out of service. Indicate how long services/systems will be disrupted.

6. Structural Elements: Where cutting and patching involve adding reinforcement to structural elements, submit details and engineering calculations showing integration of reinforcement with original structure.

7. Architect's Approval: Obtain approval of cutting and patching proposal before cutting and patching. Approval does not waive right to later require removal and replacement of unsatisfactory work.

1.4 QUALITY ASSURANCE

A. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.

B. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Operating elements include but are not limited to the following:

1. Primary operational systems and equipment.

2. Air or smoke barriers.

3. Fire-suppression systems.

4. Mechanical systems piping and ducts.

5. Control systems.

6. Communication systems.

7. Conveying systems.

8. Electrical wiring systems.

C. Miscellaneous Elements: Do not cut and patch miscellaneous elements or related components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety. Miscellaneous elements include but are not limited to the following:

1. Water, moisture, or vapor barriers.

2. Membranes and flashings.

CUTTING AND PATCHING

3. Exterior curtain-wall construction.

4. Equipment supports.

5. Piping, ductwork, vessels, and equipment.

6. Noise- and vibration-control elements and systems.

D. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

E. Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

1.5 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during cutting and patching operations, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections.

B. In-Place Materials:

1. Use materials identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

2. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.

CUTTING AND PATCHING

1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with in-place finishes or primers.

2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Temporary Support: Provide temporary support of Work to be cut.

B. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

D. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to minimize interruption to occupied areas.

3.3 PERFORMANCE

A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.

2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.

3. Concrete or Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.

4. Excavating and Backfilling: Comply with requirements in applicable Division 31 Sections where required by cutting and patching operations.

CUTTING AND PATCHING

5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.

6. Proceed with patching after construction operations requiring cutting are complete.

C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.

2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.

a. Clean piping, conduit, and similar features before applying paint or other finishing materials.

b. Restore damaged pipe covering to its original condition.

3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.

4. Where patching occurs in a painted surface, apply primer and intermediate paint coats over the patch and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.

5. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.

6. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.

D. Cleaning: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.

END OF SECTION

CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:

1. Inspection procedures.

2. Warranties.

3. Final cleaning.

B. Related Sections:

1. Division 1 Section “Payment Procedures” for requirements for applications for Payment for Substantial and Final Completion.

2. Division 1 Section “Field Engineering” for site progress cleaning.

3. Division 1 Section “Project Record Documents” for submitting Record Drawings, Record Specifications, and Record Product Data.

4. Division 1 Section “Operation and Maintenance Data” for operation and maintenance manual requirements.

1.2 SUBSTANTIAL COMPLETION

A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete in request.

1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.

2. Advise Owner of pending insurance changeover requirements.

3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.

4. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.

5. Prepare and submit Project Record Documents, operation and maintenance manuals, Final Completion construction photographs, damage or settlement surveys, property surveys, and similar final record information.

6. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.

7. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.

8. Complete startup testing of systems.

9. Submit test/adjust/balance records.

10. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.

11. Advise Owner of changeover in heat and other utilities.

12. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.

13. Complete final cleaning requirements, including touchup painting.

14. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

B. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

2. Results of completed inspection will form the basis of requirements for Final Completion.

1.3 FINAL COMPLETION

A. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:

1. Submit a final Application for Payment according to Division 1 Section "Payment Procedures."

2. Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.

3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.

4. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.

CLOSEOUT PROCEDURES

B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

C. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.4 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Preparation: Submit two copies of list. Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

1. Organize list of spaces in sequential order.

2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.

3. Include the following information at the top of each page:

a. Project name.

b. Date.

c. Name of Architect.

d. Name of Contractor.

e. Page number.

1.5 WARRANTIES

A. Submittal Time: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.

B. Partial Occupancy: Submit properly executed warranties within 15 days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.

C. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.

1. Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2 x 11-inch paper.

2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or

installation, including the name of the product and the name, address, and telephone number of Installer.

3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.

D. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 FINAL CLEANING

A. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:

a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.

b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.

c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.

d. Remove tools, construction equipment, machinery, and surplus material from Project site.

e. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing

natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.

f. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.

g. Sweep concrete floors broom clean in unoccupied spaces.

h. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean carpet in accordance with carpet manufacturer's instructions if visible soil or stains remain.

i. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.

j. Remove labels that are not permanent.

k. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.

(1) Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.

l. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.

m. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.

n. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.

o. Clean ducts, blowers, and coils if units were operated without filters during construction.

p. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

q. Leave Project clean and ready for occupancy.

C. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.

CLOSEOUT PROCEDURES

END OF SECTION

OPERATIONS AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:

1. Operation and maintenance documentation directory.

2. Operation manuals for systems, subsystems, and equipment.

3. Maintenance manuals for the care and maintenance of products, materials, and finishes, and systems and equipment.

1.2 DEFINITIONS

A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.

B. Subsystem: A portion of a system with characteristics similar to a system.

1.3 SUBMITTALS

A. Initial Submittal: Submit one draft copy of each manual at least 15 days before requesting inspection for Substantial Completion. Include a complete operation and maintenance directory. Architect will return one copy of draft and mark whether general scope and content of manual are acceptable.

B. Final Submittal: Submit one copy of each manual in final form at least 15 days before final inspection. Architect will return copy with comments within 15 days after final inspection.

1. Correct or modify each manual to comply with Architect's comments. Submit 3 copies of each corrected manual within 15 days of receipt of Architect's comments.

1.4 COORDINATION

A. Where operation and maintenance documentation includes information on installations by more than one factory-authorized service representative, assemble and coordinate information furnished by representatives and prepare manuals.

PART 2 - PRODUCTS

2.1 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

A. Organization: Include a section in the directory for each of the following:

1. List of documents.

OPERATIONS AND MAINTENANCE DATA

2. List of systems.

3. List of equipment.

4. Table of contents.

B. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.

C. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.

D. Tables of Contents: Include a table of contents for each operation and maintenance manual.

E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

2.2 MANUALS, GENERAL

A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:

1. Title page.

2. Table of contents.

3. Manual contents.

B. Title Page: Enclose title page in transparent plastic sleeve. Include the following information:

1. Subject matter included in manual.

2. Name and address of Project.

3. Name and address of Owner.

4. Date of submittal.

5. Name, address, and telephone number of Contractor.

6. Name and address of Architect.

7. Cross-reference to related systems in other operation and maintenance manuals.

OPERATIONS AND MAINTENANCE DATA

C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.

1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.

D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.

1. Binders: Heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.

a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.

b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents. Indicate volume number for multiple-volume sets.

2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.

3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software diskettes for computerized electronic equipment.

4. Supplementary Text: Prepared on 8-1/2-by-11-inch white bond paper.

5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.

a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.

b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

2.3 OPERATION MANUALS

OPERATIONS AND MAINTENANCE DATA

A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:

1. System, subsystem, and equipment descriptions.

2. Performance and design criteria if Contractor is delegated design responsibility.

3. Operating standards.

4. Operating procedures.

5. Operating logs.

6. Wiring diagrams.

7. Control diagrams.

8. Piped system diagrams.

9. Precautions against improper use.

10. License requirements including inspection and renewal dates.

B. Descriptions: Include the following:

1. Product name and model number.

2. Manufacturer's name.

3. Equipment identification with serial number of each component.

4. Equipment function.

5. Operating characteristics.

6. Limiting conditions.

7. Engineering data and tests.

8. Complete nomenclature and number of replacement parts.

C. Operating Procedures: Include the following, as applicable:

1. Startup procedures.

2. Equipment or system break-in procedures.

3. Routine and normal operating instructions.

4. Regulation and control procedures.

5. Instructions on stopping.

6. Normal shutdown instructions.

7. Seasonal and weekend operating instructions.

8. Required sequences for electric or electronic systems.

9. Special operating instructions and procedures.

D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

2.4 PRODUCT MAINTENANCE MANUAL

A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.

C. Product Information: Include the following, as applicable:

1. Product name and model number.

2. Manufacturer's name.

3. Color, pattern, and texture.

4. Material and chemical composition.

5. Reordering information for specially manufactured products.

D. Maintenance Procedures: Include manufacturer's written recommendations and the following:

1. Inspection procedures.

2. Types of cleaning agents to be used and methods of cleaning.

3. List of cleaning agents and methods of cleaning detrimental to product.

4. Schedule for routine cleaning and maintenance.

OPERATIONS AND MAINTENANCE DATA

E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

2.5 SYSTEMS AND EQUIPMENT MAINTENANCE MANUAL

A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.

B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.

C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:

1. Standard printed maintenance instructions and bulletins.

2. Drawings, diagrams, and instructions required for maintenance.

3. Identification and nomenclature of parts and components.

4. List of items recommended to be stocked as spare parts.

D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:

1. Test and inspection instructions.

2. Troubleshooting guide.

3. Precautions against improper maintenance.

4. Aligning, adjusting, and checking instructions.

5. Demonstration and training videotape, if available.

E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.

OPERATIONS AND MAINTENANCE DATA

1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.

2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.

F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.

G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.

H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

PART 3 - EXECUTION

3.1 MANUAL PREPARATION

A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to operation and maintenance manuals.

B. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

C. Equipment Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.

D. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.

1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.

E. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in Record Drawings to ensure correct illustration of completed installation.

OPERATIONS AND MAINTENANCE DATA

1. Do not use original Project Record Documents as part of operation and maintenance manuals.

2. Comply with requirements of newly prepared Record Drawings in Division 1 Section "Project Record Documents."

F. Comply with Division 1 Section "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION

PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for Project Record Documents, including the following:

1. Record Drawings.

2. Record Specifications.

3. Record Product Data.

1.2 SUBMITTALS

A. Record Drawings: Comply with the following:

1. Number of Copies: Submit copies of Record Drawings as follows:

a. Initial Submittal: Submit one set of marked-up Record Prints. Architect will initial and date each print and mark whether general scope of changes, additional information recorded, and quality of drafting are acceptable. Architect will return prints for organizing into sets, printing, binding, and final submittal.

b. Final Submittal: Submit one set of marked-up Record Prints.

B. Record Specifications: Submit one copy of Project's Specifications, including addenda and contract modifications.

C. Record Product Data: Submit one copy of each Product Data submittal.

1. Where Record Product Data is required as part of operation and maintenance manuals, submit marked-up Product Data as an insert in manual instead of submittal as Record Product Data.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

A. Record Prints: Maintain one set of black-line white prints of the Contract Drawings and Shop Drawings.

1. Preparation: Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.

PROJECT RECORD DOCUMENTS

a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.

b. Accurately record information in an understandable drawing technique.

c. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.

2. Content: Types of items requiring marking include, but are not limited to, the following:

a. Dimensional changes to Drawings.

b. Revisions to details shown on Drawings.

c. Depths of foundations below first floor.

d. Locations and depths of underground utilities.

e. Revisions to routing of piping and conduits.

f. Revisions to electrical circuitry.

g. Actual equipment locations.

h. Duct size and routing.

i. Locations of concealed internal utilities.

j. Changes made by Change Order or Construction Change Directive.

k. Changes made by Request for Interpretation (RFI) or Architect's Supplementary Instructions (ASI).

l. Details not on the original Contract Drawings.

m. Field records for variable and concealed conditions.

n. Record information on the Work that is shown only schematically.

3. Mark the Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. If Shop Drawings are marked, show cross-reference on the Contract Drawings.

4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.

5. Mark important additional information that was either shown schematically or omitted from original Drawings.

6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

B. Format: Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.

1. Record Prints: Organize Record Prints and newly prepared Record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.

2. Identification: As follows:

a. Project name.

b. Date.

c. Designation "PROJECT RECORD DRAWINGS."

d. Name of Architect.

e. Name of Contractor.

2.2 RECORD SPECIFICATIONS

A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.

2. Mark copy with the proprietary name and model number of products, materials, color selection and equipment furnished, including substitutions and product options selected.

3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.

4. For each principal product, indicate whether Record Product Data has been submitted in operation and maintenance manuals instead of submitted as Record Product Data.

5. Note related Change Orders, ASI's, RFI's, Record Product Data, and Record Drawings where applicable.

2.3 RECORD PRODUCT DATA

A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.

PROJECT RECORD DOCUMENTS

2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.

3. Note related Change Orders, Record Specifications, and Record Drawings where applicable.

2.4 MISCELLANEOUS RECORD SUBMITTALS

A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and modifications to Project Record Documents as they occur; do not wait until the end of Project.

B. Maintenance of Record Documents and Samples: Store Record Documents and Samples in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Architect's reference during normal working hours.

END OF SECTION

INTERIOR DEMOLITION

PART 1 GENERAL

1.1 SUMMARY

A. Furnish labor, material, equipment and any required temporary shoring required for the partial demolition and removal of existing wall structure, and other material as detailed on the Demolition Drawings.

B. The Contractor shall be responsible for engineering and execution of all temporary shoring and obtaining any special permits that may be required by the governing jurisdiction.

1.2 PROJECT CONDITIONS

A. Existing Conditions: Verify existing conditions at the site and include all work evident by site inspection whether or not shown on the Drawings. Include demolition that is implied or consequential to other trades to achieve the intended results.

C. Notify the Architect in advance of cutting or alteration which may affect the structural safety of any portion of the project. This is a notification only, the Contradctor is soley responsible for the demolition work.

D. All material and debris resulting from demolition Work, unless specifically designated for reuse or to be turned over to the Owner, shall become property of the Contractor and be removed from the site at Contractor's expense. Items to be salvaged and turned over to the Owner known at this time include:

1. Fixed in place wood shelving

E. Materials and items known to be removed and retained for reinstallation and/or refinishing by the Contractor include:

1. All floor supported stainless steel sinks and couinters located in the existing Scullery/Warewash room. All fixtures are to be disconnected, removed and reinstalled to allow for the install of the new resilient flooring system.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.1 EXAMINATION

A. Inspect the work to determine condition of existing building and amount of existing materials and debris to be removed. Materials shall not be thrown or dropped outside exterior walls except in fully enclosed chute. Remove debris from the site as demolition progresses and do not allow to accumulate on the premises.

INTERIOR DEMOLITION

3.2 PREPARATION AND COORDINATION

A. Utilities: Coordinate demolition work with affected utility agencies or electrical and mechanical crafts. Completely remove all existing utility services which are not a part of new work or designated to remain. Save and protect existing utilities shown to remain. Notify Architect at once if unknown utilities are found in the work.

B. Laws and Ordinances: Comply with the applicable laws and ordinances governing the disposal of debris on or off the site, and commit no trespass on any public or private property in any operation due to or connected with demolition and site clearing.

3.3 DEMOLITION PROTECTION

A. Existing Facilities: Protect adjacent walkways, building entries, and other building facilities during demolition operations.

B. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during demolition. When permitted by Architect and Owner, items may be removed to a suitable, protected storage location during demolition and cleaned and reinstalled in their original locations after demolition operations are complete.

C. Existing Utilities: Maintain utility services indicated to remain and protect them against damage during demolition operations.

1. Do not interrupt existing utilities serving adjacent occupied or operating facilities unless authorized in writing by Owner and authorities having jurisdiction.

2. Provide temporary services during interruptions to existing utilities, as acceptable to Owner and to authorities having jurisdiction.

D. Temporary Protection: Erect temporary protection where required by authorities having jurisdiction and as indicated. Comply with requirements in Division 1 Section "Construction Facilities and Temporary Controls."

1. Protect walls, windows, roofs, and other adjacent exterior construction that are to remain and that are exposed to building demolition operations.

2. Erect and maintain dustproof partitions and temporary enclosures to limit dust and dirt migration and to separate areas from fumes and noise from occupied portions of the building.

3.4 DEMOLITION, GENERAL

A. General: Demolish indicated portions of the existing building as detailed. Include demolition that is implied or consequential to other trades to achieve the intended results. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Do not use cutting torches until work area is cleared of flammable materials. Maintain fire watch and portable fire-suppression devices during flame-cutting operations.

INTERIOR DEMOLITION

2. Maintain adequate ventilation when using cutting torches.

3. Locate building demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.

B. Renovation/Space Access, Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with building operations, adjacent occupied spaces, general building access, and hallway/concourse circulation.

1. Do not close or obstruct streets, walks, walkways, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.

2. The Contractor is responsible for the safe delivery of all materials and equipment necessary to complete the work. The contractor shall coordinate access with the owner and request approval for material delivery and/or access through existing exit stairs and elevator. Access for material delivery through exterior windows, or other means, shall first be approved by the Owner.

3. Use exhaust fans and other suitable methods to limit spread of dust and dirt. Comply with Owner requirements and governing environmental-protection regulations.

3.5 DISPOSAL OF DEMOLISHED MATERIALS

A. Remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.

1. Do not allow demolished materials to accumulate on-site.

2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

3.6 REPAIR AND REPLACEMENT

A. Repair or replace all sidewalks, streets, and curbs damaged by the Work of the Project as required by the Owner.

3.7 HAZARDOUS MATERIALS

A. The areas designated for demolition are NOT known to contain hazardous materials. If hazardous materials are encountered or suspected, the contractor is to suspend work immediately and notify the Owner so as not to delay the Project.

END OF SECTION

CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.1 SUMMARY

A. Furnish all labor, materials, equipment, reinforcing, dowels, and services necessary for the installation of cast-in-place concrete at infill trench's and slabs as required for new plumbing systems and flush floor grease interceptor, including mixing, installation of reinforcing, delivery and placement; finishing, curing, and sealing.

B. Furnish all labor and materials for the installation of self-leveling polymer topping at locations required to ensure level floor surface prior to installation of finish flooring materials.

C. Grind existing exposed concrete floors free of all build-up to achieve a clean surface.

1.2 REFERENCES

A. American Concrete Institute (ACI).

B. American Society for Testing and Materials (ASTM) C143, Test for Slump of Portland Cement Concrete.

1.3 SUBMITTALS

A. Submit the following in accordance with Division 1 Section "Shop Drawings, Product Data, Samples."

B. Manufacturer's printed product data of concrete additives, curing compounds and sealers, and fibrous concrete reinforcement, clearly marked to indicate selected products.

C. Mix designs for all specified mixes, 14 days before any concrete placement, including manufacturer's product data for all admixtures and amounts per yard. Submittals shall conform to ACI 318, Chapter 5, requirements for mix designs.

D. Copies of laboratory test reports on the compressive strength of test cylinders made with each mix proposed for use.

1.4 QUALITY ASSURANCE

A. Tolerances for concrete construction and materials shall conform to all requirements of ACI 117-90, unless more stringent requirements are part of this specification.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Product manufacturers are listed below.

B. Other Manufacturers: Submit Substitution Requests prior to bid date in accordance with Division 1 Section "Product Substitution Procedures."

2.2 CONCRETE MATERIALS

A. Cement: ASTM C150, Type I, low alkali for all concrete Work.

B. Admixtures:

1. All admixtures produced by the same manufacturer to ensure compatibility of the products.

2. Water Reducing Admixture:

a. ASTM C494, Type A. All concrete shall contain a Type A admixture in the basic design with dosages high enough to reduce water by at least 10% from the same mix without the admixture. This admixture shall produce no retardation.

b. Products:

(1) "WRDA-64" by Grace Construction Products.

(2) "Polyheed" by Master Builders.

3. Accelerating Admixture:

a. ASTM C494, Type E. Do not use chloride in its manufacture. Use of this product is Contractor’s option.

b. Products:

(1) "Daraset" by Grace Construction Products.

(2) "Pozzutec 20" by Master Builders.

C. Curing Paper and Sheet Covering: ASTM C171, waterproof paper, polyethylene film, and burlap polyethylene sheet.

D. Curing Compound for interior structural slabs:

1. ASTM C309, Type 1. One coat application at coverage rate of 200 s.f./gallon.

2. Products:

a. "Masterkure 200" water base curing compound by Master Builders.

b. "VOCOMP-20" by W.R. Meadows.

c. "Hydro Cure 309" by Unitex.

d. "Conspec RX Cure WB" by Dayton Superior.

E. Cold Joint Form: Straight joints of metal.

F. Bonding New Concrete to Old:

1. Epoxy Bonding adhesive.

2. "Concressive LPL" by Master Builders.

2.3 TOPPING / LEVELING & REPAIR MATERIALS

A. Topping & Self Leveling: Mapei, Ultraplan M20, quick-setting concrete topping where required to ensure perfectly level surface at Putting Analysis 102.

B. Repair Overlayment and Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.

1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.

2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.

3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.

4. Compressive Strength: Not less than 5000 psi at 28 days when tested according to ASTM C 109/C 109M.

2.4 REINFORCING STEEL & SCHEDULE

A. Materials:

1. Unless noted on the Drawings, all reinforcing steel conforming to ASTM A615 Grade 60 or ASTM A706 Grade 60.

2. Bar and rod mats for concrete reinforcement conforming to ASTM A184.

3. Cold drawn wire reinforcement conforming to ASTM 82.

4. Plain smooth dowels and 1/4-inch diameter smooth bars conforming to ASTM A615 Grade 60.

5. Tie wire shall be 16 gauge or heavier black annealed wire.

6. Welded wire fabric electrically welded, gauge and mesh size as detailed, conforming to ASTM A185.

7. Reinforcing bars to be embedded in concrete shall be free from oil, loose mill scale and rust. Reinforcing bars with rust, mill scale or a combination of both will not be acceptable without cleaning or brushing provided that upon wire brushing a sample, the dimensions including height of deformations and weights shall not be less than the applicable ASTM requirements.

B. Infill Trench's:

1. Provide #4 bar dowels across trench from each side so that they overlay a minimum of 6-inches in the middle of the trench. Drill each side of existing slab a minimum of 4-inches and dowels with epoxy.

D. Installation:

1. Details of concrete reinforcement not covered in the Drawings and these Specifications shall be in accordance with the CRSI Manual of Standard Practice.

2. Reinforcing bars shall conform accurately to standard fabricating tolerances.

3. Unless otherwise noted on the Drawings, bend all hooks using the pin diameters and dimensions detailed as ACI Standard Hooks.

4. Do not bend or straighten reinforcing bars in a manner that will injure the material.

5. Place bars in conformance with the CRSI Manual of Standard Practice.

6. Securely tie bars to prevent displacement during the pouring operation. Wire dowels in place before depositing concrete.

7. Minimum Clear Thickness of Concrete Over Bars: 3/4-inch at faces of slabs.

8. Welding of reinforcing bars only as approved by the Architect and shall be performed in accordance with AWS D1.4, Structural Welding Code - Reinforcing Steel, ASTM A706 Grade 60.

2.5 CONCRETE MIX DESIGN

A. Mix Design 1:

1. 4,000 PSI, 28-day minimum compressive strength per ACI 301.

2. ASTM C33 fine aggregate and size No. 67 (3/4-inch to No. 4) coarse aggregate.

3. Maximum slump and maximum water/cement ratio as indicated on the structural drawings.

4. Include additives as specified.

B. Contractor's Option:

1. Before ordering concrete, submit four copies of previously used and tested design mixes meeting the requirements of ACI 301, using aggregates, admixtures, and cement/fly ash intended for use in this concrete, to Architect for review and approval for use in this Work.

2. Laboratory designed mix strength used as a basis for selecting proportions of ingredients for concrete exceeds the minimum specified design strength by the amount required by ACI 301, but not less than 500 psi.

C. Show dry weight of cement, fly ash, saturated-surface-dry weights of fine and coarse aggregate, quantities of admixtures, W/C ratio, slump, air content, and the unit weight per cubic yard of concrete. Submit a separate design mix for each design mix number required in this Work.

D. Manufacturer is fully responsible for the selection of proportions for the concrete mix, ASTM C94 and ACI 301.

PART 3 EXECUTION

3.1 CONCRETE MIXING

A. Ready-Mixed Concrete:

1. Use only ready-mixed concrete obtained from plant approved by the Architect, mixed and delivered in conformance with the approved design mix. Obtain a delivery ticket for each batch of concrete delivered to the job.

2. Maintain a file of all delivery tickets at the job site, in good order, available for inspection by Architect at all times. Include the following information: Name of ready-mix batch plant; serial number of ticket; date and truck number; Contractor's name; job name, and location (address); amount of concrete in batch (cubic yards); mix type number; location placing on job; and name, quantity and type of admixtures.

B. Add all ingredients to the concrete at the batch plant during the mixing time. This includes all cement, fly ash, aggregate, water, and admixtures.

C. Mix concrete in strict accordance with admixture manufacturer's instructions and recommendations for uniform and complete distribution.

D. Mix epoxy topping / leveling products in accordance with manufacturer's instructions.

3.2 CONCRETE PLACEMENT

A. Deposit concrete as near to the final position as possible to avoid rehandling or movement by vibrators. Deposit concrete continuously and as rapidly as practical until the entire unit of pour is completed.

B. In ambient temperatures over 80°F, pour concrete within 90 minutes of being mixed.

C. Do not deposit concrete that has partially hardened or been contaminated by foreign material nor use retempered concrete.

3.3 PROTECTION AND CURING

A. Protect concrete finishes against injury from the elements and defacements of any nature during construction operation.

B. When concrete slabs have received their finish, and as soon as the surface water subsides, coat the entire surface with curing compound applied at a rate recommended in the manufacturer's written instructions.

C. Cure slabs by covering with curing paper or moist cure whenever finish is to receive a sealer coat, decoration coat, or other applied finish not compatible with curing compound. Use moist curing on structural slabs receiving synthetic floor surfacing.

3.4 FLOOR FLATNESS AND LEVELNESS TOLERANCES

A. An independent testing agency will inspect finished slabs for conformance to specified tolerances.

B. Minimum F(F) Floor Flatness and F(L) Floor Levelness Values:

1. Epoxy Topping at Existing Concrete Floors: F(F) of 20; F(L) of 15.

2. Under Carpeting: F(F) of 25; F(L) of 20.

3. Under Resilient Flooring: F(F) of 35; F(L) of 25.

C. Measure F(F) and F(L) in accordance with ASTM E1155, within 48 hours after slab installation; report both composite overall values and local values for each measured section.

D. Correct the slab surface if composite overall value is less than specified and if local value is less than two-thirds of specified value or less than F(F) 13/F(L) 10.

E. Correct defects by grinding or by removal and replacement of the defective work. Areas requiring corrective work will be identified. Re-measure corrected areas by the same process.

3.5 CONCRETE FINISHING

A. New Infill Slabs:

1. Floor slabs to be monolithic construction, of thickness and reinforced as detailed. Place reinforcing bars in conformance with the Drawings.

2. Slab concrete shall be of a flowable consistency, well tamped into place, and finishes compressed and compacted by troweling. Finish slab free from small hollows or bumps and graded to the elevations called for, with depressions in floors between high spots not greater than 1/4-inch below a 10-foot straightedge in accordance with ACI 117 and ACI

302 Slab Finishing Class 2, and not vary more than 5/16-inch between opposite exterior walls, unless otherwise called for on the Drawings.

3. Wood float finish surfaces especially scheduled and when floor receives cement mortar bonded ceramic tile, or similar finishes.

4. Sprinkling or adding water to the slab surface during finishing will not be permitted. In drying conditions use the specified "Hot Weather Finishing Aid" to prevent plastic finish cracking and reduce labor and time in finishing operations.

B. Epoxy Topping / Leveling:

1. Install leveling product in accordance with manufacturer’s instructions.

2. Protect all concrete topping against rapid temperature fluctuations, moisture loss, extreme heat, and mechanical injury for a period of seven days.

3. Commence curing after placement and finish operations are complete, and after the disappearance of free moisture on the surface of the concrete.

4. Thoroughly wet all topping surfaces with a fine spray of water and completely cover with curing paper or sheeting.

3.6 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Architect and Owner.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part Portland cement to two and one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.

C. Repair materials and installation not specified above may be used, subject to Architect's and Owner’s approval.

END OF SECTION

METAL FABRICATIONS

PART 1 GENERAL

1.1 SUMMARY

A. Examine Drawings for required items and furnish in sizes, number, and kind to complete the Work.

B. Shop fabricate miscellaneous steel, including brackets, angles, anchors, supports, and other items as detailed for support or connection of other Work.

1.2 REFERENCES

A. American Institute of Steel Construction (AISC).

B. American Society for Testing and Materials (ASTM).

C. The Society for Protective Coatings (SSPC).

D. National Association of Corrosion Engineers International (NACE International).

E. International Code Council (ICC).

F. Occupational Safety and Health Administration (OSHA).

G. International Building Code (IBC).

H. American Welding Society (AWS).

1.3 SUBMITTALS

A. Submit the following in accordance with Division 1 Section “Shop Drawings, Product Data, Samples.”

B. Shop drawings showing dimensioned details of all components. Cross-reference shop drawing details to detail numbers on the Drawings to facilitate checking.

C. Welding Certificates: Copies of certificates for welding procedures and personnel.

D. Qualification Data: For firms and persons specified in “Quality Assurance” Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

1.4 QUALITY ASSURANCE

A. Fabricator Qualifications: A firm experienced in producing metal fabrications similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

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

1. AWS D1.1, “Structural Welding Code – Steel.”

2. AWS D1.3, “Structural Welding Code – Sheet Steel.”

3. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

1.5 PROJECT CONDITIONS

A. Field Measurements:

1. Check actual locations of walls and other construction to which metal fabrications must fit by accurate field measurements before fabrication. Show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

2. Where field measurements cannot be made without delaying the Work, guarantee dimensions and proceed with fabricating products without field measurements. Coordinate construction to ensure that actual dimensions correspond to guaranteed dimensions.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Product manufacturers are listed in Paragraph 2.2, Materials.

B. Other Manufacturers: Submit Substitution Requests prior to bid date in accordance with Division 1 Section “Product Substitution Procedures.”

2.2 MATERIALS

A. Metal Surfaces, General: For metal fabrications exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.

B. The following is a list of items needed for the construction of the building as specified and constitutes a description of the type of materials necessary to fabricate such items. However, it does not preclude that each individual item on the job is herein listed. It is the responsibility of this Section to completely furnish all items as detailed.

1. Angles: ASTM A36, standard rolled section of size and weight fabricated as detailed.

2. Steel Tubing: ASTM A500, Grade B, structural steel tubing in size, weight, and wall thickness fabricated as detailed.

3. Steel Sheet: Uncoated, cold-rolled, ASTM A1008 and A1008M, matte finish, stretcher-leveled standard of flatness.

4. Stainless Steel:

   a. Tubing: ASTM A554, Grade MT-304.

   b. Piping: ASTM A312A, Grade TP-304.

   c. Sheet/Plate: ASTM A167, Type 304, stretcher-leveled standard of flatness.

   d. Bar Stock: ASTM A276, Type 304.

5. Plates, Clips, Hangers, Lintels, and Brackets: ASTM A36, standard rolled shapes and sections fabricated to sizes and dimensions as detailed.

6. Screws, Nuts and Washers:

   a. Screws: Furnish wood and lag screws as detailed.

   b. Nuts and Washers: Furnish nuts and washers for all bolted connections.

   c. Washers, where required: Under head and nut in all wood connections.

   d. Finish: Furnish hot-dip galvanized finish when installed with galvanized items.

7. Expansion Anchors:

   a. ICC approved, zinc plate finish.

   b. Manufacturers: “Kwik Bolt II” by Hilti, “Ramset/Redhead TruBolt” by ITW.

8. Steel Supports for Partition Wall: Tube steel vertical supports and floor mounting plate fabricated as detailed on the Architectural Drawings. All welds ground smooth and flush.

9. Steel Supports for Counters: Wall and floor support structure fabricated with steel tube sections and plate steel as detailed on the Architectural Drawings. All welds ground smooth and flush for exposed appearance. Paint finish: Black.

2.3 FABRICATION

A. Examine Drawings for required items and furnish in sizes, number and kind to complete the Work.

B. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

C. Form metal work to required shapes and sizes, with true curves, lines and angles. Provide components in sizes and profiles indicated, but not less than required to comply with requirements indicated for structural performance or, if not indicated, to comply with

requirements of authorities having jurisdiction and with structural properties to sustain safety or withstand loads to which normally subjected.

D. Allow for thermal movement resulting from a maximum change (range) in ambient temperature of 100°F, in the design, fabrication, and installation of installed metal assemblies to prevent buckling, opening up of joints and overstressing of welds and fasteners. Base design calculations on actual surface temperatures of metals due to both solar heat gain and night time sky heat loss. Provide necessary rebates, lugs, and brackets for assembly of units. For Work exposed to view, use concealed fasteners unless indicated as exposed fasteners or welded joints, or unless otherwise indicated on final shop drawings.

E. Mill all exposed joints to a tight, hairline fit, flush and smooth. Miter exposed corner joints as indicated and machine fit to hairline joint. Joints shall be securely and neatly tenoned, drawn together using concealed fasteners. Locate joints where indicated or accepted on final shop drawings.

F. Cut shapes to pattern, sizes, and dimensions as detailed and approved. Punch and drill holes accurately, maintaining proper edge and end clearance and proper diameter to fit each fastening. Countersink holes for flat head wood screws.

G. Ease exposed edges to a radius of approximately 1/32 inch (1 mm), unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

H. Weld corners and seams continuously to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.

2. Obtain fusion without undercut or overlap.

3. Remove welding flux immediately.

I. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

J. Furnish and shop assemble all items true to measurements taken at the job, disassembled and ship to the job, complete with all sleeves, bolts, etc., necessary for erection.

K. Fabricate joints that will be exposed to weather in a manner to exclude water, or provide weep holes where water may accumulate.

L. Mark each member or assembly of members with erection marks for identification; furnish an erection diagram with marks as detailed. Ship assembled units in such a manner that they may be transported and unloaded without being excessively stressed, deformed or otherwise damaged. Place fabricated material on skids, off the ground; keep clean and properly drained.

M. All welding performed by Certified Welders and in accordance with AWS D1.1. Perform welding, brazing, and soldering such that surface exposed to view in completed Work will be free

of pitting, runs, spatter, cracks, warping, dimpling, depressions, distortion, discoloration and other imperfections. Grind exposed welds to match adjacent finish. Welds shall not be visible on finished surface.

N. Grind exposed ends and cut edge of all items smooth and slightly beveled to remove sharpness, burrs, and cutting marks. Use gas cutting torch in the field to cut holes or correct fabrication errors only after submitting each condition to Architect for review.

O. Fabrication tolerance for flat surface shall be ±1/32-inch in 2-feet measured in every direction at any location with no evidence of oil canning.

P. Separate dissimilar metals fabricated under this Section and metals of this Section that contact metals of other construction with separator recommended by fabricator to prevent corrosion and galvanic action. Do not extend coating onto exposed surfaces.

2.4 STEEL FINISHES

A. Mill Finish: For the purposes of this Specification and notations on the Drawings, the term “mill finish” shall mean steel surfaces shall be prepared in accordance with and primed with clear, two component aliphatic polyurethane, MPI No. 78.

B. Stainless Steel: Remove or blend tool and die marks and stretch lines into finish. Grind and polish surfaces to produce uniform directionally textured, No. 4 polished finish, free of cross scratches. Run grain with long direction of each piece.

C. Powder Coat Paint Finish: All surfaces powder coated, Tiger Drylac “Tiger Series 75 Fluoropolymer,” AAMA 2605, custom color and gloss as selected by Architect. Coating includes substrate pretreatment, primer, and top coat in accordance with coating manufacturer’s application specifications.

PART 3 EXECUTION

3.1 ERECTION

A. Furnish items to other trades when setting and installation is part of their Work.

B. Do not set permanent bolting or welding until as much of the assembly as will be stiffened thereby has been properly aligned and within tolerances.

C. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

D. Set steel elements accurately to the lines and elevations indicated. Align and adjust the various members before permanently fastening. Clean bearing surfaces and other surfaces which will be in permanent contact before assembly. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

E. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

F. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.

2. Obtain fusion without undercut or overlap.

3. Remove welding flux immediately.

4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

END OF SECTION

ROUGH CARPENTRY

PART 1 GENERAL

1.1 SUMMARY

A. Furnish all labor, materials, equipment, and services necessary for the installation of all rough carpentry, including all materials and labor required for the installation of the raised platform located in the Team Room, substrate materials for Sauna and interior various finishes, blocking, etc.

1.2 REFERENCES

A. American Institute of Timber Construction (AITC).

B. American Lumber Standards Committee (ALSC).

C. American National Standards Institute (ANSI).

D. American Society for Testing and Materials (ASTM).

E. American Wood Preservers' Association (AWPA).

F. Voluntary Product Standard (PS).

G. West Coast Lumber Inspection Bureau (WCLIB).

H. American Forest and Paper Association (AF&PA).

1.3 QUALITY ASSURANCE

A. Materials shall be grade stamped equal to or better than the grades hereinafter called for according to the following associations governing their various species of lumber products:

1. American Institute of Timber Construction (AITC).

2. Unless otherwise noted, moisture content of material shall conform to WCLIB Rule No. 16, General Grading Provisions, Paragraph 3, Seasoning Provisions.

B. Treated Lumber: Inspection of material for conformity to the requirements of this specification shall be in accordance with AWPA Standard M2, Standard for Inspection of Treated Timber Products.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Wrap, cover, and protect lumber products in shipment and while stored on site to prevent weather exposure and damage. Maintain stocks neat and in good order, level and off ground or floors, raised on pallets or dunnage to prevent contact with water.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Product manufacturers are listed in Paragraph 2.2, Materials.

B. Other Manufacturers: Submit Substitution Requests prior to bid date in accordance with Division 1 Section "Product Substitution Procedures."

2.2 MATERIALS

A. Decay Resistance-Treated Lumber: No. 2 S4S Douglas-fir, shall be pressure-treated to net retention of 0.25 lbs./cu.ft. or greater with ammoniacal copper quaternary (ACQ) or 0.204 lbs./cu.ft. or greater with copper boron azole (CBA) Type A in accordance with AWPA P5. All pressure-treated lumber shall bear the AWPA LP-2 quality mark. Lumber marked "treatment to point of refusal" is not acceptable.

1. ACQ Products: "Nature Wood" by Osmose, 800/241-0240; "ACQ Preserve" by Chemical Specialties, Inc., 800/421-8661.

2. CBA Products: "Natural Select" by Arch Wood Protection, Inc., 866/789-4567.

B. Fasteners Pressure Treated Lumber: G185 galvanized ASTM A653 or Type 304 stainless steel in contact with decay-resistant treated lumber.

C. Glue-Laminated Beams:

1. Lumber for laminating shall meet the Structural Requirements of Laminating Specifications, Voluntary Product Standard PS56, for Structural Glue Laminated Timber, and AITC 117. Stress Grades of beams to provide glue-laminated members with allowable values as detailed. All members fabricated with waterproof adhesive, camber as noted, and in conformance with ANSI A190.1.

2. Beams in concealed spaces shall be Industrial Appearance Classification. Exposed beams and surfaces shall be Architectural Appearance Classification with voids filled with clear wood inserts or neutral colored filler.

3. End seal all members and protect in transit and against weather and construction stains by individually wrapping each member. Protect and clean all exposed surfaces scheduled for transparent finish.

4. Mark beams with AITC or APA Quality mark in a location that will not interfere with a transparent finish.

D. Anchor Bolts: ASTM F1554, Grade 36, American made machine thread cut bolts, 5/8-inch full diameter, 10-inches long unless noted otherwise on Drawings, with 2-inch hooked end, complete with nut and washer.

E. Framing Connectors:

1. ICC approved stock framing connectors, G90 galvanized ASTM A653, (G185 galvanized ASTM A653 or Type 304 stainless steel in contact with treated lumber) , rated according to recorded tests. Provide special framing anchor nails as required and other fastenings as detailed and normal for installation.

2. Manufacturers: K.C. Metals "Superspeed Connectors," Silver, and Simpson Strong Tie.

F. Fasteners:

1. Power-Driven Fasteners: NES NER-272.

2. Lag Bolts: ASME B18.2.1.

3. Nails, Brads, and Staples: ASTM F 1667.

4. Wood Screws: ASME B18.6.1.

5. Bolts: Steel bolts complying with ASTM A 307, Grade A, with ASTM A 563 hex nuts and, where indicated, flat washers.

6. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.

a. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.

G. Construction Adhesive:

1. Water dispersed industrial adhesive.

2. Manufacturers: 3M Co. "Scotch-Grip" 4289-NF.

H.

PART 3 EXECUTION

3.1 INSTALLATION

A. Framing Standard: Comply with AF&PA's "Details for Conventional Wood Frame Construction," unless otherwise indicated.

B. Accurately fit all connections as detailed, all bolt holes drilled and properly sized to the bolts. Washers required under head and nut of all wood connections.

C. Sills and Plates: Use pressure-preservative-treated sills and plates in all conditions where bearing on concrete. Place sill seal foam between sill and concrete and draw down with anchor bolts as

detailed. Double top plate on all partitions with end joints lapped and staggered. Reinforce top plates where cut for electrical and mechanical work with 16 gauge metal splice plates.

D. Studs, Caps and Headers: Use straight material throughout; twisted material not permitted. Set all items as necessary for rigid frame.

E. Headers: Install over all openings. Fabricate from two or more members on edge with shims as required, spike solidly together. Install stud and cripple minimum at each rough jamb. Minimum as shown on the Structural Drawings.

F. Beams and Trusses: Install in locations as detailed, anchoring solidly. Stay and brace members in position until all connections are complete. Handle and protect specially wrapped or prepared items to avoid damage or scarring.

G. Blocking:

1. Install as detailed and in no case more than 120-inches apart vertically and horizontally, in exterior and interior wood stud walls throughout. Fire block at ceiling line where wall finish does not continue above ceiling.

2. Fire block in concealed spaces between stair stringers, at the top and bottom of the run and between studs along and in line with the run of stairs, if the walls under the stair are unfinished.

H. Wood Contacting Concrete or Masonry: Wherever joists, beams, rafters, etc., make end or side contact against concrete or masonry walls and slabs, install two layers of 30 lb. roofing felt so there will be no contact between wood and concrete.

I. Cut and repair framing where required by electrical, mechanical or other mechanics throughout the job. Boring of holes for pipes and conduits not included. Where cutting is required in a structural member that is likely to weaken the construction, consult with the Architect as to the measures taken in order to perform the work without causing any deficiencies of strength or workmanship. Close all openings with incombustible material where pipes and ducts pass through framing.

3.2 CLEANING

A. Clean all exposed surfaces of structural wood members such as beams, columns, purlins, trusses, plywood, etc., of dirt, water and rust stains, lumber grading stamps, end grain sealer paint, or other marking that will show through transparent finishes.

END OF SECTION

CUSTOM CABINETS

PART 1 GENERAL

1.1 SUMMARY

A. Furnish all labor, material, equipment, and services required for the fabrication and installation of casework and lockers. Include high-pressure plastic laminate countertops, solid surface countertops, backsplashes, custom wood lockers, and all hardware.

1. Cabinets/casework

2. Laminate and stainless steel counters.

1.2 REFERENCES

A. American National Standards Institute (ANSI).

B. Architectural Woodwork Institute (AWI) Architectural Woodwork Quality Standards.

C. National Electrical Manufacturers Association (NEMA).

D. Hardwood Plywood Manufacturers Association (HPMA) Hardwood and Decorative Plywood Standard.

1.3 SUBMITTALS

A. Submit the following in accordance with Division 1 Section "Shop Drawings, Product Data, Samples."

B. Shop drawings showing plans and elevations of all cabinets, lockers, typical sections, details of fabrication and trim and finishes.

C. Material Samples: 12” x 12” finished wood samples including solid wood trim, veneer panels, etc. 6” x 6” plastic laminate finished samples of each pattern specified. Coordinate samples with Section 06 40 00.

D. Hardware samples and product data cut sheets.

E. Composite wood manufacturer certification of compliance with requirement for no added urea-formaldehyde resins in composite wood products.

1.4 QUALITY ASSURANCE

B. Casework Grade: Conform to AWI Custom Grade standards for material, fabrication and installation, except for more stringent requirements where specified.

C. Manufacturer Qualifications: Firm with at least 5 years commercial experience in successfully producing architectural woodwork similar to that indicated for this Project, with sufficient production capacity to produce required units without causing delay in the Work.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Cover and protect cabinets at all times from dirt and moisture. Deliver and store at site only in a dry, heated area.

1.6 PROJECT CONDITIONS

A. Details and Dimensions: Verify field dimensions and clearances as required for built-in casework.

B. Report unsatisfactory tolerances in adjoining work.

C. Proceed with woodwork only after substrate construction and penetrating work have been completed and if necessary, corrected by other trades.

1.7 WARRANTY

A. Woodwork: Provide one-year warranty from the date of Substantial Completion agreeing to repair or replace work which is not in conformance with requirements of Contract Documents or work that becomes out of adjustment.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. High-Pressure Plastic Laminate Faces and Tops:

1. Formica.

2. Other Manufacturers: Submit Substitution Requests prior to bid date in accordance with Division 1 Section "Product Substitution Procedures."

B. Custom Casework and Lockers:

1. McCarthy Manufacturing, Inc., 503-665-2662.

2. Salem Wood Products, Inc., 503-364-9772.

3. Lanz Cabinets, 800-788-6332.

4. Anderson Woodworks, Ltd., 541-607-8456.

5. Kriegsco Manufacturing Co., 503-981-9083.

6. Lemons Millwork, 541-926-1463.

7. Fremont Millwork Co., 541-884-5554.

C. Hardware:

1. Blum (Julius).

2. Hafele America.

3. Knape & Vogt.

4. McKinney Parker.

5. Stanley Hardware.

D. Other Manufacturers: Submit Substitution Requests prior to bid date in accordance with Division 1 Section "Product Substitution Procedures."

2.2 MATERIALS

A. Cabinet Frame Stock: No. 1 shop kiln dried Douglas-fir.

B. Particleboard Core Stock: Medium density particleboard, complying with ANSI A208.1, 45 lbs./c.f. minimum average modulus of rupture of 2400 psi, minimum average modulus of elasticity of 400,000 psi.

C. Plywood in Sink Counters/Vanities: HPMA hardwood plywood, exterior glue, 3/4-inch thick.

D. Semi-Exposed Surfaces, Interior Cabinet Shelves, and Partitions (located behind cabinet doors): White low pressure laminate (polyester or melamine) laminated to particleboard. Edge banding of the same material where edges are exposed when drawers and doors are open. Laminate edges that are visible in gaps between closed doors and drawers with same material as cabinet face. Shelves 3/4-inch thick for spans up to 32-inches, 1-inch thick for spans up to 42-inches.

E. HPL, High-Pressure Plastic Laminate:

1. Faces: 0.030 grade NEMA Type 1 on exposed faces including visible surfaces of open shelving and surfaces behind glass doors. Backing sheet on concealed portion of work. In solid decorator colors as selected by Architect.

2. Tops: 0.050 grade NEMA Type 1 on countertops and open shelves. Backing sheet on concealed portion of work. In solid decorator colors as selected by Architect.

3. **PL-1**: Wilsonart “Sand,” #D331-60 390 - cabinet and cabinet faces, open shelving, countertops and backsplash, etc. See drawings.

F. Open Shelving:

1. **PL-1** face as scheduled on shelf top, bottom, and front edge. Shelves 1-inch for spans up to 42-inches.

2. Shelf Hardware: Knape & Vogt heavy duty standard 87 and heavy duty bracket 186.

G. Countertops:

1. **PL-1** Countertops Under High-Pressure Plastic Laminate: INT-DFPA plybase B-D Grade or Ext. HD Type 2A particleboard. Particleboard not permitted in sink counters.

2. **Edging** at Office Countertop: Hardwood “maple” trim/edging at specific countertops receiving PL-1 surface. Height of edging to be flush with laminate surface. Located at Office 102.

3. **SST-1** Stainless Steel Countertop at Kitchen Serving Counter: Type 306 stainless steel 14 gauge sheets with 90-degree rolled edges over substraight. SST-1 to be installed over (2) layers of ¾” thick plywood substrate (1-1/2” total thickness). Polish free of all blemishes. See drawings and details.

H. Drawer and Door Edge Banding: 3mm PVC, color to match plastic laminate except where detailed for hardwood trim.

I. Edge Banding for Open Shelves and Other Exposed Edges: Same material as cabinet face.

J. Cabinet Hardware:

1. Drawer Hardware:

a. Drawer slide for shallow drawers: Blum "230M."

b. Full extension guides for deep drawers: Blum "430E."

2. Shelf Support Pin:

a. 5mm bored holes at 32mm o.c. with shelf pins.

b. U. S. Tek, 626-859-9225 "Engstrom #11 Seismic Shelf Clip," double pin, 500 lb. capacity.

3. Hinges: One pair of five knuckle tapered tip with fixed pin, dull chrome hinges and one heavy duty magnetic catch per cabinet door. Stanley, Rockford Process Control, and McKinney Parker. Hinge option: 180° hinge with exposed axle. Hafele America Aximat.

4. Wire Pulls: Hafele America 10mm diameter, brushed stainless steel wire pull, No. 115.61.601 each drawer and door.

5. Cabinet Locks: Olympus Lock 500 DR (door) and 600 DW (drawer) five pin tumbler locks installed where detailed. Provide spacers to install lock flush with face of cabinet.

6. Power Cord Hole Covers in Countertops: High impact ABS cable hole covers with spring closure top, color compatible with countertop color (black). Hafele America "Series 429.99." Located at Study Room 112 at four (4) locations.

2.3 FABRICATION

A. Fabricate custom casework in accordance with AWI Custom Grade standards and as detailed.

B. Special Construction Requirements: Edge band front edge of fixed shelves, front and back edges of movable shelves, four edges of doors and drawer fronts unless of solid lumber. Open shelves shall be considered "exposed surfaces."

2.4 APPLICATION OF HIGH-PRESSURE PLASTIC LAMINATE

A. Apply high-pressure plastic laminate to tops, backsplashes and trim in accordance with AWI Custom Grade standards. Apply high-pressure plastic laminate to fronts, faces, ends and edges as detailed and noted on the Drawings. Self-edge all countertops.

PART 3 EXECUTION

3.1 SETTING AND INSTALLATION

A. Closely scribe fit all built-in cabinets to adjacent surfaces and install all necessary trim strips and molding. Permanently fasten to solid blocking and framing using wood screws in sufficient size, number and location to hold cabinets rigidly in place and to support all normal loads placed in cabinets.

B. Provide holes in cabinets to receive electrical outlets where indicated on the Electrical Drawings.

C. Coordinate installation of grommets with electrical, low voltage, and Owner requirements for computers, audio visual equipment, etc.

D. All plumbing items, such as fixtures, supplies and wastes, are furnished and installed in Division 22.

E. Coordinate installation of locker air exhaust system and connections with Division 23.

F. Coordinate installation of shower bench seat with metal stud framing, installation of stainless steel support brackets, and installation of ceramic tile work.

3.2 HARDWARE INSTALLATION

A. Install hardware accurately located on cabinets and millwork. Adjust moving parts for correct function and perfect operation. Remove and reinstall hardware as required for finish application to woodwork, leaving hardware clean and unblemished.

3.3 CLEANING

A. Keep the building area free from accumulation of waste materials or rubbish and promptly remove all crating and packing debris from the building and site.

END OF SECTION

JOINT SEALANTS

PART 1 GENERAL

1.1 SUMMARY

A. Furnish all labor, materials, equipment, and services necessary for the installation of building sealants for joint filling including, but not limited to:

1. Perimeter of doors.

2. Construction and expansion joints.

3. Plumbing fixtures.

4. Miscellaneous sealant products used throughout job.

B. See Section 08 80 00 Glazing for sealants required for interior glass.

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM).

B. Federal Specifications (FS).

1.3 PRECONSTRUCTION TESTING

A. Preconstruction Compatibility and Adhesion Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.

1. Use ASTM C 1087 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.

2. Submit not fewer than four pieces of each kind of material, including joint substrates, shims, joint-sealant backings, secondary seals, and miscellaneous materials.

3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.

4. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures including use of specially formulated primers.

5. Testing will not be required if joint-sealant manufacturers submit joint preparation data that are based on previous testing, not older than 24 months, of sealant products for adhesion to, and compatibility with, joint substrates and other materials matching those submitted.

B. Preconstruction Field-Adhesion Testing: Before installing sealants, field test their adhesion to Project joint substrates as follows:

1. Locate test joints where indicated on Project or, if not indicated, as directed by Architect.

2. Conduct field tests for each application indicated below:

   a. Each kind of sealant and joint substrate indicated.

3. Notify Architect seven days in advance of dates and times when test joints will be erected.

4. Arrange for tests to take place with joint-sealant manufacturer's technical representative present.

   a. Test Methods:

      (1) Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix XI in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.

      (2) ASTM C794-06 Standard Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants.

   b. For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.

5. Report whether sealant failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. For sealants that fail adhesively, retest until satisfactory adhesion is obtained.

6. Evaluation of Preconstruction Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory. Do not use sealants that fail to adhere to joint substrates during testing.

1.4 SUBMITTALS

A. Submit the following in accordance with Division 1 Section "Shop Drawings, Product Data, Samples."

B. Product data from manufacturers for each joint sealant product required.

C. Samples for initial selection purposes in form of manufacturer's standard bead samples, consisting of strips of actual products showing full range of colors available, for each product exposed to view.

D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that sealants comply with requirements.

E. Preconstruction Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating the following:

1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.

2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.

F. Preconstruction Field-Adhesion Test Reports: Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on testing specified in "Preconstruction Testing" Article.

G. Certificates from manufacturers of joint sealants attesting that their products comply with specification requirements and are suitable for the use indicated.

H. Installer’s experience qualifications.

I. Sample warranty.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer with commercial experience who has completed joint sealant applications similar in material, design, and extent to that indicated for Project that have resulted in construction with a record of successful in-service performance.

B. Single Source Responsibility for Joint Sealant Materials: Obtain joint sealant materials from a single manufacturer for each different product required.

C. Product Testing: Test joint sealants using a qualified testing agency.

1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.

D. Field-Constructed Mock-Ups:

1. Prior to installation of joint sealants, apply elastomeric sealants as follows to verify selections made under sample submittals and to demonstrate aesthetic effects as well as qualities of materials and execution.

2. Install joint sealants in field-constructed mock-ups of assemblies specified in other Sections that are indicated to receive elastomeric joint sealants specified in this Section.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration period for use, pot life, curing time, and mixing instructions for multicomponent materials.

B. Store and handle materials in compliance with manufacturer's recommendations to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

1.7 PROJECT CONDITIONS

A. Environmental Conditions: Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside the limits permitted by joint sealant manufacturer or below 40°F.

2. When joint substrates are wet.

B. Joint Width Conditions: Do not proceed with installation of joint sealants where joint widths are less than allowed by joint sealant manufacturer for application indicated.

C. Joint Substrate Conditions: Do not proceed with installation of joint sealants until contaminants capable of interfering with their adhesion are removed from joint substrates.

1.8 GUARANTEE

A. Furnish written guarantee at completion of Work. Guarantee period shall be two years from date of Substantial Completion. Include repair and replacement of defective work, such as leaks, failure of material, loss of adhesion, running of compound, or staining of adjacent work.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Product manufacturers are listed below.

B. Other Manufacturers: Submit Substitution Requests prior to bid date in accordance with Division 1 Section "Product Substitution Procedures."

2.2 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, joint fillers, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.

B. Colors: Provide custom colors of exposed joint sealants to match Architect's samples.

2.3 ELASTOMERIC JOINT SEALANTS

A. Sealant 1:

1. One part neutral cure medium modulus moisture curing silicone, FS TT-S-00230C, Type 2, Class A, or ASTM C920, Type S, Grade NS, Class 25. Uses NT, M, G, A, and O, and capable of withstanding movement of 50% in extension and compression in service.

2. Products:

a. Dow Corning "795."

b. G.E. "Ultra Glaze SSG 4000."

c. Tremco "Spectrem 2."

B. Sealant 2:

1. One part low modulus moisture curing silicone, FS TT-S-00230C, Type 2, Class A, TT-S-001543A, Class A, or ASTM C920, Type S, Grade NS, Class 100/50. Uses NT, M, G, A, and O, and capable of withstanding movement of 100% in extension and 50% in compression in service.

2. Products:

a. Dow Corning "790."

b. G.E. "Silpruf SCS 2000."

c. Tremco "Spectrem 1."

C. Sealant 3:

1. One part mildew resistant silicone sealant, FS TT-S-00230C, Class A, TT-S-1543A, Class A, or ASTM C920, Type S, Grade NS, Class 25. Uses NT, A and as applicable to non-porous joint substrates indicated, O, formulated with fungicide, intended for sealing interior joints with non-porous substrates and subject to in-service exposure to conditions of high humidity and temperature extremes.

2. Products:

a. Tremco "Tremsil 200."

b. Pecora "898."

D. Sealant 4:

1. One part acrylic latex sealant, ASTM C834.

2. Products:

a. Tremco "Acrylic Latex 834" paintable caulk.

b. Pecora "AC-20" paintable caulk.

2.4 JOINT SEALANT BACKING

A. General: Provide sealant backings of material and type that are non-staining; compatible with joint substrates, sealants, primers and other joint fillers; and approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Plastic Foam Joint Fillers:

1. Preformed, compressible, resilient, non-staining, non-waxing, non-exuding strips of flexible plastic foam of size, shape, and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

2. Material: Bi-cellular material consisting of closed cell extruded polyolefin foam with nonabsorbing outer skin, non-outgassing when punctured, ASTM C1330, Type B.

3. Product: Nomaco "SOF ROD."

C. Bond Breaker Tape: Polyethylene tape or other plastic tape as recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.5 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint sealant substrate tests and field tests.

B. Cleaners for Non-Porous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming in any way joint substrates and adjacent non-porous surfaces, and formulated to promote optimum adhesion of sealants with joint substrates.

C. Masking Tape: Non-staining, non-absorbent material compatible with joint sealants and surfaces adjacent to joints.

D. Sanded Joints: Clean masonry sand, ASTM C144.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint sealant performance. Do not proceed with installation of joint sealants until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with recommendations of joint sealant manufacturer and the following requirements:

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.

2. Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil free compressed air.

3. Clean metal, glazed surfaces of ceramic tile, and other non-porous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.

B. Joint Priming: Prime joint substrates where indicated or where recommended by joint sealant manufacturer based on preconstruction joint sealant substrate tests or prior experience. Apply primer to comply with joint sealant manufacturer's recommendations. Confine primers to areas of joint sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint sealant manufacturer's printed installation instructions applicable to products and applications indicated, except where more stringent requirements apply.

B. Sealant Installation Standard: For joint sealants as applicable to materials, applications, and conditions indicated, per ASTM C1193.

C. Installation of Sealant Backings: Install sealant backings to comply with the following requirements:

1. Install joint fillers of type indicated to provide support of sealants during application and at position required to produce the cross sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

a. Do not leave gaps between ends of joint fillers.

b. Do not stretch, twist, puncture, or tear joint fillers.

c. Remove absorbent joint fillers that have become wet prior to sealant application and replace with dry material.

2. Install bond breaker tape between sealants where backer rods are not used between sealants and joint fillers or back of joints.

D. Installation of Sealants: Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration, and providing uniform, cross sectional shapes and depths relative to joint widths that allow optimum sealant movement capability. Install sealants at the same time sealant backings are installed.

3.4 CLEANING

A. Clean off excess sealants or sealant smears adjacent to joints as work progresses by methods and with cleaning materials approved by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so that installations with repaired areas are indistinguishable from original work.

3.6 SCHEDULE

A. Primerless Type Silicone Sealant: Exterior and interior joints in vertical surfaces of concrete and masonry, between concrete masonry and stone, between metal and concrete, mortar, or stone, and all other exterior joints not indicated otherwise; general exterior sealing of door and window frames, louvers, penetrations, form tie holes, toilet room fixtures, joints in chlorine vapor environments, and building expansion and control joints.

1. Medium modulus type for ±50% joint movement, general building sealing: Sealant 1.

2. Low modulus type for expansion and control joints with +100% to -50% movement: Sealant 2.

B. Mildew Resistant Silicone: Interior wet areas, Sealant 3.

C. Acrylic Emulsion Sealant: Interior joints in field-painted vertical and overhead surfaces; at perimeter of hollow metal door frames; in gypsum board, plaster, and all other interior joints not indicated otherwise: Sealant 4.

END OF SECTION

PREFINISHED STEEL DOOR FRAMES

PART 1 GENERAL

1.1 SUMMARY

A. Furnish all labor, material, equipment and services necessary for the installation of prefinished, shop frbricated, and site assembled steel door frames.

B. Related Sections: Division 8 Sections “Wood Doors,” and “Door Hardware”.

1.2 REFERENCES

A. REF ASTM A1008M – Standard for cold rolled material.

B. ASTM D2197 - Standard Test Method for Adhesion of Organic Coatings by Scrape Adhesion.

C. ASTM D2247 - Practice for Testing Water Resistance of Coatings in 100% Relative Humidity.

D. ASTM D2794 - Standard Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact).

1.3 SUBMITTALS

A. Submit the following in accordance with Division 1 Section "Submittal Procedures."

B. Shop Drawings: Indicate frame elevations, reinforcement required, and spacing, location of embosses for hardware, and finish.

C. Manufacturer's installation instructions.

1.4 QUALITY ASSURANCE

A. Installers: Individuals that are manufacturer “Certified Prefinished Frame Installers” for the installation of site assembled door frames.

B. Interior steel door frames shall comply with PS 4-66 and CS 242-62 as required by HUD Material Standards.

C. Frames: Provide all prefinished frames for project from same manufacturer.

1.5 DELIVERY, STORAGE, AND PROTECTION

A. Transport, handle, store, and protect products in a dry area off the ground.

B. Accept frames on site in manufacturer's box packaging with identification labels intact. Inspect for damage.

C. Do not open individual boxes until installation is to begin.

1.6 PROJECT CONDITIONS

A. Coordinate the work with frame opening construction, door and hardware installation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Timely Industries, A Division of SDS Industries, Inc., 800-247-6242. Web site: www.timelyframes.com.

B. Other Manufacturers: Submit Substitution Requests prior to bid date in accordance with Division 1 Section "Product Requirements."

2.2 DOOR FRAMES

A. Frame Material: Cold rolled steel, for interior frames.

B. Frame Throat Opening: To suit finished wall thickness.

C. Non-rated Frame Profile: "S" Series, 0.9 mm (20 gauge) thick.

D. Frame Casings: Standard steel type, Model TA-8 with 6 mm (1/4 inch) reveal, on steel frames. Fit factory assembled units with MiterGard corner alignment clips.

2.3 ACCESSORIES

A. Silencers: Clear stick-on type.

B. Fasteners: Drywall type.

2.4 FABRICATION

A. Cut, notch and fabricate frames at manufacturer's facility.

B. Provide minimum 14 gauge hinge reinforcement plate, tapped for machine screws supplied with hinges. Mechanically attach hinge plate to hinge emboss on frame.

C. Casing Clips: Fabricate frames with factory applied, heat treated clips to prevent deflection in the clip upon application or removal of casing. Attachment clips may not be of same material as frame.

D. Provide notches and tabs or stops (or both) for positive alignment of frame parts at all corners.

E. Notch mullions to provide tight joints.

F. Provide manufacturer's standard mullion brackets for positive connection of frame and mullion parts.

G. Provide manufacturer's standard steel glass stop, factory cut to exact length. Provide a hole for installation screw within 2 inches of each end of stop piece at fire-rated glazed openings.

H. Provide insert channel full width of light for sidelight and borrowed light frames installed on finish floor. Provide full width head channel for ceiling height units.

I. Prepare frames for ASA 4 7/8 inch (124 mm) strikes, where required. Provide minimum 1/4 inch (6.35 mm) depth of threads in factory tapped screw holes.

J. Provide corner alignment clips.

K. Silencers: Provide three (3) single silencers for single doors on strike side of frames.

2.5 FINISH

A. Frame Units: Prefininshed with factory applied impact resistant, polyester baked enamel finish.

B. Steel Casing: Prefinished with factory applied impact resistant, polyester baked enamel finish.

C. Custom Colors: As selected by Architect from manufacturer's full color range.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify acceptability of existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

3.2 INSTALLATION

A. Install frames in accordance with manufacturer's requirements.

Install prefinished frames near end of the project after completing wall painting and wall coverings.

B. Install frames using certified installers.

C. Coordinate installation of glass and glazing in glazed units.

D. Coordinate installation of frames with installation of hardware specified in Division 8 Section "Door Hardware," and doors in Division 8 "Wood Doors."

E. Touch-up blemishes on finished frames.

3.3 CLEANING

A. Upon completion, perform cleanup, remove surplus materials, rubbish, tools and equipment in accordance with Division 1 Section "Closeout Procedures."

3.4 PROTECTION

A. Protect installed product from damage during construction.

B. Repair damage to adjacent materials caused by door frame installation.

END OF SECTION

WOOD DOORS

PART 1 GENERAL

1.1 SUMMARY

A. Provide all labor, material, equipment and services necessary to furnish and install wood flush face doors.

B. Related Section: Division 8 Section “Door Hardware.”

1.2 REFERENCES

A. Architectural Woodwork Quality Standards (AWS), joint standards of Architectural Woodwork Institute (AWI) and Architectural Woodwork Manufacturers Association of Canada (AWMAC).

B. National Fire Protection Association (NFPA).

C. Wood Door Manufacturers Association (WDMA).

1.3 SUBMITTALS

A. Submit the following in accordance with Division 1 Section "Shop Drawings, Product data, Samples."

B. Product data for each type of door, including details of core and edge construction, trim for door lite openings and louvers.

C. Shop drawings indicating location and size of each door, elevation of each kind of door, details of construction, location and extent of hardware blocking, fire ratings, requirements for veneer matching and other pertinent data. For factory-machined doors, indicate dimensions and locations of cutouts for locksets and other cutouts adjacent to lite and louver openings. Indicate cutout clearances required to maintain fire-rated door construction.

D. Samples for verification: Corner sections of doors approximately 12-inches square with door faces and edgings representing the typical range of color and grain for each species of veneer and solid lumber required.

E. Certification: Manufacturer’s letter of certification of specification compliance.

1.4 QUALITY ASSURANCE

A. Doors shall comply with WDMA Industry Standard I.S. 1A-04 and 1A-97 Light Commercial Wood Flush Doors and AWS Quality Standards. Any door not meeting these standards shall be replaced without cost to the Owner.

1. Solid Core Doors: Fabrication shall comply with AWS PC-5 or PC-7 construction for non-rated or 20 minute fire rated doors, AWS FD-5 or FD-7 for 45 minute or greater fire rated doors.

B. Doors shall bear a temporary tag including the manufacturer's name with full description of face veneer assembly, species, cut, match, door type, elevation, size, hardware machining information, providing for total reconciliation with their submittals and the wood door specification. Such tag shall be affixed to the top of the door.

C. Manufacturer to provide a statement of certification as to their intended full compliance with the wood door specification.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect during transportation handling and storage from surface damage, moisture and soiling. Doors hung and protected as soon as possible after delivery.

1.6 WARRANTY

A. Provide manufacturer's full lifetime warranty of original installation including rehanging and refinishing.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Product Manufacturers:

1. Ampco Products, Inc.

2. Buell Door Company.

3. Eggers Industries.

4. Graham (Essex Ind.).

5. Lynden Door.

6. Marshfield Door Systems, Inc. (formerly Weyerhaeuser).

7. Pacific Architectural Wood Products.

8. Vancouver Door Company.

9. VT Industries.

10. Western Oregon Door.

B. Other Manufacturers: Submit Substitution Requests prior to bid date in accordance with Division 1 Section "Product Substitution Procedures."

2.2 MANUFACTURED UNITS

A. Solid Core Doors:

1. Particleboard core, ANSI A208.1,Grade LD-2, flush face, urea-formaldehyde free.

2. Premium grade five-ply and seven-ply architectural doors with stiles and rails bonded to the core by means of a thermal setting (hot press) adhesive and sanded prior to assembly of face veneers.

3. All doors have double banded laminated hardwood stiles without finger joints in outer band and outer band at least 1/2-inch wide.

4. Stile edges same species as face veneer, bonded to the core, 1-3/8-inches minimum thickness after trim.

5. Door thickness 1-3/4-inches.

6. Veneers:

a. Paint Grade Finish:

(1) Paint grade face (Grade AA, edge glued joints).

(2) Paint face veneers tight and smoothly cut, joints parallel to the edges of the door, and without sharp contrasts in color or grain.

(3) Individual pieces of veneer forming the face veneer edge glued with a thermosetting adhesive.

(4) Minimum 1/50-inch veneer thickness at 12% moisture content before sanding at project site.

(5) WDMA I.S. 1-A Architectural Door Code VPPA.

B. Lites:

1. Door Profile ‘G’: Provide ½-door lite no less than 22” wide X 30” tall (720 sq. inches) with 6-inch stiles and head.

2. All glass lites at wood doors to be clear insulated tempered/safety glass with wood stops.

2.3 FABRICATION

A. Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.

1. Comply with requirements in NFPA 80 for fire-rated doors.

B. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, DHI A115-W series standards, and hardware templates.

C. Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining.

D. Openings: Cut and trim openings through doors in factory.

PART 3 EXECUTION

3.1 INSTALLATION

A. Fit with 1/8-inch clearance in frames, head and jambs, and 3/8-inch clearance over floor or floor coverings at openings without saddles and thresholds. Bevel lock and hinge stile edges 1/8-inch in 2-inches to operate without binding. Undercut when specially noted on the Drawings or as scheduled. Fit for other clearances when required by special details, hardware, or floor coverings as approved by Architect.

B. Accurately locate surface-mounted hardware on doors by dimension, jig, and template. Pre-drill all screw fastening device holes.

END OF SECTION

COILING COUNTER DOORS

PART 1 GENERAL

1.1 SUMMARY

A. Furnish all labor, material, equipment and services required for the installation and operation of metal slat roll-up counter door as scheduled and detailed.

1.2 SUBMITTALS

A. Submit the following in accordance with Division 1 Section "Submittal Procedures."

B. Product data for each type and size of coiling counter door and accessory. Include details of construction relative to materials, dimensions of individual components, profiles, and finishes. Provide roughing-in diagrams, operating instructions, and maintenance information. Include the following:

1. Setting drawings, templates, and installation instructions for built-in or embedded anchor devices.

2. Summary of forces and loads on walls and jambs.

C. Shop drawings including the following:

1. For special components and installations not dimensioned or detailed in manufacturer’s data sheets.

D. Installer certificates signed by manufacturer certifying that installers comply with specified requirements.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer who is an authorized representative of the coiling counter door manufacturer for both installation and maintenance of units required for this Project.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Specification is based on Cookson Co., "CDF" face mounted jambs, crank operated, coiling counter door.

B. Other Approved Manufacturers: Cornell, Overhead Door Corporation, Wayne Dalton. Approval contingent upon manufacturer’s ability to provide doors with wireless safety edges.

C. Other Manufacturers: Submit Substitution Requests prior to bid date in accordance with Division 1 Section "Product Requirements."

2.2 MANUFACTURED UNITS

A. Counter Door:

1. Door: Stainless steel, crank operated roll-up counter door, face mounted, with interior keyed locking device at both jambs.

a. Counter door curtain formed of #4 stainless steel midget slats, with tubular foot piece. The foot piece to have concealed slide bolts with deadlocking feature operated by keyed cylinder lock.

b. Manufacturer: Cookson "Model CDF" face mounted jamb.

2. Jamb Track and Head:

a. Stainless steel curtain guides (#2b finish), face mounted onto wood framed jambs.

b. Curtain coils around a steel tube barrel of not less than 4-inches in diameter containing a helical torsion spring capable of counter-balancing the curtain weight. Coil enclosed in stainless steel hood with removable access door on panel.

PART 3 EXECUTION

3.1 INSTALLATION

A. Doors shall be installed by the manufacturer or manufacturer’s authorized representative.

B. Install plumb and true, securely fasten to the structure, and adjusted for operation. Include installation of control system where required.

C. Provide Owner instruction for door operation and maintenance.

END OF SECTION

DOOR HARDWARE

PART 1 GENERAL

1.1 SUMMARY

A. Furnish and install all door hardware as specified within this Section. Do not, however, construe the following specification as complete in every detail. Furnish all items classified as door hardware and necessary to complete construction.

1.2 REFERENCES

A. National Fire Protection Association (NFPA).

1.3 SUBMITTALS

A. Submit the following in accordance with Division 1 Section "Shop Drawings, Product Data, Samples."

B. If requested by the Owner and Architect, furnish properly labeled hardware samples within three weeks following award of the Contract. These samples may be retained by the Architect until completion of the job. All delivered hardware must conform to the approved samples.

C. Templates: Furnish templates to metal door and frame suppliers within one week from receipt of approved hardware schedule and verification at the Preconstruction Meeting.

1.4 QUALITY ASSURANCE

A. Qualifications:

1. Door Hardware Supplier:

a. Provide services of an AHC or DAHC (Architectural Hardware Consultant) member of Door & Hardware Institute with the technical experience and availability for consultation with the Architect, Owner and Contractor.

b. Hardware supplier shall have and maintain a factory direct status with all manufacturers’ specified or approved during the course of the project.

c. The door hardware consultant shall:

(1) Be an employee of supplier.

(2) Be knowledgeable on local, state, and federal life safety fire codes, and accessibility codes and requirements to assist the Architect when necessary.

(3) Assist in developing the keying schedule by meeting with the Owner and Architect, and make at least two job site inspections and one final inspection to ensure that all hardware has been properly installed according to the manufacturer’s directions

(4) Notify the door closer manufacturer for final adjustment of door closers prior to the consultant's final inspection.

2. Contractor: Employ a worker with commercial experience to receive, supervise, and distribute hardware at the building site, and provide a locked room with temporary shelving for hardware.

3. Distributor: Provide hardware from a factory authorized distributor. Only those manufacturers specified or approved in writing prior to bidding are acceptable. All components of each hardware item shall be by the same manufacturer.

B. Regulatory Requirements: All hardware shall comply with applicable local and state fire and current building codes. Hardware applied to doors with UL fire rating label shall comply with that rating.

C. Pre-Construction Meeting: Conduct a final "hardware function" coordination meeting with the Owner, Architect, and hardware consultant. Do not release hardware templates to door fabricators until final resolution of the hardware coordination meeting.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver all door hardware to job site unless directed otherwise. Each item shall be properly wrapped in its original factory shipping carton, labeled, and numbered for the opening for which it is intended. All items shall be shipped from the factory to the hardware supplier for final checking before sending to job site.

B. Include all necessary screws, bolts, or other fastenings of suitable size and type to securely anchor in position, and harmonize with the hardware material and finish. Furnish where necessary with sex bolts, toggle bolts, expansion shields or other approved anchors according to the material to which it is applied and recommended by the manufacturers.

1.6 WARRANTY

A. All hardware shall carry a factory warranty for a minimum of one year after Substantial Completion that hardware is free from defects in workmanship and material. Hardware must be installed exactly to the manufacturer's printed instructions to prevent voiding the warranty. Provide a 3 year material and labor warranty for exit devices and 10 year material and labor warranty for closers.

B. Provide factory order numbers to the Owner/GC for hardware warranty purposes.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Product Manufacturers:

1. BST: Best Access Systems.

2. FAL: Falcon.

3. IVE: Ives.

4. LCN: LCN.

5. PEM: Pemko.

6. RIX: Rixson.

7. SCE: Schlage Electronics.

8. SCH: Schlage.

9. TRI: Trimco.

10. VON: Von Duprin.

11. CAM: Camden

B. Other Manufacturers: Submit Substitution Requests prior to bid date in accordance with Division 1 Section "Product Substitution Procedures."

2.2 MATERIALS

A. Butt Hinges: 1-1/2 pair minimum per door unless scheduled otherwise.

B. Locks and Latches: Verify operation, hand of doors, and function for each opening as scheduled.

C. Keying:

1. It shall be mandatory that keying be done by the lock manufacturer for security, Owner’s convenience, and permanent keying records. In the event any keying security procedure is violated, replace all locks, cylinder units, padlocks, cylinders, etc., at no additional expense to the Owner.

2. Provide manufacturer’s standard keyway with standard cylinders except where interchangeable core cylinders are specified. Interchangeable core cylinders to have temporary construction cores.

3. Furnish two keys with each lock, and five master keys. Keying and master keying schedule as established by the Owner.

4. All master keys and keying transcript to be sent by registered mail from the factory to the Owner. This procedure is mandatory.

D. Closers: Verify hand of door, degree of opening, frequency of use, and head condition. Furnish cast iron body type only.

E. Pocket Door Hardware: See Wood Door section 08 14 00.

F. Silencers: Furnish in number and type to protect finishes wherever doors or hardware thereon will strike adjacent surfaces and materials. Furnish 3 rubber silencers for metal door frames that are not equipped with gaskets.

G. Wood doors that are fire rated greater than 20 minutes shall be provided with solid hardwood blocking. Through-bolt hardware mounting not permitted.

H. Hardware Finishes: As specified below in the Schedule. Verify all finishes on the Schedule and at the Site.

PART 3 EXECUTION

3.1 INSTALLATION

A. Locate and place hardware on work accurately using templates when required. Install permanently using proper nails, screws or bolts, matching finish of hardware. Remove and place in original packages all hardware after setting to permit application of finishes and reinstall when finish application is complete. Deliver any adjusting tools to Owner properly tagged and identified.

B. Properly wrap all hardware subjected to hand usage during construction for protection. Replace hardware that has damaged finish.

C. Butt Hinges: Install top hinges 5-inches from head of frame or door top to top of hinge. Bottom hinge 10-inches from finished floor to bottom of hinge. Center intermediate hinges between top and bottom hinges.

D. Locks and Latches: Install 38-inches to center line of knob locks and latches.

E. Deadlock: Install 48-inches to center line of deadlock. Vary as necessary to avoid conflict with door pulls, etc.

F. Thresholds: Set in bed of silicone sealant. Thresholds requiring additional support set in bed of non-shrink grout.

3.2 SCHEDULE

See Door Hardware Schedule on sheet A1.4.

3.3 HARDWARE GROUPS

HW SET: 01
DOOR NUMBER:
102-1

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 HW 4.5 X 4.5 NRP	652	IVE
1	EA	STOREROOM LOCK	ND96PD SPA	626	SCH
1	EA	CYLINDER	1E74(Std.)C4RP3	626	BST
1	EA	KICK PLATE	8400 CUSTOM B4E 10" X 34"	630	IVE
1	EA	FLOOR STOP	FS436	626	IVE
1	SET	SILENCERS	SR64	GRY	IVE

HW SET: 02
DOOR NUMBER:
107-1 PAIR

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	THRESHOLD	2005AV – LOW PROFILE ADA	AL	PEM
2	EA	KICK PLATE	8400 CUSTOM B4E 10" X 34"	630	IVE
2	EA	KICK DOWN HOLDER	FS455	630	IVE
1	EA	DOOR SWEEP	C627A	AL	NGP
1	SET	WEATHER SEAL	5050B (HEAD & JAMBS)	GRY	NGP

END OF SECTION

GYPSUM BOARD

PART 1 GENERAL

1.1 SUMMARY

A. Furnish all labor, material, equipment and services necessary for the installation and finishing of all gypsum board partitions and ceilings on wood stud framing and furring. Include backing for applied finishes and installation of acoustical insulation.

1.2 REFERENCES

A. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2004.

B. ASTM C 1047 - Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base; 2005.

C. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board; 2005.

1.3 QUALITY ASSURANCE

A. All gypsum board products shall be manufactured in the United States of America.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Coordinate delivery with installation to minimize storage periods. Deliver in unopened containers, bundles or packages fully identified with the manufacturer’s name, brand, type and grade. Protect from weather, soiling and damage.

1.5 PROJECT CONDITIONS

A. Examine the conditions under which the gypsum board is to be installed. Commencement of work establishes acceptance of work conditions.

B. Installation not permitted until a uniform temperature of 55°F to 70°F can be maintained in the building and ventilation provided to eliminate excessive moisture.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Product manufacturers are listed in Paragraph 2.2.

B. Other Manufacturers: Submit Substitution Requests prior to bid date in accordance with Division 1 Section "Product Substitution Procedures."

2.2 MATERIALS

A. Obtain all components and materials of the gypsum board system from manufacturers recommended and approved by the gypsum board manufacturer, unless otherwise indicated.

B. Gypsum Board:

1. Interior Walls and Ceilings: G-P Gypsum Corporation “ToughRock Fireguard,” or USG “Sheetrock Brand Firecode,” Type X fire retardant type, 1/2-inch thick, tapered edges, 48-inches wide and in lengths as long as practical to minimize number of joints. UL labeled and ICC approved, ASTM C1396.

2. High Moisture Areas: G-P Gypsum Corporation "DensArmor Plus Fireguard," or USG "Sheetrock Brand Mold Tough AR Firecode," 1/2-inch thick, Type X fire retardant, moisture resistant ASTM C1178, mildew resistant ASTM D3273, UL labeled and ICC approved.

C. Fasteners: Types G and S screws in required lengths and to suit requirement of application to 22 wood studs, ASTM C1002.

D. Joint Treatment: Provide materials from same manufacturer as gypsum board, ASTM C475/C475M.

1. Joint Tape:

a. Interior Gypsum Wallboard: Paper.

2. Joint Compound for Interior Gypsum Wallboard: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.

a. Prefilling: At open joints and damaged surface areas, use setting-type taping compound.

b. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use drying-type, all-purpose compound.

c. Use setting-type compound for installing paper-faced metal trim accessories.

d. Fill Coat: For second coat, use drying-type, all-purpose compound.

e. Finish Coat: For third coat (final coat of Level 4 finish), use drying-type, all-purpose compound.

E. Acoustical Insulation: 0.50 to 1.0 lb. density, IBC Class I flame-spread index unfaced, semi-rigid fiberglass batt, 4-inches thick for studs up to 4-inches deep, 6-inches thick for studs 6-inches deep, other thicknesses as noted.

1. Industrial Insulation Type 703 by Owens-Corning Fiberglas Corporation.

2. Insul-Shield I/S300 by Johns Manville.

3. Thermafiber Sound Attenuation Blanket by U.S. Gypsum.

4. Industrial Insulation Board ID300 by Certainteed.

F. Caulking:

1. Non-setting, non-staining, acoustically tested caulking, ASTM C919.

2. Products:

a. Acoustical Sealant by Tremco. A black synthetic rubber material suitable for concealed locations only.

b. AS-10 Acoustical Sealant by Macco Adhesives.

c. BA-9097 and BA-98 Acoustical Sealant by Pecora Chemical Corp.

d. 313 Sound Control Sealant by W.W. Henry Co.

e. Sil Pruf, SCS 2000 by General Electric Co.

f. Pensil 300 by Specified Technologies, Inc.

g. Fyre Sil by Tremco.

G. Trim Accessories:

1. Hot-dip galvanized steel corner beads, edge trim, and control joints, ASTM C1047.

2. Shapes indicated below by reference to Fig. 1 designations in ASTM C1047:

a. Corner bead on outside corners, unless otherwise indicated.

b. LC-bead with both face and back flanges; face flange formed to receive joint compound, provide for edge trim unless otherwise indicated.

c. L-bead with face flange only; face flange formed to receive joint compound, provide where indicated.

d. U-bead with face and back flanges; face flange formed to remain without application of joint compound, provide where indicated.

e. One-piece control joint formed with V-shaped slot, with removable strip covering slot opening.

H. Accessory Backing: 16 gauge sheet metal, minimum 6-inches wide, length as required, reinforced with horizontal studs.

PART 3 EXECUTION

3.1 INSTALLATION

A. Installation Standards:

1. Installation of gypsum board assemblies, ASTM C840.

B. Partitions and Furring:

1. All stud assemblies supporting door jambs to be securely anchored at the floor and run full height and secured to the structure above.

2. All studs supporting restroom counter brackets are to be doubled back-to-back on both sides of bracket and run full height. Coordinate stud locations with required locations of support brackets between lavatories.

3. Where studs are surfaced on one side only, or surfacing does not run full height of studs, the stud flanges must be laterally braced or braced to adjacent surface as recommended by manufacturer to meet lateral design loads.

4. Install 16 gauge sheet metal backing plates not less than 6-inches wide and one or more stud spacing long at location of wall mounted hardware equipment or devices. Reinforce backing plates at wall-mounted door stops with two horizontal studs. Refer to accessory fixture list for location and type for installation. Verify locations of Owner furnished and installed equipment and provide required blocking.

C. Gypsum Board:

1. In areas where gypsum board is called for on the walls and ceiling, install the ceiling first then the wall unless detailed otherwise. Verify that acoustical insulation is in place, where detailed, prior to completing panel installation.

2. Where partitions are sound or fire-rated construction, apply caulking sealant to all cut-outs and intersections with adjoining structure as described in Sealant Application, below. This requires that the gypsum board be cut for loose fit around the partition perimeter leaving a space approximately 1/8-inch wide. Line the inside of equipment recesses with gypsum board to maintain the integrity of sound and fire-rated wall construction.

3. Use gypsum board panels of maximum practical length to minimize end joints. Arrange joints on opposite sides of partition walls to occur on different studs and stagger butt joints on the same surface. Where partitions intersect exterior walls, start installation at exterior end to position butt joints as far away from exterior wall as possible. Board shall be brought into contact but not forced into place with all ends and edges neatly fitted. Use "Floating Interior Angle" application at all ceilings. Bottom edge of gypsum board on walls shall be a maximum of 1/4-inch above floor.

4. Attach gypsum board to metal framing with all edges over framing members using screw fasteners spaced at 12-inches o.c. on ceilings and 16-inches o.c. on walls, staggered on abutting edges. Power drive screws at least 1/32-inch deep.

5. While fasteners are being driven, hold gypsum board in firm contact with underlying supports, fastening from the center of the board toward ends and edges. Drive fasteners tight, with heads slightly below surface, taking care to avoid breaking the paper face.

6. For double layer panel application, install either by screw attachment or adhesive method. Screw-attach the outside layer of boards installed by adhesive method. Apply both layers vertically with joints in face layer offset from joints in base layer.

7. Cut board neatly and fit around pipes, electrical outlets, mechanical work, etc. Remove any loose face paper at cuts and fill holes or openings with quick setting plaster. Where board appears loose from framing, install second fastener within 1-1/2-inches of first.

8. Finish in every location with metal edge and corner bead unless finishing details are given and edge is covered with molding or trim. Install control joints vertically at corners of door frames, and at a maximum of 30-feet apart on unbroken wall surfaces.

9. Use water-resistant type board at wet and high moisture areas. Seal all cut ends and openings with recommended sealant.

D. Sealant Application:

1. Partition Perimeter: Apply a 1/4-inch minimum bead of sealant on each side of plates, including those used at intersections with dissimilar wall construction. Immediately install gypsum board, squeezing sealant into firm contact with adjacent surfaces. Fasten board as specified.

2. Partition Intersections: Before taping and finishing, seal edges of face layer of gypsum board abutting intersecting partitions.

3. Openings: Apply a 1/4-inch bead of sealant around all cut-outs to seal openings of electrical boxes, ducts, pipes and similar penetrations. Caulk sides and backs to seal electrical boxes.

4. Control Joints: Before installing control joints, apply sealant in back of joint to reduce flanking sound path.

E. Joint Finishing:

1. Level 1, ASTM C840: Rough taping permitted only in concealed spaces and service or unfinished areas as scheduled, including gypsum board which will be covered by rigid finish material fully concealing joints and which will not telegraph unevenness.

2. Level 4, ASTM C840:

a. Tape joint compound and finishing compound as recommended by manufacturer of gypsum board.

b. Using suitable tool or machine, apply a thin uniform layer of joint compound approximately 3-inches wide to the joint to be reinforced.

c. Center tape over the joint and seat into the compound, leaving sufficient compound under the tape to provide proper bond.

d. Apply first, fill (second), and finish (third) coats of joint compound over joints, angles, fastener heads, and accessories.

e. Touch-up and sand between coats and after last coat as needed to produce a surface free of visual defects and ready for decoration.

f. Use only water resistant materials with moisture resistant type gypsum board.

g. Upon completion of finish sanding to a smooth surface, remove all dust from wall surface. Wipe down the entire wall surface with a damp sponge mop.

h. Apply Level 4 Finish to all exposed paper faced gypsum board, except where Level 1 is allowed, or Level 3 is scheduled.

3.2 CLEANING

A. Do not dispose of or leave excess gypsum board materials or debris on the premises. Leave each area broom clean after completing gypsum board work. Clean spots and spills of taping and finishing compounds from all adjacent surfaces and equipment.

END OF SECTION

ACOUSTICAL CEILINGS

PART 1 GENERAL

1.1 SUMMARY

A. Furnish all labor, material, equipment, and services necessary for the installation of acoustical ceilings, complete with suspension systems.

1.2 REFERENCES

A. Acoustical and Insulating Materials Association Bulletin.

1.3 SUBMITTALS

A. Submit the following in accordance with Division 1 Section "Shop Drawings, Product Data, Samples."

B. Samples of exposed tee grid and acoustical board for review of color.

C. Design Data: Copies of Engineered Design calculations, drawings and documentation prepared by a structural engineer registered in the State of Oregon, showing compliance and classification of light, intermediate, or heavy duty system. Include manufacturer's literature or ICC Reports and identification of connection devices and approved loading capabilities.

D. Manufacturer's Data: When using a standard 24-inch x 24-inch or 24-inch x 48-inch grid system in lieu of an Engineered Design, submit copies of manufacturer's literature or ICC Report indicating light, intermediate, or heavy duty system. Include fixture schedule and other ceiling supported equipment and their weight, with connection devices and approved loading capabilities.

1.4 QUALITY ASSURANCE

A. Installer's Qualifications: All work performed by skilled acoustical mechanics with commercial experience, in the best and most professional manner. Material installed to provide a proper and symmetrical pattern in each area with joints straight and true and all corners level.

B. Regulatory Agency Requirements: All ratings in conformance with the Acoustical and Insulating Materials Association Bulletin.

C. Seismic Requirements:

1. Suspended acoustical ceiling systems, with or without lighting fixtures, air terminals, or other ceiling mounted items shall comply with the requirements of ASTM C635, ASTM C636, and the building code.

2. Ceiling areas of 144 s.f. or less surrounded by walls which connect directly to the structure above shall be exempt from these standards.

3. Light Duty systems to be used only where no loads other than ceiling acoustical materials weighing not more than 1.5 lbs./s.f. are supported by the suspension system.

4. Intermediate and Heavy Duty classification systems shall be used where suspension system is used to support acoustical material weighing more than 1.5 lbs./s.f., lighting fixtures or other equipment.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Properly store material within the building in such a manner and sufficiently in advance of installation to ensure adjustment to building temperatures and humidities.

1.6 PROJECT CONDITIONS

A. Do not begin installation until residual moisture from concrete and other wet application material is dissipated, building enclosed with permanent heating/cooling equipment in operation.

1.7 MAINTENANCE

A. Extra Materials: Furnish to the Owner in factory-sealed containers a 2% overrun of acoustical board from the same production run as that used in this installation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acoustical Board: Armstrong, USG, Celotex.

B. Exposed Tee Grid: Armstrong or approved equal.

C. Other Manufacturers: Submit Substitution Requests prior to bid date in accordance with Division 1 Section "Product Substitution Procedures."

2.2 MATERIALS

A. ACT-1, Acoustical Board:

1. Mineral fiber, square lay-in edge, 24-inches x 48-inches x 5/8-inch thick, IBC Class A flame-spread index per ASTM E84, LR 0.89, CAC 33 minimum, water-repellent, washable, scratch-resistant, soil-resistant, factory applied latex paint.

2. Product: Armstrong "Kitchen Zone," 672, color white.

B. Suspension Systems:

1. Exposed Tee: Main and cross tees, 1-1/2-inches deep, 15/16-inch wide, exposed surfaces finished with flat white baked enamel, color to match acoustical board.

2. Wall Moldings: 3/4-inch reveal shadow molding, white. Armstrong BERC 2 seismic clips.

3. Product: Armstrong 15/16” Prelude XL Seismic Rx”

C. Suspension Wires: Minimum 12 gauge galvanized, soft annealed steel hanger wire.

PART 3 EXECUTION

3.1 INSTALLATION

A. Suspension Systems:

1. System to be supported on minimum 12 gauge galvanized hanger wire at 4-feet o.c. Suspension wires spaced at greater than 4-feet shall be 10 gauge.

2. Approved type attachment devices capable of supporting five times the ceiling load and not less than 100 lbs. Powder driven devices not permitted. Vertical wires attached with a minimum of three turns and not hang more than 1-in-6 out-of-plumb unless countersloping hangers are provided.

3. Carrying channels and main runners to be level within 1/8-inch in 12-feet with hangers taut. Bending or kinking of hangers not permitted. Deflection limited to 1/360 (1/8-inch) in 4-feet. Fixture loads causing excess deflection shall be independently supported or the grid supplementally supported within 6-inches of each corner, and such loads shall not cause rotation of runners more than 2 degrees from vertical. Provide trapeze type system where obstructions preclude direct attachment. All runners shall be supported within 8-inches of wall or discontinuity.

4. Lateral bracing required in lieu of Engineered Design installed within 4-feet of walls and at 12-feet o.c. in each direction. Install four 12 gauge wires within 2-inches of a main runner intersection with a cross runner and splayed at 90 degrees from each other and at an angle not exceeding 45 degrees of the ceiling plane.

5. Adjacent and parallel to the wall, secure a stabilizer bar to the members perpendicular to the wall to prevent spreading. The wall closure member may be used at two adjacent walls with clearances maintained at the other two walls.

6. Light Fixture Support:

a. Positively attach all lighting fixtures to the suspended ceiling system. The attachment device shall have a capacity of 100% of the lighting fixture weight acting in any direction.

b. When intermediate systems are used, 12 gauge hangers shall be attached to the grid members within 3-inches of each corner of each fixture. Tandem fixtures may utilize common wires.

c. Where heavy-duty systems are used, supplemental hangers are not required if a 48-inch modular hanger pattern is followed. When cross runners are used

without supplemental hangers to support lighting fixtures, these cross runners must provide the same carrying capacity as the main runner.

d. Lighting fixtures weighing less than 56 lbs. shall have, in addition to the requirements outlined above, two 12-gauge hangers connected from the fixture housing to the structure above. These wires may be slack. Lighting fixtures weighing 56 lbs. or more shall be supported directly from the structure above by approved hangers.

e. Pendant-hung lighting fixtures shall be supported directly from the structure above using 9 gauge wire or approved alternate support without using the ceiling suspension system for direct support.

7. Air Terminal Support:

a. Ceiling mounted air terminals or services weighing less than 20 lbs. shall be positively attached to the ceiling suspension main runners or to cross runners with the same carrying capacity as the main runners.

b. Terminals or services weighing 20 lbs. but not more than 56 lbs., in addition to the above, shall have two 12-gauge hangers connected from the terminal or service to the ceiling system hangers or to the structure above. These wires may be slack.

c. Terminals or services weighing more than 56 lbs. shall be supported directly from the structure above by approved hangers.

B. Exposed Tee Suspension System: Where suspended acoustic tee bar ceilings are called for on the Drawings, the suspension system shall be an exposed T grid. Standard hangers placed 48-inches o.c. in both directions. Exposed metal parts finished with white baked enamel. Suspension system hung in a true plane with a grid pattern of 2-feet x 4-feet unless otherwise noted.

C. Tegular edge boards that are cut to fit less than full size ceiling grid modules shall have a matching tegular edge routed into the cut edge. Paint the routed tegular edge with paint type and color to match the factory finish.

3.2 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections and prepare test reports.

B. Tests and Inspections: Testing and inspecting of completed installations of acoustical panel ceiling hangers and anchors and fasteners shall take place in successive stages, in areas of extent and using methods as follows. Do not proceed with installations of acoustical ceiling hangers for the next area until test results for previously completed installations of acoustical ceiling hangers show compliance with requirements.

C. Extent of Each Test Area: When installation of ceiling suspension systems on each floor has reached 20 percent completion but no panels have been installed.

1. Within each test area, testing agency will select 1 of every 10 power-actuated fasteners and postinstalled anchors used to attach hangers to concrete and will test them for 200 lbs of tension; it will also select one of every 2 postinstalled anchors used to attach bracing wires to concrete and will test them for 440 lbs of tension.

2. When testing discovers fasteners and anchors that do not comply with requirements, testing agency will test those anchors not previously tested until 20 pass consecutively and then will resume initial testing frequency.

3. Remove and replace acoustical ceiling hangers and anchors and fasteners that do not pass tests and inspections and retest as specified above.

3.3 COMPLETION

A. Adjusting Defective Work: Adjust grid height as required to maintain ceiling system leveled to within 1/8-inch in 12-feet. Remove and replace panels and tiles which are improperly placed, broken, or damaged. Adjust perimeter molding where gaps between molding and vertical surface exceeds 1/8-inch. Adjust suspension system grid to form flush hairline joints.

3.4 CLEANING

A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION

RESILIENT FLOORING

PART 1 GENERAL

1.1 SUMMARY

A. Furnish all labor, material, equipment, and services required to install resilient sheet flooring, self-coved base, rubber base and all miscellaneous accessories. Prepare existing floors by removing all excess material by grinding or scrapping as required to receive new finish materials. Float all floors with self-leveling epoxy coating as required to ensure a smooth and level application.

B. Coordinate with section 03 30 00 – “Cast in Place Concrete” for concrete infill, repair, and leveling.

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM).

1.3 SUBMITTALS

A. Submit the following in accordance with Division 1 Section "Shop Drawings, Product Data, Samples."

B. Sample of color and pattern of resilient flooring product. Do not start work until samples of material have been approved.

1.4 QUALITY ASSURANCE

A. Conform to resilient flooring manufacturer's installation instructions.

B. Installer Qualifications: Engage an installer with commercial experienced in Rubber Flooring installation and is certified by the manufacturer as an approved installer.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver finish materials to job site only when satisfactory conditions for storage can be provided. Maintain in manufacturer's unbroken packages with original labels thereon.

1.6 PROJECT CONDITIONS

A. Do not begin installation until the work of all other trades including painting has been completed and the temperature of the rooms maintained at 70°F at least 48 hours before work proceeds.

B. Employ the services of an Independent Testing Laboratory (ITL) for testing the moisture content of suspended concrete slabs. Cooperate with the Testing Laboratory by providing the required environmental conditions for moisture testing.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Installer experience in performing work of this section who has specialized in installation of work similar to that required for this project.
   1. Training: Installers who have attended an Altro Installation Clinic or has successfully installed Altro in three previous kitchens.
   2. Awarded flooring contractor must use in-house installers.
   3. Awarded flooring contractor must be able to provide recent Altro references with contacts.

B. Regulatory Requirements: Provide slip resistant sheet vinyl safety flooring in compliance with the following:
   1. Americans with Disabilities Act Architectural Guidelines (ADAAG)
   2. Occupational Safety and Health Administration (OSHA).

C. Mock-Ups: Install at project site a job mock-up using acceptable products and manufacturer approved installation methods, including concrete substrate testing.
   1. Maintenance: Maintain mock-up during construction for workmanship comparison; remove and legally dispose of mock-up when no longer required.
   2. Incorporation: Mock-up may be included into final construction upon Owner’s approval.

D. Pre-Installation Meeting: Convene a pre-installation meeting to verify project requirements, substrate conditions, manufacturer’s installation instructions, manufacturer’s warranty requirements, and installer qualifications.

E. Bond Test: Install multiple bond tests using a 3’x3’ pieces of material adhered with the appropriate adhesive to verify quality of adhesion. Remove half of each piece after 24 hours, then the other half after 48 hours. To help assess resistance to indentation, place end user equipment onto a sample for 72 hours. Document all results.

1.8 WARRANTY

A. Provide manufacturer's standard warranty for each resilient flooring type.

1.9 MAINTENANCE

A. Extra Materials: Furnish the following quantities to the Owner at completino:

   1. One (1) box of rubber base.

   2. One (1) roll of Resilient Sheet Flooring.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Product manufacturers are listed below.

B. Other Manufacturers: Submit Substitution Requests prior to bid date in accordance with Division 1 Section "Product Substitution Procedures."

2.2 MATERIALS

A. RF-1, Resilient Sheet Flooring:

1. Manufacturer: Altro Classic 25, Color: Pewter Grey, Product #X2539R11.

2. Wear Layer/Overall Thickness: 2.5mm, with non-directional pattern and slip retardant particulate suspended evenly throughout the product thickness.

3. Roll/Sheet Width: 6 feet 7 inches.

4. Backing: Non-woven polyester/cellulose, glass fiber reinforcement.

5. LRV: 26

6. Mastic: A1M81

7. Weld Rod: WR81

B. RFB-1, Resilient Sheet Flooring Self-Coved Base:

1. Altro 6-inch self-coved base system with cover former.

2. C4 cap strip at walls to receive FRP paneling above. Provide sanitary sealant at joint as required.

3. C7 cap strip at wall to be painted. Provide sanitary sealant at joint as required.

C. RB-1, Rubber Base:

1. ASTM F1861 Type TS, Group 1, thermoset vulcanized SBR rubber, continuous roll, 1/8-inch gauge, 4-inch top-set, coved toe at hard floor finishes, straight base at carpet.

2. Manufacturers: Flexco, Wallflowers Premium Wall Base, or approved equal.

3. Colors: 014 Medium Gray, 4-inch tall. Coved base at non-carpet floors, straight base at carpeted floors.

D. RB-2, Rubber Base:

1. ASTM F1861 Type TS, Group 1, thermoset vulcanized SBR rubber, continuous roll, 1/8-inch gauge, 4-inch top-set, coved toe at hard floor finishes, straight base at carpet.

2. Manufacturers: Flexco, Wallflowers Premium Wall Base, or approved equal.

3. Color: Match existing. Field verify.

E. Vinyl Reducing Strip:

1. Size: 1-inch wide x 3/8” thick.

2. Manufacturers: Flexco, 158 Carpet Edge Reducer, or approved equal.

3. Color: 014 Medium Gray.

F. Adhesives: Refer to product manufacturer's recommendations for appropriate low VOC adhesive. Use only adhesives approved by resilient flooring manufacturer.

G. Mastic Underlayment and Patching Compound:

1. Latex underlayment.

2. Manufacturers:

a. Armstrong "S-760."

b. Webtex "60."

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates, with installer present, for compliance with requirements for installation tolerances, moisture content, and other conditions affecting performance.

B. Comply with manufacturer’s requirements for project conditions including the following:

1. Maintain ambient temperatures of 68 deg F (18 deg C) and 80 deg F (26 deg C) in spaces to receive resilient products for 72 hours before installation, during installation and 24 hours after installation.
2. Maintain the ambient relative humidity between 40 percent and 60 percent during installation.
3. Allow sufficient time for proper preparation, installation and cuing.
4. Close spaces to traffic during resilient flooring installation until the installer is satisfied the adhesive has set.
5. Verify permanent HVAC is operational. If temporary heat is required, use electric or indirect heat sources. Do not use kerosene or propane in direct contact with the ambient air.
6. Verify other finishing operations, including painting, have been completed.

7. Where demountable partitions and other items are indicated for installation on top of sheet resilient flooring material, install flooring material before these items are to be installed.
8. Coordinate with plumbing subcontractor that approved surface membrane clamping drainage connections will be used, including but not limited to, surface clamping round drains, surface clamping trench drains, surface clamping floor sinks, surface clamping grease traps, or use of Altro Gulley Angle/Edge, or employment of Altro's Modified Surface Clamping Drain System.
9. Conform to all pertinent ASTM, ACI and Altro Standards listed in, but not limited to, this specification.

3.2 PREPARATION

A. Prepare substrates according to manufacturer's written recommendations to ensure adhesion of resilient products.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
2. Remove substrate paint, coatings and other substances that are incompatible with adhesives or contain soap, wax, oil, solvents, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
3. Mechanically remove contamination on the substrate that may cause damage to the resilient flooring material. Permanent and non-permanent markers, pens, crayons, and paint shall not be used to write on the back of the flooring material or used to mark the substrate as they could bleed through and stain the flooring material.
4. If chemical adhesive removal is used, comply with regulations of authorities having jurisdiction. If hazardous materials in existing conditions are present or suspected, notify the Owner in writing and stop work in that area until notified by Owner of actions to be taken.

B. Concrete Substrates: Prepare according to ASTM F710 except for:

1. Moisture testing paid for by the Owner if required

2. Removal of curing compounds and hardeners used to reduce moisture emission;

3.3 INSTALLATION

A. Vinyl Reducing Strip: Install edge reducing strip at all exposed edges of resilient flooring in doorways or borders of resilient flooring and other floor finish, except not required where carpet binder bar is provided, or at metal thresholds.

B. Base:

1. Install top-set base on floor covering with corners neatly fitted.

2. Install straight base at carpets and coved base at hard floor finishes.

3. Inside corners mitered and outside corners formed from continuous roll extending at least 12-inches beyond corner and installed with contact cement. Install molded corners at vent base.

4. Install base on cabinets where scheduled.

5. Where wall finish opening at floor is over 1/4-inch, do not install base until gap in substrate has been reduced to 1/4-inch or less with appropriate filler material.

6. Cut coved toe back at 45 degree angle at door frame terminations.

C. Resilient Sheet Flooring: Install Altro Classic 25 in accordance with manufacturer requirements and recommendations. Use installation method suitable for substrate and project conditions.

1. Proceeding with the installation means the installer's acceptance that substrates are acceptable for installation of resilient flooring.
2. Install with Altro adhesive specified for the site conditions.
3. Install rolls in sequential order following roll numbers on the labels.
4. Do not reverse sheets unless instructed otherwise by manufacturer's technical representative.
5. Immediately place the flooring into the wet adhesive. Roll spread adhesive with acceptable nap paint roller before setting flooring into adhesive.
6. Roll the flooring in both directions using a 100-150 lb 3 section roller.
7. Heat-weld all seams, vertical and horizontal. Allow 12 hours cure time before heat-welding.
8. When flash-coving, use manufacturer's recommended accessories for cove former, cap, edging and other details.

3.4 CLEANING AND SEALING

A. When floors have sufficiently seated themselves to permit cleaning and other trades have completed their work, vacuum, sweep and damp mop the floors.

B. Comply with manufacturer's written instructions for cleaning and protection of resilient products. Perform the following operations immediately after completing resilient product installation:

1. Remove adhesive and other blemishes from exposed surfaces.
2. Sweep and vacuum surfaces thoroughly.
3. Damp-mop surfaces to remove marks and soil.

C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

1. Never use tapes on the surface on the finish flooring
2. Never use Sharpies, pens, crayons or construction markers on either the finish flooring or the substrate.
3. No traffic for 24 hours after installation, unless approved by Altro technical.
4. No heavy traffic, rolling loads, or furniture placement for 72 hours after installation.

D. Wait 72 hours after installation before performing initial cleaning. Start a regular maintenance program after the initial cleaning as recommended by manufacturer.

E. Demonstration: Provide instruction for Owner's maintenance personnel on proper procedures of maintaining wood flooring.

END OF SECTION

FIBERGLASS REINFORCED PLASTIC SHEET WALL COVERINGS

PART 1 GENERAL

1.1 SUMMARY

A. Furnish all labor, material, equipment, and services required and incidental to the installation of fiberglass reinforced sheet wall covering.

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM).

1.3 SUBMITTALS

A. Submit the following in accordance with Division 1 Section "Shop Drawings, Product Data, Samples."

B. Material samples for review and color selection of each type of panel, trim, and fastener.

1.4 QUALITY ASSURANCE

A. Applicator shall have commercial experience with manufacturer’s installation procedures and be approved by the manufacturer.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver finish materials to job site only when satisfactory conditions for storage can be provided. Maintain materials in manufacturer’s labeled and unbroken packages.

1.6 PROJECT CONDITIONS

A. Acclimate plastic sheet at least 24 hours in temperature and humidity conditions of final environment before beginning Work of this Section.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Product Manufacturers: Kemlite Co.

B. Other Approved Manufacturers: Marlite.

C. Other Manufacturers: Submit Substitution Requests prior to bid date in accordance with Division 1 Section "Product Substitution Procedures."

2.2 MATERIALS

A. FRP, Fiberglass Reinforced Plastic Panels:

1. Fiberglass reinforced plastic sheet, 0.09-inch thick.

FIBERGLASS REINFORCED PLASTIC SHEET WALL COVERINGS

2. Fire Hazard Classification: As tested per ASTM E84, UBC Class III flame-spread index, smoke-developed 450 or less per ASTM E84.

3. Product: Glasbord-P with Surfaseal.

4. Color: White.

5. Finish: Embossed.

B. Adhesive: Low VOC as recommended by plastic sheet manufacturer for laminating over gypsum board substrate.

C. Sealant: Kemlite 255 silicone sealant.

D. Moldings:

1. Material: PVC in matching color.

2. Manufacturer: Kemlite.

3. Schedule:

a. Top Edge: CP385.

b. Inside Corner: IA851.

c. Outside Corner: OA851.

d. Panel-to-Panel: DB385.

e. Bottom Edge: CP385.

f. End: CP385.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verification of Conditions:

1. Verify that all surfaces are smooth, level, clean, and free of irregularities that may be detrimental to proper application.

2. Commencement of installation denotes acceptance of substrate.

3. Do not begin installation until the work of all other trades, including painting, has been completed and the temperature of the rooms has been maintained within humidity and temperature requirements by adhesive manufacturer for at least 48 hours before commencing Work.

FIBERGLASS REINFORCED PLASTIC SHEET WALL COVERINGS

3.2 INSTALLATION

A. Apply adhesive in accordance with the recommendations of the adhesive manufacturer.

B. Handle and install wall covering in conformance with manufacturer's installation bulletin.

C. Install wall covering to provide a proper symmetrical pattern in each area, with joints straight and true, and all panel edges concealed with appropriate molding for finished appearance; joints sealed with silicone sealant.

3.3 CLEANING

A. Carefully clean all surfaces after application using recommended methods. Any stains or defects apparent after cleaning will require replacement of material.

END OF SECTION

PAINTING

PART 1 GENERAL

1.1 SUMMARY

A. Furnish all labor, material, equipment, and services necessary for and incidental to painting work. Paint all surfaces in finished room areas as scheduled and all rooms and areas shown with exposed ceilings which normally require a paint finish for proper appearance and best serviceability such as wood, gypsum board, concrete, metal work, exposed conduit, pipes and ducts, grilles, unless otherwise shown to be excluded.

B. Related Documents:

1. "Door Schedule" for door color and paint system.

2. "Finish Schedule" for room color and paint system.

3. Divisions 21, 22, 23 and 24 for painting of exposed mechanical and electrical items such as piping, equipment, ductwork, conduit etc., as required by those Divisions.

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM).

B. Architectural Woodwork Institute (AWI).

C. Master Painters Institute (MPI).

D. The Society for Protective Coatings (SSPC).

E. Painting and Decorating Contractors of America (PDCA).

1.3 DEFINITIONS

A. Regardless of the specular gloss name paint manufacturers give their products, provide specular gloss as measured on a 60° and 85° geometry Parallel-Beam Glossmeter per ASTM D523 and as defined by Master Painters Institute as follows:

1. Gloss Level 1: Traditional matte finish; flat. Gloss at 60°: Maximum 5 units. Sheen at 85°: Maximum 10 units.

2. Gloss Level 2: High side sheen flat; velvet-like finish. Gloss at 60°: Maximum 10 units. Sheen at 85°: 10 to 35 units.

3. Gloss Level 3: Traditional eggshell-like finish. Gloss at 60°: 10 to 25 units. Sheen at 85°: 10 to 35 units.

4. Gloss Level 4: Satin-like finish. Gloss at 60°: 20 to 35 units. Sheen at 85°: Minimum 35 units.

5. Gloss Level 5: Traditional semi-gloss. Gloss at 60°: 35 to 70 units.

6. Gloss Level 6: Traditional gloss. Gloss at 60°: 70 to 85 units.

7. Gloss Level 7: High gloss. Gloss at 60°: More than 85 units.

1.4 SUBMITTALS

A. Submit in accordance with requirements of Division 1 Section "Shop Drawings, Product Data, Samples."

B. Samples: Samples of mixed paint and clear coating applied to surfaces approximating job conditions with test areas painted on job if required. 12-inch x 12-inch minimum size of samples. Obtain preliminary approval of samples before doing any work on job.

C. Complete materials list indicating all materials proposed for use; show manufacturer’s name, material type and name, color name and formulation, gloss level, and location where material will be used. Revise list for changes made during construction and resubmit. Where paint provided varies from specified manufacturer’s product, submit product data for both the specified basis of design product and proposed paint product. Clearly note any variance between submitted product data and specified product data.

D. Paint manufacturer certification of compliance with the VOC and chemical component limits of Green Seal requirements.

1. Flat paint: Maximum of 50 grams/liter VOC.

2. Non-flat paints and Primers: Maximum of 150 grams/liter VOC.

E. Painting subcontractor's PDCA membership status for national, state, and local levels.

1.5 QUALITY ASSURANCE

A. Paints and coatings shall comply with the VOC and chemical component limits of Green Seal requirements.

B. Painter shall have commercial experience and be a PDCA member at national, state, and local levels.

C. Mock-ups:

1. Brush-out areas, 5-feet x 5-feet, as selected by Architect for each color and gloss level for review and prior to final color approval. After acceptance of color brush out, use that work as the reference standard to be matched by subsequent completed work.

2. One brush-out area of approximately 100 s.f. painted with the predominate wall color in a well-lit area selected by Architect. Paint 100 s.f. of primer, 70 s.f. of first finish coat and 40 s.f. of second finish coat such that the completed mock-up will have three levels of paint, i.e., primer only, primer plus one finish coat, and primer plus two finish coats.

Leave approved mock-up in place during painting as a standard of comparison to finished work. At completion of painting, repaint mock-up wall as necessary to conceal all lap marks.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Designate one location for the storage and mixing of materials. Keep location in a neat and clean condition at all times.

B. Deliver materials only when building is closed in and completed sufficiently to prevent freezing and other damage to paint products.

C. Deliver all materials to the job site in new and unopened containers, with the manufacturer’s name, brand name, batch number, color, directions for tinting, mixing and application on a printed label on every container.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Paint Manufacturers:

1. Benjamin Moore.

2. Glidden Professional (prior ICI Paints).

3. Miller.

4. PPG Pittsburgh Paints.

5. Rodda.

6. Sherwin Williams.

B. Wood Finish Manufacturer:

1. Lenmar

C. Other Manufacturers: Submit Substitution Requests prior to bid date in accordance with Division 1 Section "Product Substitution Procedures."

2.2 MATERIALS

A. Provide paint products from one or more manufacturers as required to comply with the color/gloss level/product type combinations. The gloss level of manufacturer's product numbers in this specification may not match the required gloss level specified. Adjust manufacturer's product numbers within the same quality line to match the required gloss level.

B. Enamel, Gloss Level 5, on Metal (System A):

1. Prime Coat:

a. Ferrous Metals, Galvanized Metals, and Non-ferrous Metals:

(1) First coat latex metal primer.

(2) Manufacturers: "Devoe DTM 4020 Devflex."

2. Second and Third Coats:

a. Water-based alkyd enamel, gloss level 5.

b. Manufacturers: Glidden Professional"1506 Lifemaster Oil Semi-Gloss Enamel."

C. Acrylic, Gloss Level 4, on Gypsum Board, Plaster and Concrete Surfaces (System B):

1. Prime Coat:

a. Acrylic primer.

b. Manufacturers: Glidden Professional Lifemaster"LM9116 No VOC Primer-Sealer."

2. Second and Third Coats:

a. 100% acrylic latex, gloss level 5, roller- or brush-applied, no spray permitted.

b. Manufacturers: Glidden Professional "Lifemaster 2000," LM 9200.

D. Acrylic, Gloss Level 3, on Gypsum Board, Plaster, and Concrete Surfaces (System C):

1. Prime Coat:

a. Vinyl acrylic latex primer.

b. Manufacturers: USG "Sheetrock Brand Primer Surfacer Tuff-Hide."

2. Second and Third Coats:

a. 100% acrylic latex, gloss level 3.

b. Manufacturers: Miller Paint Co. "Acro Pure Lo VOC," 1450 Series.

c. Gloss Level 10 – 25 @ 60.

E. Acrylic, Gloss Level 2, on Gypsum Board, Plaster, and Concrete Surfaces (System D):

1. Prime Coat:

a. Vinyl acrylic latex primer.

b. Manufacturers: USG "Sheetrock Brand Primer Surfacer Tuff-Hide."

2. Second and Third Coats:

a. 100% acrylic latex, gloss level 5.

b. Manufacturers: Glidden Professional "Lifemaster No VOC ," LM 9200.

c. Gloss Level 10 – 35 @ 60.

PART 3 EXECUTION

3.1 PROTECTION

A. Protection of Surfaces and Cleaning: Protect floors and other adjoining surfaces from paint droppings and spillage of materials.

3.2 SURFACE PREPARATION

A. General:

1. Carefully examine all surfaces over which finish is to be applied. Any surface not suitable for the proper finish which cannot be rectified by light sanding, cleaning, etc., must be brought to the attention of the Architect before any materials are applied. Do not proceed with the work until such conditions have been rectified. Beginning work denotes acceptance of substrates.

2. All surfaces shall be thoroughly dry before any finish is applied and application shall not be done in severely cold weather except under instructions from the Architect.

B. Finish Wood:

1. Properly sand wood surfaces before any sealer is applied. Knots or sappy places shall be given one coat of shellac at least twelve hours before being painted. Use putty or wood filler of the same shade as the finish coat in filling nail holes, checks, and other blemishes, then lightly sand smooth as soon as filler has hardened.

2. Moisture content of wood should be no higher than 9%, free of surface contaminants, and thoroughly sanded.

C. Metal:

1. All metal installation shall be made complete and ready for painting. Touch-up shop or prime coats that have been damaged with material of the same type and quality as originally used on the shop coat. Thoroughly remove all rust previous to this priming operation.

2. Prepare substrate and apply coatings in strict adherence with coating manufacturer's instructions.

D. Gypsum Board Surfaces: Paint shall not be applied to any surface until it is thoroughly dry and cured. Prime surfaces that show hot spots or alkali in order to prevent such blemishes from showing through the paint. Brush off all loose particles or crystals which may have formed.

E. Existing Painted Surfaces: Prepare by sanding or other procedures necessary prior to application of new paint. Primer only required on surfaces of bare substrate unless needed for adhesion to painted substrate. Verify compatibility of new and old paint prior to application.

3.3 APPLICATION

A. Employ workers that have commercial experience and be skilled in the application of paint products specified.

B. When paint mixing is required on the job, perform mixing on the premises immediately before applying, and thoroughly stir and strain all materials. Do not change or reduce any material in any way except as specified by paint manufacturer.

C. Except where method of application is specifically noted, all materials shall be applied by brush or roller. Application by spray only where approved by the Architect. All spray application shall be by airless method only.

D. Coverage and Workmanship:

1. Assume all responsibility for paint coats applied over surfaces and undercoats which have not been inspected and approved by Owner and Architect. Apply any additional coats of paint, as directed by Owner and Architect, where surface preparation and undercoats have not been approved before painting. Make finished work match approved samples.

2. The visible parts of the structure behind grilles and louvers are to be painted with flat black enamel.

E. Drying: Apply paints to surfaces at atmospheric temperatures of not less than 50°F and maintain this minimum temperature throughout the drying time. Ensure adequate ventilation in all painted spaces. Allow sufficient time to elapse as recommended by the manufacturer, between successive coats, to permit proper drying. Modify as necessary to suit adverse weather conditions.

F. Substrates/Finishes:

1. Metal: All exposed metal items including metal door frames and miscellaneous steel, plumbing vents, mechanical equipment, ducts, grilles and louvers, pipe and electrical conduits are to receive a total of three coats of material, as specified above. Shop coat to be considered one coat; touch-up as required.

2. Metal Enamel: All surfaces are to receive three coats (total including prime coat) of materials as specified above. All exposed interior metal, including but not limited to,

door frames, electrical plaster rings, grilles, registers, conduit, pipe, mechanical ducts, etc., in finished room areas are to be painted as called for above.

3. Gypsum Board: All surfaces shall receive three coats of material, as specified above, including walls behind acoustical panels and other surface applied accessories. Remove dust from surfaces, clean off or seal all stains and marks which may show or bleed through finishes.

4. Wood Clear Coating: For all architectural woodwork, paneling, trim, wood doors and other wood surfaces where scheduled, follow manufacturer's recommendations for surface preparation and industry practices to ensure an adequately prepared substrate that is free of defects and surface blemishes.

3.4 COLOR SCHEDULE

See Finish Schedule and Legend on the drawings.

END OF SECTION

CORNER GUARDS

PART 1 GENERAL

1.1 SUMMARY

A. Furnish all labor, material, equipment, and services necessary for the installation of corner guards.

1.2 SUBMITTALS

A. Submit the following in accordance with Division 1 Section "Submittal Procedures."

B. Shop drawings and manufacturer's product data.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Product manufacturers are listed below.

B. Other Manufacturers: Submit Substitution Requests prior to bid date in accordance with Division 1 Section "Product Requirements."

2.2 MATERIALS

A. Corner Guards:

1. Cement-on type, 16 gauge, Type 304 stainless steel, No. 4 satin finish, length floor-to-ceiling, including required cement and application spatula, profile as required for corner condition.

2. Wing Sizes:

a. CG-1: 4-inches x 4-inches.

b. CG-2: 2-inches x 2-inches,

3. Corner Radius: 1/8-inch.

4. Manufacturers:

a. Cape Cod Systems Company.

b. ARDEN Architectural Specialties, Inc.

c. American Floor Products Co., Inc.

d. Balco,Inc.

e. Construction Specialties, Inc.

f. IPC Door and Wall Protection Systems; Division of InPro Corp.

g. Pawling Corporation.

h. Architectural Specialties, Inc.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions and recommendations.

B. Clean the corner of wall of loose particles and dust. Apply plastic cement to the back of corner guards and place on the corner, pressing firmly in place. Remove excess cement at edges and allow to dry for 24 hours.

END OF SECTION

FIRE PROTECTION SPECIALTIES

PART 1 GENERAL

1.1 SUMMARY

A. Furnish all labor, material, and equipment required for the installation of fire extinguishers and cabinets.

1.2 SUBMITTALS

A. Submit the following in accordance with Division 1 Section "Submittal Procedures."

B. Shop drawings.

C. Manufacturer’s product information.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Product Manufacturers:

1. J.L. Industries, div. of J.N. Johnson Co.

2. Larsen’s Manufacturing Company.

B. Other Manufacturers: Submit Substitution Requests prior to bid date in accordance with Division 1 Section "Product Substitution Procedures"

2.2 MATERIALS

A. Cabinets:

1. (N) FEC: Provide J.L. Industries/Activar "Cosmopolitan Series Model 1035V10" fully recessed cabinet with Vertical Acrylic Window (Vertical Duo glazing) and Flat Trim.

2. Door Style & Trim: J.L. Industries Stainless Steel Door with Vertical Acrylic Window (Vertical Duo glazing) and Flat Trim.

B. Fire Extinguishers: UL rated 4A-60BC, Amerex "Cosmic 10E," or Ansul "Sentry A10T," steel shell, 5-inch cylinder diameter, provide one in each new cabinet and one on each wall hanger as located on the plans (1 cabinet location and 2 wall mount locations).

C. Verify fire extinguisher type and size requirements with local Fire Marshall and/or building official per the current Fire Code.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install cabinets in accordance with manufacturer's instructions. Refer to Drawings for wall construction and thickness for verification of requirements of semi-recessed cabinets and hardware and fasteners for installation. Set cabinets neatly and securely in place, plumb and true to building lines.

B. At recessed and semi-recessed wall locations where a fire rating is required, ensure that the wall membrane is continuous.

END OF SECTION

FOOD SERVICE EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES: FOOD SERVICE EQUIPMENT

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 0 and Division 1 Specification Sections, apply to this Section.

1.2 RELATED WORK

A. Rough-ins and Final Connections: Service lines from rough-in to point of final connections are provided by plumbing and electrical contractors.

B. Electrical: Wiring, conduit, fuses, breakers, final disconnects, junction boxes, and other required electrical apparatus not built-in or mounted on equipment are provided by electrical contractor.

C. Plumbing: Controls, regulators, valves, stops, traps, strainers, checks, grease traps, and fittings not mounted on/in equipment are provided by plumbing contractor.

D. Mechanical: Ductwork from above finished ceiling to building exhaust and supply fans, flue pipes, exhaust and supply fans for hoods, room ventilation, and air supply blowers are provided by mechanical contractor.

E. Miscellaneous

1. Provides backing plates or blocking in wall or ceiling partitions.

2. Provides fittings secured to structural ceiling to accommodate hangers.

3. Provides the forming of architectural enclosures, floor, wall openings or recesses for equipment.

4. Caulks and seals Cold Storage Room floor sections to building floor.

5. Finishes floors (masonry or poured-in-place) in cold storage rooms, concrete curbs and pads.

1.3 SYSTEM DESCRIPTION

A. Delegated Design: Design canopy hoods with fire protection system, walk-in cold storage rooms, and seismic restraint of equipment using performance requirements and design criteria indicated, including comprehensive engineering analysis by a qualified professional engineer licensed by the State.

B. Fabricated Equipment: Constructed to configuration, dimension, detail, and design as shown with materials and workmanship as specified.

C. Manufactured Equipment: Mass produced and referenced by manufacturer’s name and model number.

D. Each model number includes the code *H011 as a suffix. This code is known as the Specified Identification System. It is not to be removed by the bidders. Its purpose is to identify the Food Service Consultant to the vendors providing equipment in the event it is necessary to communicate questions, clarifications, and comments, from prior to bid award through the final purchase. It is to be used on all correspondence, including fax and e-mail, when communicating with manufacturer representatives and factories.

1.4 DEFINITIONS

A. Furnish - Supply and deliver to Project Site, ready for unloading, unpacking, assembly, installation, and similar operations.

B. Install (set in place) - Work at Project Site, including actual unloading, unpacking, assembly, erecting, rigging, placing, anchoring, applying, finishing, curing, protecting, cleaning, and similar operations, ready for final utility connections by other Sections as appropriate.

C. Coordinate – Relay required information requested by other trades to ensure they are able to correctly perform their work related to the food service or laundry equipment installation.

D. Provide - Furnish and install complete, ready for intended use.

E. Kitchen Equipment Contractor (KEC) - All references to the Contractor in this Section 114000 shall refer to the Kitchen Equipment Contractor (KEC). Reference to any other Contractor shall be specific, such as General Contractor, Plumbing Contractor, Electrical Contractor, Architect, designated, etc.

1.5 LAWS, ORDINANCES AND STANDARDS

A. STANDARDS: Except as otherwise indicated, comply with the following standards as applicable to the manufacture, fabrication, and installation of the work of this Section:

1. Air Conditioning and Refrigeration Institute (ARI): Comply with the applicable regulations and references of the latest edition of standards for remote refrigeration system(s), components, and installation.

2. American Gas Association (AGA): Comply with AGA standards for gas heated equipment and provide equipment with the AGA seal. Automatic safety pilots shall be provided on all equipment, where available. (Canadian Gas Association or alternate testing lab's seals may be accepted if acceptable to local code jurisdictions.)

3. American National Standards Institute (ANSI): Comply with ANSI Z21-Series standards for gas-burning equipment and provide labels indicating name of testing agency.

4. American National Standards Institute (ANSI): Comply with ANSI B57.1 for compressed gas cylinder connections and with applicable standards of the Compressed Gas Association for compressed gas piping.

5. American National Standards Institute (ANSI): Comply with ANSI A40.4 and A40.6 for water connection air gaps and vacuum breakers.

6. American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE): Comply with the applicable regulations and the latest edition of standards for remote refrigeration system(s), components, and installation.

7. American Society of Mechanical Engineers (ASME): Comply with ASME Boiler Code requirements for steam generating and steam heated equipment and provide ASME inspection, stamp, and registration with National Board.

8. American Society for Testing and Materials (ASTM): Comply with ASTM C1036 for flat glass.

9. American Society for Testing and Materials (ASTM): Comply with ASTM C1048 for heat-treated flat glass – Kind HS, Kind FT coated and uncoated glass.

10. American Welding Society (AWS): Comply with AWS D1.1 structural welding code.

11. National Electric Code (NEC): Comply with NFPA Volume 5 for electrical wiring and devices included with food service equipment, ANSI C2 and C73, and applicable NEMA and NECA standards.

12. National Electrical Manufacturers Association (NEMA): Comply with NEMA LD3 for high-pressure decorative laminates.

13. National Fire Protection Association (NFPA): Comply with the applicable sections of the NFPA for exhaust hood, ventilators, duct and fan materials, hoods fire suppression systems, construction and installation, as well as local codes and standards.

14. National Sanitation Foundation (NSF): Comply with the latest Standards and Revisions established by NSF for equipment and installation. Provide NSF Seal of Approval on each applicable manufactured item and on items of custom fabricated work. (UL Sanitation approval and seal may be accepted if acceptable to local code jurisdictions.)

15. Sheet Metal and Air Conditioning Kitchen Equipment Contractor (KEC)'s National Association (SMACNA): Comply with the latest edition of SMACNA guidelines for seismic restraint of kitchen equipment and applicable local regulatory agencies requirements.

16. Underwriters Laboratories (UL): Provide either UL labeled products for electrical components and assemblies or, where no labeling service is available, "recognized markings" to indicate listing in the UL "Recognized Component Index." (Canadian Standards Association or alternate testing lab's seals may be accepted if acceptable to local code jurisdictions.)

17. UL 300 Standard: Wet chemical fire suppression systems for exhaust hoods/ventilators shall comply with these requirements.

18. American with Disabilities Act (ADA): Comply with requirements as applicable to this Project.

19. Refrigeration Service Engineers Society (RSES): Comply with the applicable regulations, the latest edition of standards for remote refrigeration system(s), components and installation, and the 1995 requirements of the Montreal Protocol Agreement.

20. All refrigerants used for any purpose shall comply with the 1995 requirements of the Montreal Protocol Agreement and subsequent revisions and amendments. No CFC refrigerants shall be allowed on this Project.

21. All refrigeration components installation, repairs, and/or associated work on any refrigeration system, self-contained or remote, shall be performed by a Certified Refrigeration Mechanic.

22. Comply with all applicable local codes, standards and regulations, and any special local conditions (example only: City of Los Angeles Testing Lab requirements or seismic standards compliance).

23. Jails, prisons, and all detention facilities shall comply with Correctional Standards as applicable to the specific Project. Verify the level of security and construction required with the Project Architect and provide all items in compliance. As a minimum, no part or component of any item provided shall be easily removable and used as a weapon.

24. Subway grating installed in floor drain troughs must meet IBC 1104.3.1 standards for maximum opening sizes in grates.

25. Confirm all drawings, specifications, and project documentation meet all federal, state, and local codes and regulations.

1.6 KITCHEN EQUIPMENT CONTRACTOR (KEC) QUALIFICATIONS

A. In addition to requirements of Related Sections 1.2, submit evidence of compliance with the following qualifications and conditions:

1. Five (5) years minimum continuous operation under the same company name and ownership.

2. Evidence of Company's financial stability and financial ability to complete this Project without endangering that stability.

3. List a minimum of comparable size and scope projects completed in the last five (5) years with Owner's contact name and telephone number.

4. Have manufacturer's authorization to purchase, distribute, and install all items specified with this Project.

5. Maintain a staff or have access to personnel with a minimum of five (5) years experience in the installation of comparable size and scope projects, and meeting NSF standards and requirements. (UL Sanitation standards and requirements may be accepted if acceptable to local code jurisdictions.)

6. Maintain or have access to a fabrication shop meeting NSF standards and labeling requirements. (UL Sanitation approval and seal may be accepted if acceptable to local code jurisdictions.) If other than the Kitchen Equipment Contractor (KEC)'s own fabrication shop, they shall have five (5) years minimum experience in the fabrication of comparable size, scope, and level of quality projects. The Kitchen Equipment Contractor (KEC) shall submit their company name and credentials to the Architect, who shall have the right of approval or disapproval

7. Maintain a staff or have access to personnel experienced in the preparation of professional style shop drawings and submittals.

8. Maintain or have access to manufacturer's authorized service personnel together with readily available stock of repair and replacement parts.

9. Any sub-Kitchen Equipment Contractor (KEC) employed by Kitchen Equipment Contractor (KEC) for this Project shall comply with the same qualification requirements.

1.7 SUBSTITUTIONS

A. Refer to Division 1 for Substitution Request requirements.

1.8 APPROVED SUBSTITUTIONS AND/OR LISTED ALTERNATES

A. Substitutions approved as noted in article 1.07 and/or any Listed Alternate Manufacturers listed in these Itemized Specifications or added by Addendum may be utilized in lieu of the primary specified manufacturer with the following conditions and understanding:

1. The Project Documents are designed and engineered using the primary specified manufacturer and model. The Kitchen Equipment Contractor (KEC) shall assume total responsibility for any deviations required due to the utilization of a substitution/alternate manufacturer or model including, but not limited to, fitting alternates into the available space, providing directions for required changes, and assuming any and all associated costs for utility, building, food service design, architectural, or engineering changes directly or indirectly related to the substitution.

2. The Kitchen Equipment Contractor (KEC) shall be responsible for supplying the model, which is equal to the primary specified model in regards to general function, features, options, sizes, accessories, utility requirements, finish, operation, and listing approvals. If the Owner or their appointed representative determines at any time during the construction and installation, prior to the final acceptance of the Project, that the substitution/alternate model submitted is not equal to the primary specified model, the Kitchen Equipment Contractor (KEC) shall assume all associated cost and implications required to replace the model submitted with the correct model.

3. The bid proposal shall clearly state any substitutions/alternates which will be utilized, including the manufacturer and model number. The proposal shall also include a data sheet for each substitution/alternate with any and all deviations between the primary specified manufacturer and the substitution/alternate manufacturer itemized and listed on the data sheet. The manufacturers' cut sheets are not acceptable as a substitute for the data sheet. Complex alternates, such as utility distribution systems, exhaust hoods, ventilators, etc., shall include a shop drawing specific to the Project.

4. Inclusion of an alternate manufacturer in the Itemized Specifications is not intended to indicate that there is an equal alternate unit to match every primary specified unit. It shall be the responsibility of the Kitchen Equipment Contractor (KEC) to insure that the alternate unit submitted matches the primary specified unit and meets the other conditions, as stated above.

5. Manufacturers not approved as substitutions or listed as a Listed Alternate will not be permitted unless submitted for prior approval, as described above and in the General and Supplementary Conditions and applicable Division-1 Specifications Sections.

6. Submittal of a substitution/alternate manufacturer or model shall indicate agreement to the above stated conditions. Solely at the Owner's discretion, failure to comply with any of these conditions or to supply complete and correct data information shall result in the Kitchen Equipment Contractor (KEC) being required to provide the primary specified manufacturer at no additional cost to the Owner or to adjust the Contract cost.

1.9 DISCREPANCIES

A. Where discrepancies are discovered between the drawings and the specifications regarding quality or quantity, the higher quality or the greater quantity shall be included in the Bid Proposal. The Kitchen Equipment Contractor (KEC) shall notify the Architect, in writing, of any discrepancies discovered and await clarification prior to proceeding with the items or areas in question.

1.10 SUBMITTALS

A. The Kitchen Equipment Contractor (KEC) shall review all submittals for basic compliance with the Contract Documents and correct as required prior to submitting to the Design Team (Architects/Engineers/ Consultants/Owner) for review. Failure to comply with this requirement, the submission of submittal(s) which are significantly inconsistent with the Contract Documents, or inconsistencies that are discovered during review by a Design Team member shall be justification for reimbursement by the Kitchen Equipment Contractor (KEC) to the Design Team member's company for the "lost" time or for the time required for a second review.

B. Rough-In Drawings

1. Submit electronic PDF file for approval. After approval, reproduce and supply the required number of distribution prints for record and construction purposes.

2. Submit 1/4 inch (1:50) scale rough-in drawings for approval. These drawings shall be dimensioned from grid lines showing location of ducts, stubs, floor and wall sleeves for ventilation, plumbing, steam, electrical, refrigeration lines, beverage lines, concrete base and curb dimensions as required for equipment so supported.

3. Site-verify mechanical, electrical and ventilating rough-in and sleeve locations.

4. The Kitchen Equipment Contractor (KEC) shall be responsible for the accuracy of the information on their submittals.

5. In the event rough-ins have been accomplished before the award of this contract, the Kitchen Equipment Contractor (KEC) shall check the existing facility and make adjustments to their equipment to suit building conditions and utilities, where possible. If not possible, the Kitchen Equipment Contractor (KEC) shall so state in a letter to the Owner and Architect with reasons and an alternate method and pricing.

C. Shop Drawings

1. Submit electronic PDF file for approval. After approval, reproduce and supply the required number of distribution prints for record and construction purposes.

2. Submit shop drawings for items of custom fabrication included in this contract. Shop drawings shall be submitted at 3/4 inch (1:20) and/or 1-1/2 inch (1:10) scale and shall show dimensions, materials, details of construction, features and options, installation and relation of adjoining work requiring cutting or close fitting. Shop drawings shall also indicate reinforcements, anchorage and related work required for the complete installation of fixtures.

3. Before proceeding with the fabrication of any item, the Kitchen Equipment Contractor (KEC) shall be responsible for verifying and coordinating all dimensions and details with site dimensions and conditions.

D. Product Data Submittal Manuals

1. Submit electronic PDF file of Product Data Submittal Manuals with a cover sheet and detailed information on every item included in this Section for approval. Detailed information shall include, but not be limited to, item number, description, quantity, model numbers, options and accessories provided, exact utility requirements, manufacturer's cut-sheets, reference to specific shop drawings, etc. Distribute one additional copy of installation and start-up instructions to the Installer. Mark each data sheet with the applicable project equipment item number. Each data sheet shall include NEMA plug and receptacle configuration for applicable items, where applicable. Every cover sheet and associated detailed submittal shall provide sufficient and complete information to verify that the Kitchen Equipment Contractor (KEC) is providing each item in compliance with the Contract documents.

2. Architect review of drawings, shop details, product data brochures, and service and parts manuals is for general conformance with the design concept and contract documents. Markings or comments shall not be construed as relieving the Kitchen Equipment Contractor (KEC) from compliance with the contract documents or departures there from. The Kitchen Equipment Contractor (KEC) remains responsible for details and accuracy, for confirming and correlating all quantities and dimensions, for selecting fabrication processes, for techniques of assembly, and for performing their work in a safe, satisfactory, and professional manner.

1.11 OPERATION AND MAINTENANCE DATA MANUALS

A. Operation And Maintenance Manuals (Service And Parts Manuals): Three (3) bound sets of manuals shall be furnished for items of standard manufacture on/or before the date of the first event to occur of the following: demo/start-up, start-up for intended use by the Owner/Operator, completion of installation of kitchen equipment contract package, or final acceptance of installation by Owner. Manuals shall be in alphabetical order according to manufacturer, including item numbers and utility options provided for the equipment installed.

1. Installing company’s name, address, telephone number, and date of completed installation.

2. Serial numbers of principal pieces of equipment.

3. Part numbers of all replaceable items.

4. Lubrication data and belt sizes.

5. Electrical characteristics including data for motors and heaters.

B. Service Agency List: Submit a complete list of local service agencies with the service and parts manuals for included manufacturers, complete with telephone numbers for all buy-out equipment installed.

C. Provide video tapes for maintenance, training, operation, etc. where available from the manufacturer.

1.12 AS-BUILT/RECORD DOCUMENTS

A. Maintain one record set of Food service Equipment Plans with any related corrections, revisions, additions, deletions, changes, etc. noted during construction and installation. Provide an "as-built" set in reproducible transparency form and electronic computer disk form.

B. Provide one (1) final set of Product Data Submittal Manuals with any related corrections, revisions, additions, deletions, changes, etc. noted during construction and installation as a specifications record set.

C. These documents shall be provided on/or before the date of the first event to occur of the following: demo/start-up, start-up for intended use by the Owner/Operator, completion of installation of kitchen equipment contract package, or final acceptance of installation by Owner.

D. Provide two (2) final complete set of Submittals to be retained by Architect as a Record Set.

1.13 SCHEDULE

A. General: Time is of the essence in this agreement. Acceptance constitutes a guarantee that the Kitchen Equipment Contractor (KEC) can and will obtain materials, equipment, and manpower to permit overall completion of the entire building project on schedule upon notice to proceed. The Kitchen Equipment Contractor (KEC) shall coordinate their work with the progress schedule, as prepared and updated periodically by the General Kitchen Equipment Contractor (KEC) or Construction Manager.

B. The Kitchen Equipment Contractor (KEC) shall notify the Food service Consultant and the Architect in writing of anticipated delays not within the realm of control of the Kitchen Equipment Contractor (KEC) immediately upon the Kitchen Equipment Contractor (KEC)'s realization that delays are imminent.

C. The Kitchen Equipment Contractor (KEC) will not be granted relief for failure to meet schedules or failure of manufacturers to meet promised delivery dates unless the Kitchen Equipment Contractor (KEC) can establish, in writing, that orders were received by the manufacturer with reasonable lead times.

D. The Kitchen Equipment Contractor (KEC) shall pay extra charges resulting from special handling or air shipment in order to meet the schedule if insufficient time was allowed in placing factory orders.

1.14 PRODUCT HANDLING

A. Delivery Of Materials: Deliver materials (except bulk materials) in manufacturer's containers fully identified with manufacturer's name, trade name, type, class, grade, size, color, power requirement, if any, and item number.

B. Storage of Materials, Equipment and Fixtures: Kitchen Equipment Contractor (KEC) is responsible for receiving and warehousing of equipment and fixtures until ready for installation. The Kitchen Equipment Contractor (KEC) will store materials, equipment, and fixtures in sealed containers. They shall be stored off the ground and under cover, protected from damage.

C. Handling Materials and Equipment: The Kitchen Equipment Contractor (KEC) will verify and coordinate conditions at the building site, particularly door and/or wall openings and passages to assure access for all equipment. Pieces too bulky for existing facilities shall be hoisted or otherwise handled with apparatus as required. All special handling equipment charges shall be arranged for and paid for by the Kitchen Equipment Contractor (KEC).

1.15 PRODUCT PROTECTION

A. The Kitchen Equipment Contractor (KEC) is responsible to protect their equipment against theft or damage during the progress of the project until final acceptance by the Owner. Items delivered to the job site at the Owner's or Contract Manager's request before the site is ready for installation should be signed for as approved by the Owner or Contract Manager.

B. The Kitchen Equipment Contractor (KEC) will use all reasonable means to protect the materials of this Section before, during, and after installation and to protect the associated work and materials of the other trades.

C. Pre-fabricated walk-in boxes, on-site and installed in advance of the rest of the equipment are not to be used for general storage by other trades and should be locked before leaving the site. Damage and theft resulting from the failure to secure boxes shall be repaired or replaced at the Kitchen Equipment Contractor (KEC)'s own expense. The Kitchen Equipment Contractor (KEC) shall be available, asneeded, to open and secure walk-in boxes for the other trades to perform their work related to these walk-in boxes, within the other trades' schedules as not to delay their work.

D. Kitchen Equipment Contractor (KEC) will verify if the flooring is to be acid washed. In the event of this type of cleansing, any equipment constructed of stainless steel shall not be delivered until a minimum of 24 hours after the final cleansing is completed.

1.16 WARRANTY

A. Work shall be guaranteed against defects for one (1) year from the date of operation of the equipment. The Kitchen Equipment Contractor (KEC) will provide a written warranty of each component to include work in this Section to cover all testing and re-testing as may become necessary for one year past the Contract final acceptance date. Any equipment, system, or element failing to perform as directed in this Section shall be repaired or replaced at no cost to the Owner (including labor and transportation), excluding replacement cost of damaged components or work caused by misuse of the equipment.

B. Additional Warranty: Refrigeration systems shall include a start-up and one-year service and maintenance contract in addition to the regular one-year warranty as stated above, plus an additional four-year warranty on sealed portions of condensing units, including refrigerant lost. This shall include all refrigerators, ice cream makers and cabinets, ice makers, freezers, dispensers, walk-in coolers/freezers compressors, and/or any other items with refrigeration system(s).

PART 2 PRODUCTS

2.1 EQUIPMENT

A. Equipment schedule: Refer to schedule on Food service Drawings and Part 5 Itemized Specifications for equipment included in this Section.

2.2 MATERIALS

A. Metals

1. Stainless Steel: AISI Type 302/304, hardest workable temper, and No.4 directional polish. Standard gauges are noted in these specifications under Heading 2.04; Section B.1.

2. Galvanized Steel Sheet: ASTM A526, except ASTM A527 for extensive forming; ASTM A525, G90 zinc coating, chemical treatment.

Note: Where painted finish is indicated, provide mill phosphatized treatment in lieu of chemical treatment.

3. Steel Sheet: ASTM A569 hot-rolled carbon steel.

4. Galvanized Steel Pipe: ASTM A53 or ASTM A120, welded or seamless, schedule 40, galvanized.

5. Steel Structural Members: Hot rolled or cold formed, carbon steel unless stainless steel is indicated.

Note: Galvanized Finish (G.I.): ASTM A123 hot-dipped zinc coating, applied after fabrication.

6. Aluminum: ASTM B209B221 sheet, plate and extrusions (as indicated), alloy, temper and finish as determined by manufacture / fabricator, except 0.40-mil natural anodized finish on exposed work unless another finish is indicated.

B. Plastic Laminate: NEMA LD3, Type 2, 0.050" thick, except Type 3, 0.042" for post-forming smooth (non-textured). Color and texture as selected by the Architect/Interior Designer.

1. Comply with NSF Standard No. 35.

2. Veneered with approved waterproof and heat proof cement. Rubber base adhesives are not acceptable.

3. Applied directly over close grained plywood, such as solid Mahogany or solid Birch, of selected, smooth, sanded stock to ensure a smooth ripple-free laminated surface; or commercial grade furniture particle board, Cortron or equal.

4. If specified plywood or particle board is unavailable, submit specifications and sample of alternate material for approval. If specified for a “wet” area, only marine grade wood products will be approved for these areas.

5. Exposed faces and edges shall be faced with 1/16 inch (1 .6mm) thick material. Cover corresponding backs with approved backing and balancing sheet material. No unfinished exposed plywood/particle board will be acceptable.

C. Hardwood Work Surfaces: Laminated edge grained hard maple (Acer saccharum), NHLA First Grade with knots, holes and other blemishes culled out, kiln dried at 8 percent or less moisture, waterproof glue, machined, sanded, and finished with NSF approved oil-sealer.

D. Solid Surface Material (SSM): Unless otherwise specified, provide 1/2" thick 100% homogeneous filled acrylic material meeting ANSI Z124.6 Type 6, as manufactured by DuPont Company and known as Corian. Color(s) and pattern(s) as selected by the Architect/ Interior Designer.

1. Comply with NSF Standard No. 51.

2. Acrylic adhesive shall be used for all joints.

3. Install directly over 3/4" thick (minimum) substrate of close grained plywood, such as solid Mahogany or solid Birch, of selected, smooth, sanded stock to ensure a smooth ripple-free surface or a commercial grade furniture particle board, Cortron or equal. Provide additional bracing and support as required by the SSM manufacturer.

4. Fabrication shall be by a fabricator trained by DuPont factory authorized training personnel and Certified as a Commercial Corian Fabricator.

5. Installation shall be by an installer trained by DuPont factory authorized training personnel and Certified as a Commercial Corian Installer.

6. All fabrication and installation of Corian and all components attached to or installed in or through Corian shall be in compliance with manufacturer's instructions and the DuPont Corian Food Service Guidelines and Design Manual. Of particular concern are the sections, details, and instructions on the installation of drop-in or built-in hot or cold components.

7. All other Solid Surface Material (SSM), which may be specified by others to be used in food service areas, must comply with NSF certification and ANSI Standard No. 51.

E. Insulation

1. For low temperature applications, such as ice bins, cold pans, or fabricated under counter freezers, use urethane, rigid board foam or foamed-in-place, not less than 2 inches (50mm) thick, except that vertical surfaces of cold pans and ice bins may be 1 inch (25mm) thick. Insulation shall be bonded at joints to prevent condensation on exterior.

2. For refrigerated applications, such as fabricated undercounter refrigerators, use urethane rigid board foam or foamed-in-place, or Styrofoam rigid board foam 2 inches (50mm) thick, bonded at joints.

3. For heated type applications, such as plate warmers, use block type rock wool, minimum 1 inch (25mm) thick.

4. At counter tops, subject to heat from cooking equipment and refrigeration compressors, use 1 inch (25mm) thick B and Z Products (1-800-999-0890) Marinite I, or equal, to insulate underside of top.

5. Marinite material shall be added between freezer or refrigerator and 14 gauge (2.0) stainless steel top.

6. All insulation shall be fully encased or enclosed.

F. Joint Materials

1. Sealants: 1-part or 2-part, polyurethane or silicone based, liquid elastomeric sealant, non-solvent release type, Shore A hardness of 30, except 45 if subject to traffic. Sealants shall be NSF Listed for use in food zones. Installation shall comply with applicable requirements of NSF Standards.

2. Backer Rod: 3/8 inch or larger joints shall be polyurethane rod stock, larger than joint width.

3. Gaskets: Solid or hollow (but not cellular) neoprene or polyvinyl chloride, light grey, minimum of 40 Shore A hardness, self-adhesive or prepared for either adhesive application or mechanical anchorage.

G. Paint and Coatings

1. Provide the types of painting and coating materials which, after drying or curing, are suitable for use in conjunction with food service, durable, non-toxic, non-dusting, non-flaking, mildew resistant, and comply with governing regulations for food service.

2. Galvanize Repair Paint: MIL-P-21035.

3. Sound Deadener: NSF listed sound deaden material such as latex sound deadener for internal surfaces of metal work and underside of metal counters and tables between work top and underbracing.

4. Pretreatment: SSPC-PT2 or PT3, of FS TT-C490.

5. Primer Coating for Metal: FS TT-P-86, type suitable for baking, where indicated.

6. Enamel for Metal: Synthetic type, FA TT-P-491, type suitable for baking, where indicated.

2.3 FABRICATED PRODUCTS

A. Hardware

1. General: Manufacturer's standard, but not less than ANSI 156.9 Type 2 (Institutional), satin finish stainless steel or dull chrome finish on brass, bronze, or steel.

2. Hinged Door Hardware: Hinged doors shall be mounted with heavy duty NSF approved hinges with Component Hardware Group, Model No. P62-1010 pulls, or equal. Catches shall be heavy-duty magnetic type, except as otherwise indicated.

3. Drawer Hardware: Slides to be 200 pounds minimum capacity per pair, 300 series stainless steel, full extension, side-mounting, self-closing type, with stainless steel ball bearings and positive stops, Component Hardware Group Series S52, or equal. Pulls shall be Component Hardware Group, Model No. P62-1 012, or equal.

4. Sliding Door Hardware: Sliding doors shall be mounted on large, quiet ball bearing rollers in 14-gauge (2.0mm) stainless steel overhead tracks, and be removable without the use of tools. Bottom of cabinet shall have stainless steel guide-pins and not channel tracks for doors.

5. All hardware shall be identified with manufacturer's name and number so that broken or worn parts may be replaced.

B. Casters

1. Type and size as recommended by caster manufacturer, NSF approved for the type and weight of equipment supported, but not less than 5 inch (127mm) diameter heavy-duty, ball bearing, solid or disc wheel with non-marking grease proof rubber, neoprene or polyurethane tire, unless otherwise specified. Minimum width of tread shall be 1-3/16 inch (30mm). Minimum capacity per caster shall be 250 pound (113.4kg), unless otherwise noted in itemized specifications.

2. Provide solid material wheels with stainless steel rotating wheel guard.

3. To be sanitary, provide sealed wheel and swivel bearings and polished plated finish per NSF.

4. Unless otherwise indicated, equip each item with two (2) swivel-type casters and two (2) fixed casters. Provide foot brakes on two (2) casters on opposite front corners of equipment.

5. Unless equipment item is equipped with another form of all-around protective bumper, provide circular rotating bumper above each caster, 5 inch (127mm) diameter tire of light grey synthetic rubber (hollow or closed-cell) on cadmium-plated disc.

C. Plumbing Fittings, Trim and Accessories

1. General: Where exposed or semi-exposed, provide bright chrome plated brass or polished stainless steel units. Provide copper or brass where not exposed.

2. Vacuum Breakers: Provide with food service equipment as listed in the itemized specifications.

3. Water Outlets: At sinks and at other locations where water is supplied (by manual, automatic or remote control), furnish commercial quality faucets, valves, dispensers or fill devices of the type and size indicated and as required to operate as indicated.

4. Waste Fittings: Except as otherwise indicated, furnish 2 inch (50mm) remote-lever waste valve and 3-1/2 inch (89mm) strainer basket.

D. Electrical Materials

1. General: Provide standard materials, devices and components as recommended by the manufacturer or fabricator, selected and installed in accordance with NEMA standards and recommendations and as required for safe and efficient use and operation of the food service equipment without objectionable noise, vibration and sanitation problems.

2. Before ordering equipment, confirm pertinent electrical requirements with the serving electrical utility, such as actual voltages available, number of phases and number of wires in the system.

3. Wire electrical work for fabricated equipment completely to a junction or pull box which is wholly accessible and mounted on the equipment. Wiring shall be labeled for outlet or item served. Verify local requirements for UL Listing on complete assembly, and provide if required.

4. Components shall bear the UL label or be approved by the prevailing authority.

5. Provied Custom fabricated refrigerator units with vapor tight light receptacles, shatterproof lamps and automatic switches. Conceal wiring.

6. Controls and Signals: Provide recognized commercial grade signals, on-off push buttons or switches, and other speed and temperature controls as required for operation, complete with pilot lights and permanent signs and graphics to assist the user of each item. Provide stainless steel cover plates at control and signal electrical boxes. Locate controls and switches out of heat zones, in easily accessible locations that preclude accidental contact by employees.

7. Internal Wiring of Fixtures and Equipment

a. The Kitchen Equipment Contractor (KEC) shall be responsible for internal wiring of electrical devices built into or forming an integral part of fabricated equipment items. Wiring will be in metal conduit, connected to an accessible pull-box or j-box, and tagged for intended use. Refer to Section 16 Specifications for color coding of wiring.

b. Each standard item shipped in sections shall be properly connected internally and verified by the Kitchen Equipment Contractor (KEC).

c. Furnish dish washers and conveyors internally wired to junction box or distribution panel as specified, including push button switches, motors, immersion heaters, solenoids, etc.

d. Where light fixtures are specified or detailed as part of counters, furnish and install cases or fixtures, light fixtures, lamps and shields. Provide warm white lamps unless otherwise specified. If fluorescent light fixtures are specified, provide ballasts and include shields. Provide shields for all light fixtures.

e. Wiring for built-in strip heaters or immersion-type elements shall be provided as follows:

1) In heat zone: shall have UL approved insulation and be not less than 300-volt rated heat resistant insulation with nickel wire.

2) Connection wiring extended in raceway or conduit to junction or pull box shall be not less than 600 volt rated heat resistant insulation covered wire, UL approved, or equal.

f. Wiring for fabricated refrigerator and freezer cabinets shall be UL approved insulated cable from exterior junction box to internal components, within insulation unless code requires metallic conduit:

1) Conduit shall be Electrical Metallic Tubing, rigid or flexible (Greenfield). For freezer applications, Seal-Tite Flex or approved equal shall be used.

2) Internal wiring shall be UL approved rubber covered 600 volt rated conductor, except door heaters, which shall be Nichrome wire with silicone braided jacket, having resistance of 10.4 watts per lineal foot.

3) Mount convenience outlets, lighting receptacles, (rubber or porcelain) and door switches in approved boxes. Convenience outlets for evaporators shall be twist lock type. Solid connections, as for freezer evaporators, shall be made vapor tight.

g. Exposed flexible steel conduit on kitchen equipment shall be neoprene jacketed Seal -Tite conduit equal to Anaconda type "UA." UL approved, complete with approved liquid tight connectors on each end, and designed to provide electrical grounding continuity.

h. Exposed electrical conduit used in kitchen wet area applications, except for flexible connections, shall be rigid galvanized steel. Thin wall conduit (EMT) shall not be permitted for wet areas. Exposed outlet boxes shall be liquid tight type, with threaded hubs.

8. Convenience and Power Outlets

a. Make cutouts and install appropriate boxes or outlets in fabricated fixtures, complete with wiring, conduit, outlet and stainless steel cover plate.

b. Outlets and plugs shall conform to NEMA standards.

c. Electrical outlets and devices shall be first quality "Specification Grade."

d. Furnish GFCI outlets where adjacent to sink compartments, as per the National Electrical Code.

9. Plugs and Cords: Where cords and plugs are provided, they shall comply with National Electrical Manufacturer's Association (NEMA) requirements. Indicate NEMA configuration for each applicable item.

10. Heating Equipment

    a. Install electric and heating equipment as to be readily cleanable or removable for cleaning.

    b. Steam heated custom fabricated equipment shall be a self-contained assembly, complete with control valves located in an accessible position.

11. Motors: Totally enclosed type, except drip-proof type where not exposed to a dust or moisture condition; ball bearings, except sleeve bearings on small timing motors; windings impregnated to resist moisture; horse-power and duty-cycle ratings as required for the service indicated.

12. Power Characteristics: Refer to Division 26 specifications for project power characteristics. Also, refer to individual equipment requirements, for loads and ratings.

2.4 FABRICATION OF METAL WORK

A. General Fabrication Requirements

1. Remove burrs from sheared edges of metalwork, ease the corners and smooth to eliminate cutting hazard. Bend sheets of metal at not less than the minimum radius required to avoid grain separation in the metal. Maintain flat, smooth surfaces without damage to finish.

2. Reinforce metal at locations of hardware, anchorages, and accessory attachments wherever metal is less than 14 gauge (2.0mm) or requires mortised application. Conceal reinforcements to the greatest extent possible. Weld in place, on concealed faces.

3. Exposed screws or bolt heads, rivets, and butt joints made by riveting straps under seams and then filled with solder will not be accepted. Where fasteners are permitted, provide Phillips head, flat or oval head machine screws. Cap threads with acorn nuts, unless fully concealed in inaccessible construction, and provide nuts and lock washers unless metal for tapping is at least 12 gauge (2.5mm). Match fastener head finish with finish of metal fastened.

4. Where components of fabricated metal work are indicated to be galvanized and involve welding or machining of metal heavier than 16 gauge (1.6mm), complete the fabrication and provide hot-dip galvanizing of each component, after fabrication, to the greatest extent possible (depending upon available dip-tank sizes). Comply with ASTM A123.

5. Welding and Soldering

    a. Materials 18-gauge (1.27mm), or heavier, shall be welded.

    b. Seams and joints shall be shop welded or soldered as the nature of the material may require.

    c. Welds must be ground smooth and polished to match original finish.

d. Where galvanizing has been burned off, clean and touch up the weld with high grade aluminum paint.

6. Provide removable panels for access to mechanical and electrical service connections, which are concealed behind or within food service equipment, but only where access is not possible and not indicated through other work.

7. Closures: Where ends of fixtures, splash backs, shelves, etc., are open, fill by forming the metal or welding sections, if necessary, to close entire opening flush to walls or adjoining fixtures.

8. Rolled Edges: Rolled edges shall be as detailed, with corners bull nose, ground and polished.

9. Coved Corners: Stainless steel food service equipment shall have 1/2 inch (13mm) or larger radius coves in horizontal and vertical corners, and intersections, per NSF standards.

B. Metal and Gauges

1. Except as otherwise indicated, fabricate exposed metalwork from stainless steel. Fabricate the following components from the gauge of metal indicated and other components from not less than 20 gauge (0.8mm) metal:

a.	Table and counter tops:	14 gauge.
b.	Sinks and drain boards:	14 gauge.
c.	Shelves:	16 gauge.
d.	Front drawer and door panels:	18 gauge (double pan construction).
e.	Single pan doors and drawer fronts:	16 gauge.
f.	Enclosed base cabinets:	18 gauge.
g.	Enclosed wall cabinets:	18 gauge.
h.	Exhaust hoods and ventilators:	18 gauge.
i.	Pan-type insets and trays:	16 gauge.
j.	Removable covers and panels:	18 gauge.
k.	Skirts and enclosure panels:	18 gauge.
l.	Closure and trim strips over 4" wide:	18 gauge.
m.	Hardware reinforcement:	12 gauge.

n. Gusset plates: 10 gauge.

C. Work-Surface Fabrication

1. Fabricate metal work surfaces by forming and welding to provide seamless construction using welding rods matching sheet metal, grinding and polishing. Where necessary for disassembly, provide waterproof gasketed draw-type joints with concealed bolting.

2. Reinforce work surfaces 30 inches on center both ways with galvanized or stainless steel concealed structural members. Reinforce edges, which are not self-reinforced, by formed edges.

D. Metal Top Construction

1. Metal tops shall be one-piece welded construction, including field joints. Secure to a full perimeter galvanized steel channel frame cross-braced not farther than 2'-6" (760mm) on center. Fasten top with stud bolts or tack welds. If hat sections are used in lieu of channels, close ends.

2. Use properly designed draw fastening, trim strip, or commercial joint material to suit requirement, only if specified.

E. Structural Framing

1. Except as otherwise indicated, provide framing of minimum 1 inch (25mm) pipe-size round pipe or tube members with mitered and welded joints and gusset plates ground smooth. Provide 14 gauge (2.0mm) stainless steel tube for exposed framing, and galvanized steel pipe for concealed framing.

2. Where indicated, flange rear and end edges up to form splashes integrally with top, with vertical and horizontal corners coved of not less than 1/4 inch (6mm) radius, die formed. Turn back splashes 1 inch to wall across top and ends with rounded edge on break, unless otherwise specified.

3. For die-crimped edges, use inverted "V" 1/2 inch (13mm) deep inside and 2 inch (38mm) deep on outside, unless otherwise shown. For straight down flanges, make 1- 3/4 inch (45mm) deep on outside. For bull nose edges, roll down 1-3/4 inch (45mm).

4. Edges: die-formed, integral with top. For rounded corners, form to 1 inch radius, weld, and polish to original finish.

F. Field Joints: For any field joint required because of size of fixture, use butt-joints, reinforce on underside with angles of same material, bolt together with non-corrosive bolts and nuts, field weld, grind and polish.

G. Pipe Bases: Construct pipe bases of 1-5/8 inch (41mm) diameter 18 gauge (1.2mm) stainless steel tubing. Fit legs with polished stainless steel sanitary adjustable bullet feet to provide for adjustment of approximately 1-1/2 inch (38mm), without exposing threads. Space legs to provide ample support for tops, precluding any possibility of buckling or sagging and in no case more than 6'-0" centers.

H. Legs and Cross-rails

1. Equipment legs and cross rails shall be 1-5/8 inch (41mm), 16-gauge (1 .59mm) stainless steel tubing.

2. Welds at cross rails shall be continuous and ground smooth. Please note: tack welds are not acceptable.

3. Camber bottom of legs inward and fit with a stainless steel bullet-type foot with not less than 2 inch (50mm) adjustment. Flanged feet with bolt holes may be required dependent on design applications. Provide proper type feet in compliance with local codes. Use stainless steel in all applications.

4. Peg free standing legs to floor with 1/4 inch (6mm) stainless steel rod.

5. Components:

a. Stainless Steel Gusset: Stainless steel exterior to fit 1-5/8 inch (41mm) tubing, with Allen screw for fastening and adjustment. Not less than 3 inches (76mm) diameter at top and 3-3/4 inch (95mm) long. Outer shell 16-gauge (1.6mm) stainless steel, reinforced with 12-gauge (2.5mm) mild steel insert welded interior shell, or approved equal.

b. Stainless Steel Low Counter Legs: Stainless steel exterior 5-3/4 inch (146mm) minimum, 7 inch (1 78mm) maximum length with stainless steel 3- 1/2 inch (89mm) square plate with four counter-sunk holes, welded to top for fastening.

c. Stainless Steel Adjustable Foot: Stainless steel 1-1/2 inch (38mm) diameter tapered at bottom to 1 inch (25mm) diameter, fitted with threaded cold rolled rod for minimum 1-1/2 inch (38mm) diameter x 3/4 inch (19mm) threaded bushing plug welded to legs, or approved equal. Push-in foot not acceptable.

6. Fasten legs to equipment with gussets, as follows:

a. Sinks: Reinforced with bushings and set screw.

b. Metal Top Tables and Dish Tables: Welded to galvanized steel channels, 14-gauge (1.98mm) or heavier, anchored to top with screws through slotted holes.

c. Wood Top Tables: Welded to stainless steel channels, 14-gauge (1.98mm) or heavier, anchored to top with screws through slotted holes.

I. Shelves

1. Construct solid shelves under pipe base tables of 16 gauge stainless steel, with 1-1/2 inch turned down and under edges on exposed sides, and 2 inch turn up against walls or equipment. Fully weld to pipe legs.

2. In fixtures with enclosed bases, turn up shelves on back and sides with 1/4 inch (6mm) (minimum) radius and feather slightly to ensure a tight fit to enclosure panels.

J. Sinks

1. Construct sinks of 14 gauge stainless steel with No.4 finish inside and outside.

2. Form back, bottom and front of one piece, with ends and partitions welded into place. Partitions: double thickness, 1 inch minimum space between walls. Multiple compartments shall be continuous on the exterior, without applied facing strips or panels.

3. Cove interior vertical and horizontal corners of each tub not less than 1/4 inch radius, die formed. Outer ends of drain boards to have roll rim risers not less than 3 inches high.

4. Drill faucet holes in splashes 2-1/2 inches below top edge. Verify center spacing with faucet specified.

5. Sink insets shall be deep drawn of 16-gauge (1 .59mm), or heavier, polished stainless steel. Weld into sink drain boards with 1-1/2 inch x 1-1/2 inch x 14 gauge stainless steel angle brackets, securely welded to sinks and galvanized cross angles spot welded to underside of drain boards to form an integral part of the installation.

6. The bottom of each compartment shall be creased such as to ensure complete drainage to waste opening. Slope bottom of sink bowls toward outlet.

K. Drains, Wastes and Faucets

1. Furnish and install T and S Brass faucets model B-3940-01 stainless steel rotary drain assembly with connected overflow assembly, in die-drawn inset type sinks and bain-marie sinks.

2. Other custom fabricated sinks shall be furnished with T and S Brass faucets model B-3940-01 stainless steel rotary drain assembly, with S/S cap nut over overflow outlet. Waste connection shall have 2 inch (50mm) external thread size, with 1-1/2 inch (38mm) internal thread size.

3. Rotary Handle: Of sufficient length to extend to front edge of sink. No riveting, screws or soldering permitted to fit drains to sinks, with all parts of drains easily removable for servicing and replacement. Rotary handle bracket to be provided as part of the sink fabrication.

4. Water pans for steam tables shall be fitted with 1 inch (25mm) drains with chrome-plated brass stand pipes.

5. All faucets furnished with equipment included in this Section shall be lead free and comply with NSF Standard #61, Section #9, such as manufactured by Fisher, Chicago, or T and S. Where the itemized specifications list a faucet by manufacturer and model, the Kitchen Equipment Contractor (KEC) shall verify that the listed faucet complies with this requirement.

6. If the listed faucet does not comply, the Kitchen Equipment Contractor (KEC) shall submit similar model which does comply from the same manufacturer where available or from one of the above manufacturers.

L. Workmanship

1. Best quality in the trade. Field verify dimensions before fabricating, conform all items to dimensions of building, neatly fit around pipes, offsets and other obstructions.

2. Fabricate only in accordance with approved shop drawings, showing pipes, obstructions to be built around, and location of utilities and services.

M. Enclosures

1. Provide enclosures, including panels, housings, and skirts for service lines, operating components and mechanical and electrical devices associated with the food service equipment, except as specifically indicated to be "open."

2. Where equipment is exposed to customer view, enclose of service lines, operating components, and mechanical and electrical devices.

N. Casework

1. Enclosure: except as otherwise indicated, provide each unit of casework (base, wall, overhead and free-standing) with a complete-enclosure metal cabinet, including fronts, backs, tops, bottoms, and sides.

2. Bases shall be made of 18-gauge (1.27mm) stainless steel sheets reinforced by forming the metal.

3. Ends, partitions and shelves are stainless steel.

4. Unexposed backs and structural members are galvanized.

5. Vertical ends and partitions are single wall, with a 2 inch (50mm) face.

6. Sides and through partitions are flush with bottom rail, welded at intersections.

7. Shelves: Provide adjustable standards for positioning and support of shelves in casework, except bottom shelf of cabinet mounted on legs or as specified. Turn back of shelf units up 2 inches and hem. Turn other edges down to form open channel. Reinforce shelf units to support 40 pounds per square foot loading, plus 100 percent impact loading.

8. Bottom front rail of bases set on masonry platform shall be continuously closed and sealed to platform.

O. Doors

1. Metal doors shall be double-cased stainless steel. Outer pans shall be 18-gauge (1.27mm) stainless steel with corners welded, ground smooth and polished. Inner pan shall be 20-gauge (.95mm) stainless steel fitted tightly into outer pan with a sound-deadening material such as Celotex or Styrofoam used as a core. The two pans shall be tack welded together and joints solder filled. Doors shall finish approximately 3/4 inch (19mm) thick and be fitted with flush recessed type stainless steel door pulls.

2. Wood doors shall be fabricated as detailed. If Formica or other plastic surfaces are used, sides and backs must be laminated.

3. Hinged doors shall be mounted on heavy-duty NSF approved hinges, or as noted on plans or specifications.

P. Drawer Assemblies

1. Assemblies shall consist of removable drawer body mounted in a ball bearing slide assembly with fully enclosed housing.

2. Slide assembly consists of one pair of 200 pound stainless steel roller bearing extension slides, with side and back enclosure panels, front spacer angle, two drawer carrier angles secured to slides and stainless steel front.

3. Drawer bodies for general storage are to be 20 inches x 20 inches (508mm x 508mm), with 18 gauge stainless steel containers.

4. Drawers intended to hold food products shall be removable type with 12 x 20 (305mm x 508mm) stainless steel food pans in a stainless steel assembly.

5. Drawer fronts are double cased, 3/4 inch (19mm) thick with 18 gauge (1.27mm) stainless steel welded and polished front pan. Steel back pan is tightly fitted and tack welded. Sound deaden with rigid insulation material.

6. Provide drawers with replaceable soft neoprene bumpers or for refrigerated drawers, a full perimeter soft gasket.

Q. Closed Base: Where casework is indicated to be located on a raised-floor base, prepare casework for support without legs and for anchorage and sealant application, as required for a completely enclosed and concealed base.

R. Support from Floor: Equip floor supported mobile units with casters and equip items indicated as roll-out units with manufacturer's standard one-directional rollers. Otherwise, and except for closed-base units, provide pipe or tube legs with adjustable bullet-design feet for floor supported items of fabricated metalwork. Provide 1-1/2 inch adjustment of feet (concealed threading).

S. Shop Painting

1. Clean and prepare metal surfaces to be painted. Remove rust and dirt. Apply treatment to zinc coated surfaces which have not been mill phosphatized. Coat welded and abraded areas of zinc coated surfaces with galvanize repair paint.

2. Apply 1.5 mil (dry film thickness) metal primer coating, followed by 2, 1.0 mil (dry film thickness) metal enamel finish coatings.

3. Bake primer and finish coatings in accordance with paint manufacturer's instructions for a baked enamel finish.

T. Sound Deadening

1. Sound deaden underside of metal tops, drain boards, under shelves, cabinet interior shelves, etc., above the underbracing/reinforcing/framing only.

2.5 FILTER EXHAUST HOODS

A. Filter Exhaust Hoods

1. 18 Gauge type 304 stainless steel external welded construction, in accordance with the latest edition of NFPA No.96, including all applicable appendices. Exposed welds to be ground and polished.

2. Grease Removal: UL classified, non-adjustable, stainless steel grease filters with drip-channel gutters, drains and collection basins.

3. Light Fixtures: Furnish type of fixture specified. Fixtures shall be UL listed for hoods, NSF approved, with sealed safety lenses and stainless steel exposed conduit for wiring.

4. Exhaust Duct: Furnish welded stainless steel formed duct collars at ceiling or wall duct connections, where exposed. Furnish exposed to view ductwork as specified. Verify size and location of duct connections required in this contract, before fabrication. Other ductwork will be by the Mechanical Section.

5. Fire Extinguishing System: Pre-piped liquid chemical or water fire suppressant system, as specified, complying with applicable local and NFPA regulations. Wet chemical fire suppression systems shall comply with UL 300 Standards.

6. Light Fixtures: Furnish type of fixture specified. Fixtures shall be UL listed for hoods, NSF approved, with sealed safety lenses, with stainless steel exposed conduit for wiring.

7. Exhaust Duct: Furnish welded stainless steel formed duct collars at ceiling or wall duct connections. Verify size and location of duct connections required in this contract, before fabrication. Other ductwork will be by the Mechanical Section.

8. Fire Extinguishing System: Pre-piped liquid chemical or water fire suppressant system, as specified, complying with applicable local and NFPA regulations. Wet chemical fire suppression systems shall comply with UL 300 Standards.

2.6 REFRIGERATION EQUIPMENT

A. General

1. Furnish either single or multiple compressor units, as specified or recommended by the manufacturer for the sizes and variations between connected evaporator loads as indicated.

2. Furnish units of the capacities indicated, arranged to respond to multiple-evaporator thermostats and defrosting timers. Include coils, receivers, compressors, motors, motor starters, mounting bases, vibration isolation units, fans, dryers, valves, piping, insulation, gauges, winter control equipment and complete automatic control system.

3. Refrigerant: Pre-charge units with type or types recommended by manufacturer for services indicated, with quick-disconnect type connections where specified, ready to receive refrigerant piping runs to evaporators and (where remote) to condensers. All refrigerant and associated components shall comply with the requirements of the Montreal Protocol Agreement. No CFC refrigerants or associated components shall be allowed on this Project. HFC refrigerants and components shall be used where available. HCFC refrigerants and components, with a minimum 2010 phase-out date, and intermediate replacement refrigerants are to be used only when HFC refrigerants are not available. Kitchen Equipment Contractor (KEC) shall be responsible for coordinating with manufacturers. Provide refrigerant leak monitoring devices where required by federal, state, or local codes.

4. The minimum outdoor operating ambient temperature for design of units is -10 degrees Fahrenheit, or as applicable for extreme low local conditions. The maximum indoor design temperature for operation of compressor units is 95 degrees Fahrenheit. The maximum outdoor ambient design temperature shall be determined with prevailing conditions at mounting location(s) of compressor(s), such as sun exposure, limited ventilation, high fences/walls, roof color and materials, local climatic extremes, etc., but in no case shall it be less than 100 degrees Fahrenheit.

B. Components

1. Coils: Coils for fabricated refrigerators shall have vinyl plastic coatings, stainless steel housings and shall be installed in such a manner as to be replaceable.

2. Expansion Valves: Remote refrigeration system shall be complete with thermostatic expansion valves at the evaporator.

3. Thermometers

a. Fabricated refrigerated compartments to be fitted minimally with a flush dial thermometers, with chrome plated bezels and to be provided as specified.

b. Thermometers shall be adjustable and shall be calibrated after installation.

c. Thermometers shall have an accuracy of ± 2 degrees Fahrenheit (1 degree Centigrade).

4. Hardware

a. Refrigerator hardware for fabricated refrigerator compartments shall be heavy-duty components.

b. Self closing hinges.

c. Latches to be magnetic edge mount type, unless specified or detailed otherwise.

5. Locks

a. Doors and drawers for walk-in coolers/freezers and reach-in refrigerated compartments, both fabricated and standard, shall be fitted with cylinder locking type latches and provided with master keys.

C. Cold Pans: Ice pans, refrigerated pans and cabinets shall be provided with breaker strips, where adjoining top or cabinet face materials, to prevent transfer of cold.

D. All open top mechanically cooled custom fabricated or standard buy-out refrigerators and/or cold pans shall comply with NSF Standard #7 requirements, as of April 1, 1998. The Kitchen Equipment Contractor (KEC) shall verify that the specified unit complies with this requirement or submit a similar model, which does comply, from the same manufacturer where available.

E. Ventilation of Refrigerated Equipment

1. Adequate ventilation shall be provided for custom fabricated equipment with integral refrigeration condensing units, both built-in and drop-in. If flow through ventilation cannot be provided, provide flow direction partitions and an additional fan capable of cooling the condensing unit.

2. If, in the opinion of the Kitchen Equipment Contractor (KEC), additional room ventilation is required to ensure correct operating temperatures of standard buy-out, custom fabricated or remote refrigeration condensing units, or compressor rack assemblies, they shall so state in a letter to the Architect for evaluation and direction.

2.7 MISCELLANEOUS MATERIALS

A. Nameplates: Whenever possible, locate nameplates and labels on manufactured items, in accessible position, but not within customer's normal view. Do not apply name-plates or labels on custom fabricated work, except as required for compliance with governing regulations, insurance requirements, or operator performance.

B. Manufactured Equipment Items: Furnish items as scheduled or herein specified. Verify dimensions, spaces, rough-in and service requirements, and electrical characteristics before ordering. Provide trim, accessories and miscellaneous items for complete installation.

C. Insert Pans

1. General: Provide cut-outs, openings, drawers, or equipment specified or detailed to hold stainless steel insert pans with a full complement of pans as follows:

a. One (1) stainless steel, 20-gauge (0.95mm) minimum, solid insert pan for each space, sized per plans, details, or specifications.

b. Where pan sizes are not indicated in plans, details, or specifications, provide one full-size pan for each opening.

c. Provide maximum depth pan to suit application and space.

2. Provide 18-gauge (1.27mm) removable stainless steel adapter bars where applicable.

3. Provide all cut-outs and openings or equipment specified or detailed to hold stainless steel insert pans with a hinged stainless steel removable night cover.

D. Tray Slides: Before fabrication of counters with tray slides, verify:

1. Size and shape of tray. Edge of tray shall not overhang outer support/slider by more than 2". If edge of tray exceeds this dimension, notify Architect, in writing, for evaluation and adjustment, if necessary.

2. Configuration of corners, turns, and shape of tray slides for proper support and safe guidance of trays.

3. Tray slide capable of supporting 200 pounds per linear foot, live load.

E. Self-leveling dispensers: Verify type and make of ware, dimensions and weight, request samples from Operator and submit to the dispenser manufacturer for proper sizing and calibration of dispensers.

F. Carbon dioxide (co') equipment: Where equipment requires connection with compressed co' cylinder for operation, provide proper sized cylinder manifold and control system (integral with equipment) with proper connectors for Department of Transportation (DOT) approved type cylinders, complete with cylinder safety devices and supports.

G. Reasonable quietness of operation of equipment is a requirement. The Kitchen Equipment Contractor will be required to replace or repair any equipment producing out-of-the-ordinary intolerable noise. This also includes providing and installing bumpers and gaskets for doors and drawers on fabricated and standard manufactured items and sound insulation where feasible.

2.8 ITEMIZED SPECIFICATIONS

A. Refer to the following pages for specific specification information on each item included in this Section.

ITEM 1 DRY STORAGE SHELVING: 1 LOT REQUIRED

A. Owner furnished/Contractor installed.

B. InterMetro, Super Adjustable Super Erecta *H011 wire shelving. Shelf sections shall be four tier high using 86-5/8 inch high individual posts with adjustable feet, and top caps equally spaced with bottom shelf located 8” above finished floor. Install in sizes and configuration as shown on Sheet FS1.1.

C. Verify room size before ordering.

ITEM 2 MANAGERS STATION: 1 REQUIRED

A. Owner furnished and installed.

ITEM 3 MOBILE TRANSPORT CARTS: 2 REQUIRED (OFOI)

A. Existing equipment.

ITEM 4 CORNER/CHANNEL GUARDS: 1 LOT REQUIRED

A. Owner furnished/Contractor installed.

B. Fabricate as detailed and construct vertical corner/channel guards of one piece all welded 48” high 14 gauge stainless steel. Install in locations shown on Sheet FS1.1. Install with stainless steel screws.

C. Seal guards to walls and at joints as required.

ITEM 5 WASHER AND DRYER: 1 REQUIRED

A. Owner furnished and installed.

ITEM 6 HAND WASHING SINKS: 2 REQUIRED

A. Owner furnished/Contractor installed.

B. Advance Tabco, model 7-PS-44 *H011.

C. Seal to wall.

ITEM 7 WORK TABLE: 1 REQUIRED

A. Owner furnished/Contractor installed.

B. Pacific Stainless Products, model WKS-7224-A6S *H011 Spec Line stainless steel table with the following accessories:

1. Model TMSS7212 table mount shelf. Install with 18” clear to table top.

2. Two model SDAS-202006S stainless steel drawer assemblies as shown.

3. Sound deaden underside of top.

C. Install assembly complete.

D. Clip and seal to wall.

ITEM 8 MOBILE POT AND PAN SHELVING: 2 REQUIRED

A. Owner furnished/Contractor installed

B. InterMetro, model PR48VX3 *H011.

ITEM 9 UTILITY CARTS: 2 REQUIRED

A. Owner furnished and installed

B. Lakeside, model 721 *H011 with 5" swivel casters (two with brakes) and perimeter bumper.

ITEM 10 WALK-IN COLD STORAGE ROOMS AND REFRIGERATION: 2 REQUIRED

A. Existing equipment.

ITEM 11 WALK-IN COOLER: 1 REQUIRED

A. Imperial Manufacturing, modular sandwich panel design Foam-A-Lite *H011 cold storage rooms complete in configuration shown on Sheet FS1. 1. Room shall incorporate the following:

1. Provide room with walk-in door and door frame 36 inch x 78 inch stainless steel inside and out with 14 inch x 14 inch insulated glass window and 36” high 1/8” polished aluminum diamond tread plate interior and exterior kick plates. Doos hinged as shown on plan. Include Kason #944 deadbolt mortise lockset with interior safety release, Kason #1229 chrome pull handles, Kason #1094000013 concealed mounting door closer, and Kason #1248 chrome spring assisted hinges; three per door. Hinge door as shown on plans.

2. Provide 36” high 1/8” polished aluminum diamond tread plate wainscot on exposed exterior face of walk-in cold storage room.

3. Exposed exterior, closure panels, and trim strips to adjacent walls and ceiling shall be 22 gauge stainless steel finish. Exposed interior shall be .040 stucco embossed aluminum except ceiling which shall be .040 aluminum with baked white acrylic finish. Unexposed surfaces shall be 26 gauge galvanized steel.

4. Finished exterior height of 8 foot-4 inches (confirm finished ceiling height). Wall and ceiling insulation shall be 4 inch thick foamed in place, Class 1, urethane insulation.

5. No floor installation. Anchor wall panels to floor per manufacturer's recommendations.

6. Install surface mounted 4-1/2 inch diameter dial thermometer above door.

7. Provide 3/8 inch diameter nylon coil hangers mounted on 3 inch x 3 inch aluminum plates with nuts and retainers to support evaporator hung from ceiling panel.

8. Furnish penetrations to accommodate all electrical, plumbing, and refrigeration lines. Furnish stainless steel escutcheons.

9. Provide Kason 1810 LED cooler ceiling light fixtures as shown. Field connections under Division 26. Include lamps.

10. Provide Kason, model 1908-603 press type switches mounted inside and outside of room as indicated on electrical plan.

11. All electrical conduits shall be run concealed within the walk-in walls or above the ceiling panels (coordinate with electrician).

12. Refer to Architectural Room Finish Schedule for cooler/freezer wearing floor and cove base material inside and out by Division 9.

13. Temperature monitor/alarm system provided with Beacon System as specified under Item 12.

B. Walk-ins shall comply with current state energy codes.

C. Walk-ins shall be installed by this manufacturer or this manufacturer's certified installer only and must have a minimum 5 years' experience installing Imperial walk-ins.

D. Walk-in door is to be secured in the "open" position until the concrete sub-floor cures and until manufacturer states that it is safe to close. Oxidized panels will be replaced at the Contractors' expense.

ITEM 12 REFRIGERATION SYSTEM: 1 REQUIRED

A. System A: Cooler @ +35°F to +40°F

1. Evaporator: Bohn ADT090AKQRC; 9,000 BTU at 20°F suction temperature. Include expansion valve, drier strainer, liquid line solenoid, and room thermostat.

2. Condensing Unit: Bohn BHT010X6C; 9,800 BTU at +90°F ambient air temperature. Include crank case heater.

B. Each system shall incorporate the following:

1. Flexible vibration eliminator in suction line.

2. Circuit breaker, automatic starting switch, motor protectors and pressure limit switch, all enclosed with interconnecting wire installed in a junction box ready for line connections.

3. Liquid line dehydrator filter of ample capacity.

4. Suction line filter of ample capacity.

5. Thermal expansion valve for evaporator.

6. Thermostat set to cut- in at +38°F and cut-out at +34°F for refrigerator.

7. Suction pressure regulator.

8. Crank case heater.

9. Refrigerant Lines: Hard copper type “L” with “Silfos” brazed joints. Use refrigeration service tubing.

10. Full charge refrigerant and oil.

11. Condensing unit is located outside. Verify exact location with General Contractor. Raised housekeeping pads specified by architectural division.

12. Beacon System Controller. Locate in Kitchen Office (verify exact location).

C. Where refrigerant suction lines are trapped, use next size smaller pipe in vertical portion of the trap than that indicated so as to acquire sufficient gas velocity for proper oil return.

D. Provide anti-sweat pipe covering 3/4 inch Armstrong Armaflex or equivalent for suction lines from evaporator to condensing unit.

E. Provide painted 1 inch drain tubing from evaporator to nearest indirect drain as shown on Sheet FS1.2. Trap at outlet end.

F. Provide Raychem, model H611250 heating cable with H900 power connection to wrap all drain lines running through freezer.

G. Evaporators and condensing units as shown on the Contract Documents shall be installed under the supervision of a licensed Refrigeration Contractor subject to review by the Consultant.

H. Provide testing, charging, adjusting, operational testing, and cleaning of equipment and lines.

ITEM 13 WALK-IN FREEZER SHELVING: 1 LOT REQUIRED

A. Owner furnished/Contractor installed.

B. InterMetro, Metroseal 3 *H011 Super Adjustable Super Erecta wire shelving. Shelf sections shall be four tier high using 74-5/8 inch high individual posts with adjustable feet, and top caps equally

spaced with bottom shelf located 8” above finished floor. Install in sizes and configuration as shown on Sheet FS1.1.

C. Verify room size before ordering.

ITEM 14 NOT USED

ITEM 15 NOT USED

ITEM 16 NOT USED

ITEM 17 SUPPORT WORK TABLE: 1 REQUIRED

A. Owner furnished/Contractor installed.

B. Pacific Stainless Products, model WKS-9030-A6S *H011 Spec Line stainless steel table with the following accessories:

1. Model TMSS9012 table mount shelf. Install with 18” clear to table top.

2. Two model SDAS-202006S stainless steel drawer assemblies as shown.

3. Sound deaden underside of top.

C. Install assembly complete.

D. Clip and seal to wall.

ITEM 18 MOBILE MIXER CART: 1 REQUIRED

A. Owner furnished and installed.

B. Advance Tabco, model MX-SS-300 *H011 Mobile mixer cart.

ITEM 19 20-QUART MIXER: 1 REQUIRED

A. Owner furnished and installed.

B. Vollrath, model 40757 *H011.

ITEM 20 SHEET PAN RACKS: 2 REQUIRED

A. Owner furnished and installed.

B. New Age, model 1331-PB *H011.

ITEM 21 CUBE ICE MACHINE WITH BIN: 1 REQUIRED

A. Existing equipment to be relocated and reinstalled by Contractor.

ITEM 22 VEGETABLE PREP SINK TABLE: 1 REQUIRED

A. Owner furnished/Contractor installed.

B. Pacific Stainless Products, model DCS-1824-14-B30 *H011 fully welded Spec Line sink table with two sinks. Sink table shall incorporate the following:

1. 14” deep sinks.

2. Stainless steel under shelf below left drainboard.

3. Model TMSC-3014 cantilever shelf above each drainboard. Seal post openings in backsplash.

4. Fisher Manufacturing, model 53457 spray rinse faucet with 8” swing spout centered between sinks. Include wall bracket.

5. Two Fisher Manufacturing, model 22411 rotary waste assemblies with 14 gauge stainless steel lever waste brackets.

6. Waste brackets welded to underside of sink compartment.

7. Sound deaden underside of top and sink compartments.

C. Install assembly complete. Clip and seal to wall.

ITEM 23 REACH-IN REFRIGERATOR: 1 REQUIRED

A. Owner furnished/Contractor installed.

B. True, model STR2R-2S *H011.

ITEM 24 COOK'S SUPPORT WORK TABLE: 1 REQUIRED

A. Owner furnished/Contractor installed.

B. Pacific Stainless Products, model WKS-9030-A6S *H011 Spec Line stainless steel table with the following accessories:

1. Model TMSS9012 table mount shelf. Install with 18” clear to table top.

2. Two model SDAS-202006S stainless steel drawer assemblies as shown.

3. Sound deaden underside of top.

C. Install assembly complete.

D. Clip and seal to wall.

ITEM 25 MOBILE WASTE RECEPTACLES: 2 REQUIRED

A. Owner furnished/Contractor installed.

B. Rubbermaid, model 263200 *H011 with FG264043 dolly and FG263100 matching lid. Color: grey.

ITEM 26 DISH DOLLIES: 2 required

A. Owner furnished/Contractor installed

B. Cres Cor, model 501-D with corner bumpers and vinyl dust cover.

ITEM 27 CANOPY HOOD WITH FIRE PROTECTION SYSTEM: 1 REQUIRED

A. Captive-Aire, model 5412ND-2 *H011, 14’-2” long x 1’-0” high 18 gauge stainless steel canopy hood. Refer to factory file #3145855. The hood shall incorporate the following:

1. LED light fixture. Furnish and install lamps.

2. Light and fan on/off switch. Furnish loose for installation by Division 26.

3. Ansul R-102 Chemical Fire Protection System with Automan Regulated Release Assembly furnished and installed by Captive-Aire Install in accordance with NFPA bulletin 96, including all current amendments to protect this hood including surface protection as required. All piping and conduit shall be run concealed in walls or above ceiling, except where exposure in necessary for functional reasons. Exposed piping shall be chrome plated or run in stainless steel sleeves. Include reset relays and manual remote pull station. System shall connect to mechanical gas shut-off valve furnished loose by Captive-Aire. All contactors are furnished by the Electrical Division for shut down of electric supply to all equipment in the event of system activation.

4. Include 18 gauge stainless steel removable closure panels and trim as required to seal hood to ceiling and walls. Verify ceiling height. Submit shop drawings prior to fabrication.

5. Install hood with 80” clearance from finished floor.

B. Exhaust and supply duct work and fans furnished and installed by Division 23.

ITEM 28 STAINLESS STEEL WALL FLASHING: 1 LOT REQUIRED

A. Owner furnished/Contractor installed.

B. Fabricate 20 gauge stainless steel Number 4 finish wall flashing bonded to gypsum board with heat resistant mastic beginning directly above base tile on wall and terminating 2” above bottom edge of canopy hood. Flashing shall run full length of canopy hood and ends at wall returns.

C. Note: ceiling and wall flashing shall meet Mechanical Code Sections 507.4 and 507.9. Verify all requirements and provide flashing (insulated for 1 hour rating if required) to meet the codes.

D. Install flashing with no exposed fasteners or screws in interlocking sections of equal lengths. Verify that surfaces are flat and smooth with a maximum variation of 1/16” in 10 feet.

E. Install assembly complete.

ITEM 29 DOUBLE STACK CONVECTION OVENS: 1 REQUIRED

A. Existing equipment to be relocated and reinstalled by Contractor.

ITEM 30 CONVECTION STEAMER WITH STAND: 1 REQUIRED

A. Owner furnished/Contractor installed.

B. Cleveland, model (2) 1SCEMCS *H011 with Unistand34 stand. Include Everpure, model EV979750 Water Filtration System.

ITEM 31 36" GRIDDLE: 1 REQUIRED

A. Owner furnished/Contractor installed.

B. Star Manufacturing, model 836TSA *H011 with the following accessories:

1. Rear gas connection with 18” quick disconnect assembly with cable restraint.

2. Electric spark ignition.

3. Stainless steel stand with solid top holding shelves, adjustable feet and casters (front two with brakes).

C. Install assembly complete.

ITEM 32 6-OPEN BURNER RANGE: 1 REQUIRED

A. Owner furnished/Contractor installed.

B. Imperial Commercial Cooking, model IR-6-C *H011. Provide with the following accessories:

1. Rear gas connection with 3' flex connector kit.

2. Stainless steel sides.

3. Gas manifold end caps and cover.

4. 6” diameter casters; front two with brakes.

C. Install assembly complete.

ITEM 33 WAREWASHING EQUIPMENT: 1 LOT REQUIRED

A. Existing equipment to be relocated and reinstalled by Contractor.

ITEM 34 WAREWASHER WITH BOOSTER HEATER: 1 REQUIRED

A. Owner furnished/Contractor installed.

B. Hobart, model AM15T *H011 with electric tank heat. Include the following:

1. Sense-A-Temp 70º rise booster.

2. Sheet pan and combination racks (three each).

3. Flanged and seismic feet.

C. Install assembly complete.

ITEM 35 SERVING COUNTER: 1 REQUIRED

A. Owner furnished/Contractor installed.

B. Fabricate as detailed and construct top and back/end splashes of one piece all welded 14 gauge stainless steel. Reinforce underside of top and install on a cabinet base constructed of ¾ marine grade plywood with all exposed and accessible surfaces faced with plastic laminate color and pattern as selected by the Architect. Include the following:

1. Wall mount upper wall mount cabinets constructed of ¾” marine grade plywood with al exposed and accessible surfaces faced with platic laminate in color and pattern as selected by the Architect.

2. Hardware: Heavy-duty stainless steel pull out shelf slides to support the weight of a full cup or glass rack.

C. Install cabinet on 6” high enclosed steel channel base. Finished base material furnished and installed by General Contractor.

D. Clip and seal to walls.

ITEM 36 MICROWAVE OVEN: 1 REQUIRED

A. Owner furnished and installed.

ITEM 37 DROP-IN HOT WELS: 1 REQUIRED

A. Owner furnished/Contractor installed.

B. Wells, model MOD400TDMAFS *H011 with wood mount kit.

ITEM 38 BEVERAGE COUNTER: 1 REQUIRED

A. Specified by Architectural Division.

ITEM 39 DROP-IN SINK: 1 REQUIRED

A. Owner furnished/Contractor installed.

B. Advance Tabco, model DI-1-168 *H011 with the following accessories:

1. Model K-52 deck mounted faucet.

2. Model K-28 mounting clips.

C. Install assembly complete. Seal to counter top.

ITEM 40 COFFEE BREWER: 1 REQUIRED

A. Vendor furnished and installed.

PART 3 EXECUTION

3.1 SUPERVISION

A. A competent supervisor, representing the Kitchen Equipment Contractor (KEC), shall be present at all times during progress of the Kitchen Equipment Contractor (KEC)'s work.

3.2 SITE EXAMINATION

A. Verify site conditions under the provisions of the General Conditions, Supplementary Conditions and applicable provisions of Division 1 Sections. Notify the Architect, in writing, of unsatisfactory conditions for proper installation of food service equipment.

B. Verify wall, column, door, window, and ceiling locations and dimensions. Fabrication and installation should not proceed until dimensions and conditions have been verified and coordinated with fabrication details.

C. Verify that wall reinforcement or backing has been provided, and is correct for wall supported equipment. Coordinate placement dimensions with wall construction Section.

D. Verify that ventilation ducts are of the correct characteristics, and in the required locations.

E. Verify that utilities are available, of the correct characteristics, and in the required locations.

3.3 INSTALLATION

A. Sequence installation and erection to ensure correct mechanical and electrical utility connections are achieved.

B. Install items in accordance with manufacturer's instructions.

C. Set each item of non-mobile and non-portable equipment securely in place, leveled and adjusted to correct height. Anchor to supporting substrate where indicated, and where required for sustained operation and use without shifting or dislocation. Conceal anchorages wherever possible. Adjust counter tops and other work surfaces to a level tolerance of 1/16 inch (maximum offset, and plus or minus on dimension, and maximum variation in 2'-0" run from level or indicated slope). Provide anchors, supports, bracing, clips, attachments, etc., as required to comply with the local seismic restraint requirements. The Guidelines For Seismic Restraint of Kitchen Equipment, as prepared for the Sheet Metal Industry Fund of Los Angeles and endorsed by SMACNA, should be followed.

D. Complete field assembly joints in the work (joints which cannot be completed in the shop) by welding, bolting-and-gasketing, or similar methods as indicated and specified. Grind welds smooth and restore finish. Set or trim flush, except for "T" gaskets as indicated.

E. Provide closure plates and strips where required, with joints coordinated with units of equipment.

F. Provide sealants and gaskets all around each unit to make joints airtight, waterproof, vermin-proof, and sanitary for cleaning purposes.

G. Joints up to 3/8 inch wide will be stuffed with backer rod to shape sealant bead properly, at 1/4 inch depth.

H. At internal corner joints, apply sealant or gaskets to form a sanitary cove of not less than 3/8 inch radius.

I. Shape exposed surfaces of sealant slightly concave with edges flush with faces of materials at joint.

J. Provide sealant filled or gasketed joints up to 3/8 inch joint width. Wider than 3/8 inch, provide matching metal closure strips, with sealant application each side of strips. Anchor gaskets mechanically or with adhesives to prevent displacement.

K. Treat enclosed spaces, inaccessible after equipment installation, by covering horizontal surfaces with powdered borax at a rate of 4 ounces per square foot.

L. Insulate to prevent electrolysis between dissimilar metals.

M. Cut and drill components for service outlets, fixtures, piping, conduit, and fittings.

N. Coordinate the installation of approved dry pendant sprinkler head in each cooler and freezer. Sprinkler heads should be installed in coolers/freezers only if required by local codes.

O. Verify and coordinate the mounting heights of all wall shelves and equipment, with equipment located below them for proper clearances.

P. Coordinate with the Plumbing and Electrical Divisions and provide holes in food service equipment for plumbing and electrical service to and through the fixtures, as required. This includes welded sleeves, collars, ferrules, or escutcheons. Locate these services so that they do not interfere with intended use and/or servicing of the fixture. No alterations of the building are allowed without written permission by the General Contractor and/or Architect. (i.e. – routing refrigerant lines).

3.4 ADJUSTING

A. Test and adjust equipment, controls and safety devices to ensure proper working order and conditions.

B. Repair or replace equipment which is found to be defective in its operation, including units which are below capacity or operating with excessive noise or vibration.

3.5 CLEANING AND RESTORING FINISHES

A. After completion of installation and completion of other major work in food service areas, remove protective coverings and clean food service equipment internally and externally.

B. Restore exposed and semi-exposed finishes, to remove abrasions and other damages, polish exposed metal surfaces and touch-up painted surfaces. Replace work, which cannot be successfully restored.

C. Polish glass, plastic, hardware and accessories, fixtures and fittings.

D. Wash and clean equipment and leave in a condition ready for the Owner to sanitize and use.

3.6 TESTING, START-UP AND INSTRUCTIONS

A. Delay the start-up of equipment until service lines have been tested, balanced, and adjusted for pressure, voltage and similar considerations and until water and steam lines have been cleaned and treated for sanitation.

B. Make arrangements for demonstration of food service equipment operation and maintenance in advance with the Owner/Operator.

C. Demonstrate food service equipment to familiarize the Owner and the Operator on operation and maintenance procedures, including periodic preventative maintenance measures required. Include an explanation of service requirements and simple on-site service procedures as well as information concerning the name, address and telephone number of qualified local source of service. The individual performing the demonstration shall be knowledgeable of operating and service aspects of the equipment.

D. Provide a written report of the demonstration to the Owner, outlining the equipment demonstrated and malfunctions or deficiencies noted. Indicate individuals present at demonstration.

E. Final Cleaning: After testing and start-up, clean the food service equipment and leave in a condition ready for the Owner to sanitize and use.

3.7 CLEAR AWAY

A. Throughout the progress of their work, the Kitchen Equipment Contractor (KEC) shall keep the working area free from debris and shall remove rubbish from premises resulting from work being done by them. At the completion of their work, the Kitchen Equipment Contractor (KEC) shall leave the premises in a clean and finished condition.

END OF SECTION

BASIC PLUMBING REQUIREMENTS

PART 1 GENERAL

1.1 DESCRIPTION OF WORK

A. This Section specifies the basic requirements for all Contractor installed equipment. It applies to all sections included in Division 22. The requirements herein are an expansion upon the requirements of Division 1.

B. Provide all materials, labor and equipment required to install complete and fully operational plumbing systems as indicated by the contract drawings and this specification.

C. Obtain and pay for all permits, licenses, fees and taxes applicable to this project as required by law.

D. Cooperate with other trades in furnishing material and information required for installation and operation of mechanical items.

E. Requirements for the following are included:
   1. Related work (other Contract Documents and specification sections) that must be combined with the requirements of this Section.
   2. Design performance.
   3. Delivery, storage, and handling.
   4. Quality assurance and standards.
   5. Submittals.
   6. Product quality, basic type, and finishes.
   7. Equipment identification.
   8. Excavation and backfill.
   9. Installation.
   10. Mounting and shimming.
   11. Inspection.
   12. Safety considerations.
   13. Cleaning, startup, and adjustments.

1.2 RELATED WORK

A. This general section shall be used in conjunction with the following other specifications and related Contract Documents to establish the total requirements for the project equipment and systems:
   1. Division 1 sections included in this Project specifications.
   2. The Contract.
   3. General and specific mechanical specifications and drawings included in the project.

1.3 DEFINITIONS

A. “Indicated”: Refers to graphic representations, notes or schedules in the Drawings; or to other paragraphs or schedules in Specifications and similar requirements in the Contract Documents.
   1. Terms such as “shown”, “noted”, “scheduled”, and “specified”, are used to notify or help the user to locate reference. Location is not limited.

B. “Directed”: Terms such as “directed”, Requested”, “authorized”, “selected”, “approved”, “required”, and “permitted” mean directed by Architect/Engineer, approved by Architect/Engineer and similar phrases.

C. “Approved”: When used in conjunction with Architect/Engineer's action on contract submittals, applications, requests, is limited to Architect/Engineer's duties and responsibilities as stated in the Conditions of the Contract.

D. “Regulations”: Includes laws, ordinances, statutes and lawful orders issued by authorities having jurisdiction, as well as rules, conventions and agreements within the construction industry that control performance of Work.

E. “Furnish”: Means to supply and deliver to the Project site, ready for unloading, unpacking, assembly, installation and similar operations.

F. “Install”: Describes operations at Project site including actual unloading, temporary storage, unpacking, assembling, erecting, placing, anchoring, supporting, isolating, applying, working to dimension, finishing, curing, protecting, cleaning and similar operations.

G. “Provide”: Means to furnish and install.

H. “Installer”: A contractor, or another entity engaged by the contractor, either as an employee, subcontractor, or contractor of a lower tier, to perform a particular construction activity including installation, erection, application or similar operations.
   1. Installers are required to be experienced in operations they are engaged to perform.
   2. The term “experience” means having successfully completed a minimum of three previous projects similar in scope and size to this Project and within the time frame indicated in the “Quality Assurance” section of the Specifications. In addition, in means being familiar with special requirements indicated and having complied with requirements of authorities having jurisdiction.

I. “Project Site”: Is defined as the space available to the Contractor for performing construction activities, either exclusively or in conjunction with others performing other work as part of Project.

1.4 DESIGN PERFORMANCE

A. Compliance by the Contractor and/or Vendor with the provisions of this Specification does not relieve him of the responsibilities of furnishing equipment and materials of proper design, mechanically suited to meet operating guarantees at the specified service conditions.

1.5 SUBMITTALS

A. Product Data: Submit complete sets of manufacturer's product data in .PDF format for approval. All submittals are to be received in no more than (3) three packages. See Division 1 for further information regarding submittal requirements. Literature submitted shall clearly indicate the model number, capacity, rated operating conditions, noise levels, size, weight, support requirements, rough-in data and dimensions, electrical power requirements, wiring diagrams, utility (fuel, air, cooling water, etc.) requirements, and options furnished. Submittals shall include, but are not necessarily limited to the following;
   1. Plumbing: Piping and insulation; Plumbing fixtures, including trim; insulation; valves; hangers and supports; isolators and the like.

B. Operation and Maintenance Data: Submit three complete sets of manufacturer's literature in .PDF format for approval. Data shall include installation, start-up, and maintenance instructions, parts lists, and wiring diagrams. Include all material on a CD-ROM or USB device.

C. Substitutions: System design was based upon the equipment and materials listed on the drawings and specifications herein. At contractor's option, another manufacturer's equipment of similar quality, capacity and features may be submitted for prior approval per Section 01 60 00. Prior permission to substitute does not relieve the contractor of the responsibility of including this information in the bound submittal packages.

1.6 QUALITY ASSURANCE

A. Codes and Standards: Comply with the provisions of the following codes, standards and specifications, except where more stringent requirements are shown or specified:
   1. State of Oregon "IBC".
   2. State of Oregon "IMC".
   3. State of Oregon "UPC".
   4. State of Oregon "IFC".
   5. ANSI/ASHRAE 90 - “Energy Efficient Design of New Buildings….”
   6. ANSI B31.9 "Building Service Piping".
   7. NFPA - Sections 13, 54 and 90B.

B. Drawings: All drawings are diagrammatic and show general design, arrangement, and extent of the systems. Do not scale drawings for rough-in dimensions, nor use as shop drawings.

C. Installer Qualifications: Company specializing in performing the work required with a minimum of five years documented experience.

D. Contractor shall furnish and install all work in accordance with manufacturers' recommendations and instructions.

1.7 DELIVERY, STORAGE AND PROTECTION

A. Delivery: Deliver to site with manufacturer's labels intact and legible.

B. Preparation for shipment:
   1. Each unit shall be suitably prepared for the shipment specified and for storage in accordance with manufacturer's instructions in a manner requiring no disassembly prior to operation.
   2. The Contractor shall be solely responsible for the adequacy of the Preparation for Shipment provisions employed with respect to materials and application.
   3. One complete set of Installations, Operating and Maintenance Instructions shall be packed and shipped with the equipment. This set is in addition to the sets that are to be sent directly to the Owner.

C. Handling: Avoid damage. Comply with manufacturer's installation instruction requirements for rigging, unloading and transporting units.

D. Storage: Inside protected from weather, dirt and construction dust. Where necessary to store outside, elevate well above grade and enclose with durable, waterproof wrapping. Cap all pipe ends. Taping pipe ends is not adequate or allowable.

1.8 PROJECT CONDITIONS

A. General: Provide products which are compatible with other portions of the work and provide products with the proper power characteristics and similar adaptations for the project.

B. Arrangement: Arrange piping parallel with primary lines of the building construction and with a minimum 7 feet overhead clearance in unfinished equipment rooms where possible. Conceal all piping and ductwork where possible unless indicated otherwise. Locate operating and control equipment properly to provide easy access for operation and maintenance. Give right-of-way to piping which must be sloped for drainage. Set all equipment level or as recommended by manufacturer.

C. Coordination: Where several elements of the work must be sequenced and positioned in order to fit the available space, prepare shop drawings showing the actual physical dimensions (at accurate scale) required for installation and submit prior to purchase/fabrication/installation of any of the elements involved in the coordination.

1.9 STANDARDS

A. General: Provide all new materials and equipment, identical to apparatus or equipment in successful operation for a minimum of five years. Provide materials of comparable quality

omitted here but necessary to complete the work. Maximum allowable variation from stated capacities, minus 5% to plus 10% as approved in each case.

B. Governing Standards: The following are typical standards generally referenced in these specifications and identified by their acronym. Federal Specifications (FS), American Society for Testing Materials (ASTM), American National Standards Institute (ANSI), Manufacturer's Standardization Society of the Valve and Fitting Industry, Standard Practice (MSS SP-69), Cast Iron Soil Pipe Institute (CISPI), Underwriters Laboratory (UL) numbers are given.

1.10 WARRANTIES

A. Contractor shall provide a 1 year warranty on all equipment, materials and workmanship for a period of one year from the date of owner's acceptance.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.1 LAYOUT AND COORDINATION

A. Site Examination: Before starting work, carefully examine site and all Contract Drawings. Become thoroughly familiar with conditions governing work on this project. Verify all indicated elevations, building measurements, rough-in dimensions and equipment locations before proceeding with any work.

B. Utility Locations: The location of all utilities, wires, conduits, pipes, ducts, or other service facilities are shown in a general way only on the drawings and in some instances are taken from existing drawings. Ascertain whether any additional facilities other than those shown on the plans may be present and determine the exact location and elevations of all utilities prior to commencing installation.

C. Discrepancies: Any error, conflict or discrepancy in Drawings, Specifications and/or existing conditions shall be reported immediately. Do not proceed with any questionable items of work until clarification of same has been made. Should rearrangement or re-routing of piping or ductwork be necessary, provide for approval the simplest layout possible for that particular portion of the work. Under no circumstances shall beams, girders, footings or columns be cut for mechanical items. Casting of pipes into concrete is prohibited unless so shown on Drawings.

D. The Contractor shall cooperate with others to avoid interferences and delays in the construction work.

E. Interference as a result of poor coordination or lack of cooperation with other trades shall be corrected at the Contractor's expense.

3.2 CONTINUITY OF EXISTING SERVICES

A. Existing water, power, heat, ventilation, air conditioning and other services shall remain in service during new construction work. Coordinate any interruption in service during new

construction work. Coordinate any interruption of these services with the Owner's representative a minimum of twenty-four (24) hours in advance.

B. Protect from damage active utilities existing and evident by reasonable inspection of the site whether shown or not on the Drawings. Protect, relocate or abandon utilities encountered in the work which were not shown on the Drawings or evident by inspection of the work as directed by the Architect. Maintain continuity of all utility services to existing buildings.

3.3 CUTTING AND PATCHING

A. General: Perform cutting and patching in accordance with Division 1.

B. Protection: During cutting and patching, protect adjacent installations. Provide temporary barriers to prevent the spread of dust and dirt outside of the immediate work area.

C. Repair: Patch finished surfaces and building components using new materials to match the existing.

D. Inspection: Upon written direction from the Architect, uncover and restore work to provide for observation of concealed work.

3.4 EXCAVATION AND BACKFILL

A. General: Perform all necessary excavation and backfill required for the installation of mechanical work. Any piping or other work damaged by the Contractor's operations shall be repaired at the Contractor's expense.

B. Water: Keep all excavations free of standing water. Excavations damaged or softened by water or frost shall be re-excavated and filled back to original level with approved material at the Contractor's expense.

C. Test: During the progress of the work for compacted fill, the Owner reserves the right to request compaction tests made under the direction of a testing laboratory.

D. Trench Excavation: Excavate trenches to the necessary depth and width, removing rocks, unstable soil (silt, peat, etc.) roots and stumps. Width of trench shall be adequate for proper installation of piping or conduit.

E. Foundation and Bedding:
   1. Proper preparation of foundation, placement of foundation material where required, and placement of bedding material shall precede the installation of the pipe. This shall include leveling of the trench bottom as well as placement and compaction of required bedding material to a uniform grade so that piping rests upon a continuous and uniform bedding.
   2. Where excavation has been made below the required grade, the Contractor shall provide, place and compact suitable bedding material to restore the proper grade elevation.

F. Provide tracer wire over top of piping.

1. Construction:
    a. Conductor: Solid or stranded copper per spec ASTM B-1, B-3, or B-8.
    b. Insulation: High Molecular Weight Polyethylene (HMWPE) ASTM D-1248. Various insulation colors dependant on usage.
    c. Temperature: 70 degrees C dry and wet.
    d. Voltage: 20 and 30 Mil = 30 to 300 volts. 45 Mil = 600 volts.

G. Backfilling: Upon acceptance of installed piping systems, trenches shall be backfilled in lifts. Backfill material shall be placed and compacted in lifts not to exceed 6 inches in depth to a height of 1 inch above the top of trench. Backfill shall be placed to obtain contact with the entire periphery of the pipe without disturbing pipe placement.

H. Compaction: One of the following methods or combination thereof shall be required; 1) Mechanical Tamper or Vibratory Compactor. Compaction shall be sufficient to attain 95% of maximum density at optimum moisture content. Water "puddling" or "washing" is prohibited.

I. Bedding/Backfill Material: Where native material has been removed, necessary foundation material consisting of 3/4 inch minus crushed rock or fill sand shall be placed and compacted to form a firm base of the required thickness. Backfill material shall be the same. Follow the pipe manufacturer's installation instructions when specified materials are specifically prohibited.

3.5 EQUIPMENT REMOVAL

A. All removed equipment is the property of the Contractor unless indicated otherwise. Disconnect and remove all such equipment from the property. Cap all piping in walls, below floors, and/or above ceilings in finished rooms.

B. Where equipment is to be reused, reconnect piping, wiring and/or controls to allow this equipment to function as it had prior to this renovation unless indicated otherwise.

3.6 MECHANICAL EQUIPMENT WIRING

A. Provide all motor starters, control devices, and wiring complete from power source indicated on Drawings.

B. Equipment and systems shown on the Drawings and/or specifications, are based upon requirements of specific manufacturers which are intended as somewhat typical of several makes which may be approved. Provide all field wiring and/or devices necessary for a complete and operable system controls for the actual selected equipment/system.

3.7 INSTALLATION

A. Locating and Positioning Equipment: Observe all Codes and Regulations and good common practice in locating and installing mechanical equipment and material so that completed installation presents the least possible hazard. Maintain recommended clearances for repair and service to all equipment.

B. Anchorage: Anchor and/or brace all mechanical equipment, piping to resist displacement due to seismic action, include snubbers on equipment mounted on spring isolators.

C. Where mounting heights or locations are not identified, install systems, equipment and materials to provide maximum headroom.

D. Provide clearance for installation of insulation and access to valves, fittings, damper actuators, etc. on pipe and duct systems.

E. Install systems, materials and equipment giving right of way to systems required to be installed at a specific slope or operation by gravity.

F. Provide condensate drain piping to over nearest floor drain for all coils, furnaces, boilers, domestic water heaters and the likes.

G. Flush clean and disinfect domestic water system.

H. Provide chrome plated rigid or flexible supplies to fixtures with stops, reducers, and escutcheons.

I. Provide trap primers and piping for floor drains and floor sinks.

J. Installation shall be in accordance with the requirements of the equipment manufacturer, including special requirements for seismic restraints.

K. Equipment Manufacturer's Responsibility and Services:
   1. A manufacturer's representative for major equipment and operating systems shall be provided as necessary to assist the Contractor during installation, and to provide written certification that the equipment has been installed as specified and in accordance with the manufacturer's representative.
   2. The manufacturer's representative shall provide the initial startup of equipment in the presence of the Owner.
      a. Provide a pre-start check of all piping, valves, control devices, control panels, and equipment.
      b. Calibrate and adjust equipment and controls for operation at the specified design and conditions.
      c. Provide a record of all startup events noting problems and their resolution.
      d. Provide a record of all set points for operational controls and devices.
   3. Upon the completion of the equipment startup, provide instructional time with the Owner's personnel to review the operations and maintenance manuals and perform each step necessary for startup, shutdown, troubleshooting, and routine maintenance. The instructional time shall be scheduled through the Owner.
   4. Upon completion of the inspections, startup, testing, and checkout procedures, the equipment manufacturer shall submit written notice to the Owner that the units are ready for use by the Owner. Provide a certificate of calibration for all equipment.

3.8 MOUNTING AND SHIMMING

A. Mount equipment as shown on the Drawings. Provisions for mounting special equipment on spring isolators, snubbers, and inertia bases are specified in Section 22 05 48, Vibration Isolation and Sound and Seismic Controls for Plumbing Piping and Equipment.

B. Level the equipment by means of 304 stainless steel wedges (stainless steel plates and stainless steel shims). Wedge taper shall not be greater than 1/4 inch per foot. Use double wedges to provide a level bearing surface for the equipment. Secure each pair of wedges in their final positions with one tack weld on each side after leveling is complete. Wedging shall be executed in a manner that will prevent a change in level or springing of the Baseplate when the anchor bolts are tightened.
   1. Adjust rotating equipment assemblies such that the driving units are properly aligned, plumb and level with the driven units and all interconnecting shafts and couplings.
   2. All rotating equipment shall be checked for proper alignment with dial indicators or laser after completion of grouting. The alignment must be within the tolerances required by the equipment manufacturer. The final alignment check shall be witnessed by the Owner.

3.9 INSPECTION

A. The Contractor shall inspect his work to ensure the installation and workmanship is in accordance with these specifications and acceptable industry standards for the work being done.

B. All materials, equipment, and workmanship shall be subject to inspection at any time by the Owner. Contractor shall correct any work, materials, or equipment not in accordance with the Contract Documents.

3.10 SAFETY CONSIDERATIONS

A. All equipment shall be installed with suitable access clearances that satisfy OSHA and code requirements for maintenance or removal of replaceable parts and components, and with necessary inions or flanges to perform the maintenance or removal without removing the connecting appurtenances.

B. Where equipment requiring periodic maintenance cannot be reached by normal walkways because of interference with ductwork, piping, or other obstructions the Contractor shall notify the Owner and propose an alternate safe means of access. These may include construction of an overhead platform with stairway or ladder ends and safety railings or handholds, or walk-through duct plenums with hinged access doors, or as required to meet OSHA standards for safe maintenance procedures.

3.11 CLEANING, START-UP, AND ADJUSTING

A. The Contractors shall be responsible for proper operation of all systems, minor subsystems, and services provided under this section. He shall coordinate start-up procedures, calibration, and system checkout with all project managers. Any system operational problems shall be

diagnosed; all correctional procedures shall be initiated as required to bring out the system into compliance with the design, and the problem then shall be rechecked to verify that the system operates normally.

B. Thoroughly clean all parts of the installation at the completion of the work. The Contractor shall clean up and remove from the premises all refuse material, crates, and rubbish arising from his work. Remove, clean, and reinstall all filters. Belt-drive tensions and alignments shall be checked. All motors and bearings shall be lubricated in accordance with the manufacturer's service manuals prior to equipment start-up. Provide a lubrication schedule for every item of equipment furnished under this section. The schedule shall include the type of lubricant and the application frequency.

END OF SECTION 22 00 00

METERS AND GAGES FOR PLUMBING PIPING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Pressure gages and pressure gage taps.

B. Thermometers and thermometer wells.

1.2 RELATED REQUIREMENTS

A. Section 22 10 05 - Plumbing Piping.

1.3 REFERENCE STANDARDS

A. ASME B40.100 - Pressure Gauges and Gauge Attachments; 2013.

B. ASTM E1 - Standard Specification for ASTM Liquid-in-Glass Thermometers; 2014.

C. ASTM E77 - Standard Test Method for Inspection and Verification of Thermometers; 2014.

1.4 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide list that indicates use, operating range, total range and location for manufactured components.

C. Project Record Documents: Record actual locations of components and instrumentation.

D. Operation and Maintenance Data: Section 01 70 00.

E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements. for additional provisions.
   2. Supply two bottles of red gage oil for static pressure gages.
   3. Supply two pressure gages with pulsation damper and two dial thermometers.

1.5 FIELD CONDITIONS

A. Do not install instrumentation when areas are under construction, except for required rough-in, taps, supports and test plugs.

PART 2 PRODUCTS

2.1 PRESSURE GAGES

A. Manufacturers:
   1. Weksler; Model 401: www.weksler-gauges.com.
   2. Trerice; Model 700 Series: www.trerice.com.
   3. Ametek (U.S. Gauge); Model Series 540: www.ametekusg.com.
   4. Other approved manufacturers: Ashcroft, Marshalltown, Weiss.
   5. Substitutions: See Section 01 60 00 - Product Requirements.

B. Pressure Gages: ASME B40.100, drawn steel case, phosphor bronze bourdon tube, rotary brass movement, brass socket, with front recalibration adjustment, black scale on white background.
   1. Case: Steel with brass bourdon tube.
   2. Size: 4-1/2 inch diameter.
   3. Mid-Scale Accuracy: One percent.
   4. Scale: Psi and KPa.

2.2 PRESSURE GAGE TAPPINGS

A. Manufacturers:
   1. Weksler: www.weksler-gauges.com.
   2. Trerice : www.trerice.com.
   3. Ametek (U.S. Gauge): www.ametekusg.com.
   4. Other approved manufacturers: Ashcroft, Marshalltown, Weiss.
   5. Substitutions: See Section 01 60 00 - Product Requirements.

B. Gage Cock: Tee or lever handle, brass for maximum 150 psi.

C. Ball Valve: Brass 1/4 inch NPT cock, for 200 psi. Lever handle.
   1. Product: A12 manufactured by Weksler, or approved equal.

D. Needle Valve: Brass, 1/4 inch NPT for minimum 150 psi.
   1. Product: BBV4 manufactured by Weksler.

E. Pulsation Damper: Pressure snubber, brass with 1/4 inch connections.
   1. Product: WG41/WG42 manufactured by Weksler.

F. Syphon: Steel, Schedule 40, 1/4 inch angle or straight pattern.
   1. Product: AO31 manufactured by Weksler.

2.3 STEM TYPE THERMOMETERS

A. Manufacturers:
   1. Weksler Glass Thermometer Corp: www.wekslerglass.com.
   2. Trerice; Model A00: www.trerice.com.

3. Ametek (U.S. Gauge); Model Fig. MN: www.ametekusg.com.
4. Other approved manufacturers: Ashcroft, Marshalltown, Weiss.
5. Substitutions: See Section 01 60 00 - Product Requirements.

B. Thermometers - Fixed Mounting: Red- or blue-appearing non-toxic liquid in glass; ASTM E1; lens front tube, cast aluminum case with enamel finish.
1. Size: 9 inch scale.
2. Window: Clear glass.
3. Stem: 3/4 inch brass.
4. Accuracy: 2 percent, per ASTM E77.
5. Calibration: Degrees F and Degrees C.

C. Thermometers - Adjustable Angle: Red- or blue-appearing non-toxic liquid in glass; ASTM E1; lens front tube, cast aluminum case with enamel finish, cast aluminum adjustable joint with positive locking device; adjustable 360 degrees in horizontal plane, 180 degrees in vertical plane.
1. Size: 9 inch scale.
2. Window: Clear glass.
3. Stem: 3/4 inch NPT brass.
4. Accuracy: 2 percent, per ASTM E77.
5. Calibration: Degrees F and Degrees C.

2.4 DIAL THERMOMETERS

A. Manufacturers:
1. Weksler Glass Thermometer Corp: www.wekslerglass.com.
2. Trerice; Model B8560: www.trerice.com.
3. Ametek (U.S. Gauge); Model Series 6000: www.ametekusg.com.
4. Other approved manufacturers: Ashcroft, Marshalltown, Weiss.
5. Substitutions: See Section 01 60 00 - Product Requirements.

B. Thermometers - Adjustable Angle: Dial type bimetallic actuated; ASTM E1; stainless steel case, adjustable angle with front recalibration, silicone fluid damping, white with black markings and black pointer, hermetically sealed lens, stainless steel stem.
1. Size: 5 inch diameter dial.
2. Lens: Clear glass.
3. Accuracy: 1 percent.
4. Calibration: Degrees F and Degrees C.

2.5 THERMOMETER SUPPORTS

A. Socket: Brass separable sockets for thermometer stems with or without extensions as required, and with cap and chain.

B. Flange: 3 inch outside diameter reversible flange, designed to fasten to sheet metal air ducts, with brass perforated stem.

2.6 TEST PLUGS

A. Test Plug: 1/4 inch or 1/2 inch brass fitting and cap for receiving 1/8 inch outside diameter pressure or temperature probe with neoprene core for temperatures up to 200 degrees F.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install positive displacement meters with isolating valves on inlet and outlet to AWWA M6. Provide full line size valved bypass with globe valve for liquid service meters.

C. Provide one pressure gage per pump, installing taps before strainers and on suction and discharge of pump. Pipe to gage.

D. Install pressure gages with pulsation dampers. Provide needle valve to isolate each gage. Extend nipples to allow clearance from insulation.

E. Install thermometers in piping systems in sockets in short couplings. Enlarge pipes smaller than 2-1/2 inch for installation of thermometer sockets. Ensure sockets allow clearance from insulation.

F. Coil and conceal excess capillary on remote element instruments.

G. Provide instruments with scale ranges selected according to service with largest appropriate scale.

H. Install gages and thermometers in locations where they are easily read from normal operating level. Install vertical to 45 degrees off vertical.

I. Adjust gages and thermometers to final angle, clean windows and lenses, and calibrate to zero.

J. Locate test plugs adjacent to pressure gages and pressure gage taps.

3.2 SCHEDULES

A. Pressure Gages, Location and Scale Range:
   1. Pumps, 0 to 100 psi.
   2. Expansion tanks, 0 to 100 psi.

B. Stem Type Thermometers, Location and Scale Range:
   1. Water zone supply and return, 0 to 150 degrees F.

2. Domestic hot water supply and recirculation, 0 to 150 degrees F.

END OF SECTION 22 05 19

PLUMBING SEISMIC RESTRAINT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Seismic restraint of equipment and piping.

1.2 RELATED SECTIONS

A. Section 22 00 00 - Basic Plumbing Requirements.

B. Section 22 07 19 - Plumbing Piping Insulation.

C. Section 22 10 05 - Plumbing Piping.

D. Section 22 30 00 - Plumbing Equipment.

1.3 QUALITY ASSURANCE

A. Seismic Restraints:
   1. The Anchorage and/or seismic restraint of permanent equipment and associated systems listed below shall be designed to resist the total design seismic forces prescribed in the latest edition of the International Building Code.
      a. All floor or roof-mounted equipment weighing 400 lbs or greater.
      b. All suspended or wall-mounted equipment weighing 20 lbs or greater.
      c. All vibration-isolated equipment weighing 20 lbs or greater.
      d. All gas piping systems throughout the building.
      e. All piping 1 1/4 inches nominal diameter and larger located in boiler, mechanical equipment and refrigeration mechanical rooms.
      f. All piping 2 1/2 inches nominal diameter and larger.
      g. Pipes, electrical conduit and ducts supported by a trapeze where none of those elements would individually require bracing, require bracing when the combined operating weight of all elements supported by the trapeze is 10 lbs/ft or greater.

B. All calculations shall be in accordance with Chapter 16 of the latest edition of the International Building Code.

1.4 SUBMITTALS

A. Submit the following in accordance with Section 01 30 00:
   1. All anchorage and seismic restraints shall be designed and stamped by a professional engineer licensed in the state of the project location. Design shall include:
      a. Number, size and location of anchors for floor or roof-mounted equipment. For curb-mounted equipment, provide design of attachment of both the unit to the curb and the curb to the structure. In addition, provide calculations or test data verifying the curb can accept the seismic loads.

b. Number, size and location of seismic restraint devices and anchors for vibration-isolated and suspended equipment. Provide calculations or test data verifying the horizontal and vertical ratings of the seismic restraint devices.
c. Number, size and location of braces and anchors for suspended piping and ductwork on shop drawings. In addition:

1) The contractor must select a single seismic restraint system pre-designed to meet the requirements of the latest edition of the International Building Code such as the 2011 Mason Industries Seismic Restraint Guidelines for Suspended Piping, Ductwork, Electrical Systems and floor and roof mounted equipment.

2) Details or designs from separate seismic restraint guidelines are not acceptable. Installations not addressed by the selected system must be designed, detailed and submitted along with the shop drawings.

3) Maximum seismic loads shall be indicated on drawings at each brace location. Drawings shall bear the stamp and signature of the registered professional engineer licensed in the state of the project location who designed the layout of the braces.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Amber Booth.

B. Mason Industries, Inc.

C. Kinetics Corporation.

D. Vibrex.

E. Substitutions: Under provisions of Section 01 60 00.

2.2 SEISMIC RESTRAINTS

A. General Requirements:
1. Seismic restraints shall be provided for all equipment, both supported and suspended, piping and ductwork as listed above.
2. Bracing of piping and ductwork shall be in accordance with provisions set forth in SMACNA seismic restraint manual.
3. Structural requirements for restraints, including their attachment to building structure, shall be reviewed and approved by the structural engineer.
4. Attachments to supported or suspended equipment must be coordinated with the equipment manufacturer.

B. Supported Equipment Products:
   1. Seismic restraints shall consist of interlocking steel members restrained by shock absorbent neoprene materials compounded to bridge bearing specifications as previously noted in paragraph 1.03. Elastomeric materials shall be replaceable and be a minimum 3/4-inch thick. Snubbers shall be manufactured with an air gap between hard and resilient material of not less than 1/8-inch, nor more than 1/4-inch. Type 1 - Seismic Snubbers: All-directional seismic snubbers shall consist of interlocking steel members restrained by a one-piece molded neoprene bushing of bridge bearing neoprene. Bushing shall be replaceable and a minimum of 1/4 inch thick. A minimum air gap of 1/8 inch shall be incorporated in the snubber design in all directions before contact is made between the rigid and resilient surfaces. Snubber end caps shall be removable to allow inspection of internal clearances. The snubber shall be designed to accept horizontal and vertical seismic loads as defined in Section 1.03.B. Mason Type Z-1225 or Z-1011.
   2. Each snubber shall be capable of restraint in all three mutually orthogonal directions. Type 2 - Seismic Sway Braces - Seismic sway braces shall consist of galvanized steel aircraft cables or steel angles/channels. Cables braces shall be designed to resist seismic tension loads and steel braces shall be designed to resist both tension and compression loads with a minimum safety factor of 2. Brace end connections shall be steel assemblies that swivel to the final installation angle. Do not mix cable and steel braces to brace the same system or equipment. Steel angles, when required, shall be clamped to the threaded hanger rods at the seismic sway brace locations utilizing a minimum of two ductile iron clamps. Sway braces shall be designed to accept horizontal and vertical seismic loads as defined in Section 1.03.B. Mason Type SCB, SSB, SRC and UC.
   3. Submittals shall include load versus deflection curves up to 1/2-inch on the x, y and z planes.
   4. Mason Model Z-1011

C. Bracing of Pipes:
   1. Provide seismic bracing of all piping as detailed below. (Exception: Piping suspended by individual hangers 12 inches or less in length, as measured from the top of the pipe to the bottom of the support where the hanger is attached, need not be braced).
      a. Brace all gas piping.
      b. Brace all piping located in boiler rooms, mechanical equipment rooms, and refrigeration mechanical rooms that is 1-1/4-inch nominal diameter and larger.
      c. Brace all pipes 2-1/2-inch nominal diameter and larger.
   2. For all gas piping, as specified in 1(a) the bracing details, schedules, and notes may be used, except that transverse bracing shall be at 20 feet maximum, and longitudinal bracing shall be at 40 feet maximum.
   3. Seismic braces for pipes on trapeze hangers may be used.
   4. Provide flexibility in joints where pipes pass through building seismic joints or expansion joints or where rigidly supported pipes connect to equipment with vibration isolators. For threaded piping, the flexibility may be provided by the installation of swing joints.
   5. Cast iron pipe of all types, glass pipe, and any other pipe jointed with a shield and clamp assembly, where the top of the pipe is 12 inches or more from the supporting structure, shall be braced on each side of a change in direction of 90 degrees or more. Riser joints shall be braced or stabilized between floors.

6. Vertical risers shall be laterally supported with a riser clamp at each floor. For buildings greater than six stories high, all risers shall be engineered individually.

D. Suspended Equipment and Piping:
1. Cable Method: The seismic restraint shall consist of a combination of stranded steel aircraft cable and the specified vibration isolation hanger with an added nut and neoprene and steel washer. The cable resists lateral and downward motion. The modified vibration hanger resists upward motion.
2. Cable attachment details, cable size, and the neoprene and steel washers shall be sized by the manufacturer and are to be indicated in the Shop Drawings.
3. Provide detailed Shop Drawings for approval in sufficient time to allow structural attachment work to be incorporated into the normal work sequence.

PART 3 EXECUTION

3.1 SEISMIC RESTRAINTS

A. General:
1. Install and adjust seismic restraints so that the equipment, piping, and ductwork supports are not degraded by the restraints.
2. Restraints must not short circuit vibration isolation systems or transmit objectionable vibration or noise.

B. Supported Equipment:
1. Each vibration isolation frame for supported equipment shall have a minimum of four seismic snubbers mounted as close as possible to the vibration isolators and/or the frame extremities.
2. Care must be taken so that a minimum 1/8-inch air gap in the seismic restraint snubber is preserved on all sides in order that the vibration isolation potential of the isolator is not compromised. This requires that the final snubber adjustment be completed after the vibration isolators are properly installed and the installation approved.

C. Bracing of Pipes:
1. Branch lines may not be used to brace main lines.
2. Transverse bracing shall be at 40 feet maximum except where a lesser spacing is indicated in the SMACNA tables for bracing of pipes.
3. Longitudinal bracing shall be at 80 feet maximum except where a lesser spacing is indicated in the tables. In pipes where thermal expansion is a consideration, an anchor point may be used as the specified longitudinal brace provided that it has a capacity equal to or greater than a longitudinal brace. The longitudinal braces and connections must be capable of resisting the additional force induced by expansion and contraction.
4. A rigid piping system shall not be braced to dissimilar parts of the building or to two dissimilar building systems that may respond differently during an earthquake.
5. Transverse bracing for one pipe section may also act as longitudinal bracing for a pipe section of the same size connected perpendicular to it if the bracing is installed within 24 inches of the elbow or tee.

D. Suspended Equipment and Piping Cable Method:

1. Cables shall be adjusted to a degree of slackness approved by the Structural Engineer.
2. Uplift and downward restraint nuts and washers for the Type HST hangers shall be adjusted so that there is a minimum 1/4-inch clearance.

END OF SECTION 22 05 49

IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Nameplates.

B. Tags.

C. Stencils.

D. Pipe Markers.

E. Ceiling tacks.

F. Labels.

G. Lockout devices.

1.2 RELATED REQUIREMENTS

A. Section 09 90 00 - Painting and Coating: Identification painting.

1.3 REFERENCE STANDARDS

A. ASME A13.1 - Scheme for the Identification of Piping Systems; 2015.

B. ASTM D709 - Standard Specification for Laminated Thermosetting Materials; 2016.

1.4 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. List: Submit list of wording, symbols, letter size, and color coding for mechanical identification.

C. Chart and Schedule: Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.

D. Product Data: Provide manufacturers catalog literature for each product required.

E. Manufacturer's Installation Instructions: Indicate special procedures, and installation.

F. Project Record Documents: Record actual locations of tagged valves.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Brady Corporation: www.bradycorp.com.

B. Safety Sign Company: www.safetysignco.com.

C. Seton Identification Products: www.seton.com/aec.

D. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 NAMEPLATES

A. Description: Laminated three-layer plastic with engraved letters.
   1. Letter Color: Black.
   2. Letter Height: 1/2 inch.
   3. Background Color: Yellow.
   4. Plastic: Conform to ASTM D709.

2.3 TAGS

A. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inch diameter.

B. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch diameter with smooth edges.

C. Valve Tag Chart: Typewritten letter size list in anodized aluminum frame.

2.4 STENCILS

A. Stencils: With clean cut symbols and letters of following size:
   1. 3/4 to 1-1/4 inch Outside Diameter of Insulation or Pipe: 8 inch long color field, 1/2 inch high letters.
   2. 1-1/2 to 2 inch Outside Diameter of Insulation or Pipe: 8 inch long color field, 3/4 inch high letters.
   3. 2-1/2 to 6 inch Outside Diameter of Insulation or Pipe: 12 inch long color field, 1-1/4 inch high letters.
   4. 8 to 10 inch Outside Diameter of Insulation or Pipe: 24 inch long color field, 2-1/2 inch high letters.
   5. Over 10 inch Outside Diameter of Insulation or Pipe: 32 inch long color field, 3-1/2 inch high letters.
   6. Ductwork and Equipment: 2-1/2 inch high letters.

B. Stencil Paint: As specified in Section 09 91 23, semi-gloss enamel, colors conforming to ASME A13.1.

2.5 PIPE MARKERS

A. Comply with ASME A13.1.

B. Plastic Pipe Markers: Factory fabricated, flexible, semi- rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.

C. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

D. Underground Plastic Pipe Markers: Bright colored continuously printed plastic ribbon tape, minimum 6 inches wide by 4 mil thick, manufactured for direct burial service.

2.6 CEILING TACKS

A. Description: Steel with 3/4 inch diameter color coded head.

B. Color code as follows:
   1. Plumbing Valves: Green.

2.7 LABELS

A. Description: Aluminum, size 1.9 x 0.75 inches, adhesive backed with printed identification.

2.8 LOCKOUT DEVICES

A. Lockout Hasps:
   1. Manufacturers:
      a. Anodized aluminum or reinforced nylon hasp with erasable label surface; size minimum 7-1/4 x 3 inches.

B. Valve Lockout Devices:
   1. Steel device preventing access to valve operator, accepting lock shackle.

PART 3 EXECUTION

3.1 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

3.2 INSTALLATION

A. Install plastic nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.

B. Install tags with corrosion resistant chain.

C. Apply stencil painting in accordance with Section 09 91 23.

D. Install plastic pipe markers in accordance with manufacturer's instructions.

E. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.

F. Install underground plastic pipe markers 6 to 8 inches below finished grade, directly above buried pipe.

G. Identify control panels and major control components outside panels with plastic nameplates.

H. Identify valves in main and branch piping with tags.

I. Identify piping, concealed or exposed, with plastic 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.

END OF SECTION 22 05 53

PLUMBING PIPING INSULATION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Piping insulation.

B. Jackets and accessories.

1.2 RELATED REQUIREMENTS

A. Section 07 84 00 - Firestopping.

B. Section 09 90 00 - Painting and Coating: Painting insulation jacket.

C. Section 22 10 05 - Plumbing Piping: Placement of hangers and hanger inserts.

1.3 REFERENCE STANDARDS

A. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.

B. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric); 2014.

C. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus; 2013.

D. ASTM C195 - Standard Specification for Mineral Fiber Thermal Insulating Cement; 2007 (Reapproved 2013).

E. ASTM C449 - Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement; 2007 (Reapproved 2013).

F. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation; 2015.

G. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel; 2008 (Reapproved 2013).

H. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.

I. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2014.

1.4 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

C. Manufacturer's Instructions: Indicate installation procedures that ensure acceptable workmanship and installation standards will be achieved.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years of documented experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified in this section with minimum three years of documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

1.7 FIELD CONDITIONS

A. Maintain ambient conditions required by manufacturers of each product.

B. Maintain temperature before, during, and after installation for minimum of 24 hours.

PART 2 PRODUCTS

2.1 REQUIREMENTS FOR ALL PRODUCTS OF THIS SECTION

A. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84.

B. Materials shall not contain pentabrominated diphenyl ethers (PBDEs) in amounts greater than allowed by Oregon law.

2.2 GLASS FIBER

A. Manufacturers:
1. Knauf Insulation: www.knaufusa.com.
2. Johns Manville: www.jm.com.
3. Owens Corning Corp: www.owenscorning.com.
4. CertainTeed Corporation: www.certainteed.com.

5. Substitutions: See Section 01 60 00 - Product Requirements.

B. Insulation: ASTM C547 ; rigid molded, noncombustible.
1. 'K' value: ASTM C177, 0.24 at 75 degrees F.
2. Maximum service temperature: 850 degrees F.
3. Maximum moisture absorption: 0.2 percent by volume.

C. Insulation: ASTM C547 ; semi-rigid, noncombustible, end grain adhered to jacket.
1. 'K' value: ASTM C177, 0.24 at 75 degrees F.
2. Maximum service temperature: 650 degrees F.
3. Maximum moisture absorption: 0.2 percent by volume.

D. Vapor Barrier Jacket: White Kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E96/E96M of 0.02 perm-inches.

E. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.

F. Vapor Barrier Lap Adhesive:
1. Compatible with insulation.

G. Insulating Cement/Mastic:
1. ASTM C195; hydraulic setting on mineral wool.

H. Indoor Vapor Barrier Finish:
1. Cloth: Untreated; 9 oz/sq yd weight.
2. Vinyl emulsion type acrylic, compatible with insulation, black color.

I. Outdoor Vapor Barrier Mastic:
1. Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.

J. Outdoor Breather Mastic:
1. Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.

K. Insulating Cement:
1. ASTM C449/C449M.

2.3 JACKETS

A. PVC Plastic.
1. Manufacturers:
a. Johns Manville Corporation: www.jm.com.
b. Substitutions: See Section 01 60 00 - Product Requirements.
2. Jacket: One piece molded type fitting covers and sheet material, off-white color.
a. Minimum Service Temperature: 0 degrees F.
b. Maximum Service Temperature: 150 degrees F.

c. Moisture Vapor Permeability: 0.002 perm inch, maximum, when tested in accordance with ASTM E96/E96M.
d. Thickness: 20 mil.
e. Connections: Brush on welding adhesive.

3. Covering Adhesive Mastic:
   a. Compatible with insulation.

B. Canvas Jacket: UL listed 6 oz/sq yd plain weave cotton fabric treated with dilute fire retardant lagging adhesive.
   1. Lagging Adhesive:
      a. Compatible with insulation.

C. Aluminum Jacket: ASTM B209 (ASTM B209M) formed aluminum sheet.
   1. Manufacturers:
      a. Childers Products Co.: www.fosterproducts.com.
      b. Substitutions: See Section 01 60 00 - Product Requirements.
   2. Thickness: 0.016 inch sheet.
   3. Finish: Embossed.
   4. Joining: Longitudinal slip joints and 2 inch laps.
   5. Fittings: 0.016 inch thick die shaped fitting covers with factory attached protective liner.
   6. Metal Jacket Bands: 3/8 inch wide; 0.02 inch thick aluminum.

D. Stainless Steel Jacket: ASTM A666, Type 304 stainless steel.
   1. Thickness: 0.010 inch.
   2. Finish: Smooth.
   3. Metal Jacket Bands: 3/8 inch wide; 0.015 inch thick stainless steel.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that piping has been tested before applying insulation materials.

B. Verify that surfaces are clean and dry, with foreign material removed.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with NAIMA National Insulation Standards.

C. Exposed Piping: Locate insulation and cover seams in least visible locations.

D. Insulated pipes conveying fluids below ambient temperature: Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.

E. Glass fiber insulated pipes conveying fluids below ambient temperature:
   1. Provide vapor barrier jackets, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.
   2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.

F. For hot piping conveying fluids 140 degrees F or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.

G. For hot piping conveying fluids over 140 degrees F, insulate flanges and unions at equipment.

H. Glass fiber insulated pipes conveying fluids above ambient temperature:
   1. Provide standard jackets, with or without vapor barrier, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples.
   2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.

I. Inserts and Shields:
   1. Application: Piping 1-1/2 inches diameter or larger.
   2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
   3. Insert location: Between support shield and piping and under the finish jacket.
   4. Insert configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.
   5. Insert material: Hydrous calcium silicate insulation or other heavy density insulating material suitable for the planned temperature range.

J. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, refer to Section 07 84 00.

K. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces (less than 10 feet above finished floor): Finish with PVC jacket and fitting covers.

3.3 SCHEDULES

A. Plumbing Systems:
   1. Domestic Hot Water Supply:
      a. Glass Fiber, Rigid, Insulation:

         1) Pipe Size Range: Under 2 inch.

         2) Thickness: 1 inch.

         3) Pipe Size Range: Over 2 inch.

4) Thickness: 1-1/2 inch.

2. Domestic Hot Water Recirculation:
   a. Glass Fiber Insulation:

      1) Pipe Size Range: All sizes.

      2) Thickness: 1 inch.

3. Domestic Cold Water:
   a. Glass Fiber, Rigid, Insulation:

      1) Pipe Size Range: 1 inch and under.

      2) Thickness: 1/2 inch.

      3) Pipe Size Range: Over 1 inch.

      4) Thickness: 1 inch.

END OF SECTION 22 07 19

PLUMBING PIPING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Pipe, pipe fittings, valves, and connections for piping systems.
   1. Sanitary sewer.
   2. Domestic water.
   3. Flanges, unions, and couplings.
   4. Pipe hangers and supports.
   5. Valves.
   6. Flow controls.
   7. Check valves.
   8. Water pressure reducing valves.
   9. Relief valves.
   10. Strainers.

1.2 RELATED REQUIREMENTS

A. Section 07 84 00 - Firestopping.

B. Section 08 31 00 - Access Doors and Panels.

C. Section 09 90 00 - Painting and Coating.

D. Section 22 05 49 - Plumbing Seismic Restraint.

E. Section 22 05 53 - Identification for Plumbing Piping and Equipment.

F. Section 22 07 19 - Plumbing Piping Insulation.

G. Division 26 - Equipment Wiring: Electrical characteristics and wiring connections.

1.3 REFERENCE STANDARDS

A. ANSI Z21.22 - American National Standard for Relief Valves and Automatic Gas Shutoff Devices for Hot Water Supply Systems; 1999, and addenda A&B (R2004).

B. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2012.

C. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2013.

D. ASME B31.9 - Building Services Piping; 2014.

E. ASME BPVC-IV - Boiler and Pressure Vessel Code, Section IV - Rules for Construction of Heating Boilers; 2015.

F. ASME BPVC-IX - Boiler and Pressure Vessel Code, Section IX - Welding, Brazing, and Fusing Qualifications; 2015.

G. ASSE 1003 - Performance Requirements for Water Pressure Reducing Valves for Domestic Water Distribution Systems; 2009.

H. ASTM B32 - Standard Specification for Solder Metal; 2008 (Reapproved 2014).

I. ASTM B42 - Standard Specification for Seamless Copper Pipe, Standard Sizes; 2015a.

J. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2014.

K. ASTM D2235 - Standard Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings; 2004 (Reapproved 2011).

L. ASTM D2564 - Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems; 2012.

M. ASTM D2665 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings; 2014.

N. ASTM D2729 - Standard Specification for Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2011.

O. ASTM D2751 - Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings; 2005.

P. ASTM D2855 - Standard Practice for Making Solvent-Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings; 1996 (Reapproved 2010).

Q. ASTM D3034 - Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2015.

R. ASTM F628 - Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe With a Cellular Core; 2012e2.

S. ASTM F877 - Standard Specification for Crosslinked Polyethylene (PEX) Plastic Hot- and Cold-Water Distribution Systems; 2011a.

T. AWS A5.8M/A5.8 - Specification for Filler Metals for Brazing and Braze Welding; 2011-AMD 1.

U. AWWA C651 - Disinfecting Water Mains; 2014.

V. CISPI 301 - Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste and Vent Piping Applications; 2009 (Revised 2012).

W. 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; 2011 (Revised 2012).

X. ICC-ES AC01 - Acceptance Criteria for Expansion Anchors in Masonry Elements; 2015.

Y. ICC-ES AC106 - Acceptance Criteria for Predrilled Fasteners (Screw Anchors) in Masonry Elements; 2012.

Z. ICC-ES AC193 - Acceptance Criteria for Mechanical Anchors in Concrete Elements; 2015.

AA. ICC-ES AC308 - Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements; 2015.

AB. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2009.

AC. MSS SP-80 - Bronze Gate, Globe, Angle and Check Valves; 2013.

AD. MSS SP-85 - Cast Iron Globe & Angle Valves, Flanged and Threaded Ends; 2011.

AE. NSF 61 - Drinking Water System Components - Health Effects; 2014 (Errata 2015).

1.4 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.

C. Shop Drawings: For non-penetrating rooftop supports, submit detailed layout developed for this project, with design calculations for loadings and spacings.

D. Project Record Documents: Record actual locations of valves.

1.5 QUALITY ASSURANCE

A. Perform work in accordance with all applicable local codes and standards.

B. Valves: Manufacturer's name and pressure rating marked on valve body.

C. Welding Materials and Procedures: Conform to ASME (BPV IX) .

D. Welder Qualifications: Certified in accordance with ASME (BPV IX).

E. Identify pipe with marking including size, ASTM material classification, ASTM specification, water pressure rating.

1.6 REGULATORY REQUIREMENTS

A. Perform work in accordance with applicable plumbing code.

B. Conform to applicable code for installation of backflow prevention devices.

C. Provide certificate of compliance from authority having jurisdiction indicating approval of installation of backflow prevention devices.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.

B. Provide temporary protective coating on cast iron and steel valves.

C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system. Store pipe on sleepers, a minimum of 4 inches above surrounding grade, at all times.

PART 2 PRODUCTS

2.1 SANITARY SEWER PIPING, BURIED WITHIN 5 FEET OF BUILDING

A. Cast Iron Pipe: CISPI 301, hubless.
   1. Fittings: Cast iron.
   2. Joints: Neoprene gaskets and stainless steel clamp-and-shield assemblies. Mission Heavyweight, Husky 4000, Clamp-All 120 system, or approved.

B. ABS Pipe: ASTM D2751 or ASTM F628.
   1. Fittings: ABS.
   2. Joints: Solvent welded with ASTM D2235 cement.

C. PVC Pipe: ASTM D2665 or ASTM D3034.
   1. Fittings: PVC.
   2. Joints: Solvent welded, with ASTM D2564 solvent cement.

2.2 SANITARY SEWER PIPING, ABOVE GRADE

A. Cast Iron Pipe: CISPI 301, hubless, service weight.
   1. Fittings: Cast iron.
   2. Joints: CISPI 310, neoprene gaskets and stainless steel clamp-and-shield assemblies.

B. ABS Pipe: ASTM D2751 or ASTM F628.
   1. Fittings: ABS.
   2. Joints: Solvent welded with ASTM D2235 cement.

C. PVC Pipe: ASTM D2729.
   1. Fittings: PVC.
   2. Joints: Solvent welded, with ASTM D2564 solvent cement.

2.3 WATER PIPING, BURIED WITHIN 5 FEET OF BUILDING

A. Copper Pipe: ASTM B42, annealed.
   1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22 wrought copper and bronze.
   2. Joints: AWS A5.8, BCuP silver braze.

2.4 WATER PIPING, ABOVE GRADE

A. Copper Tube: ASTM B88 (ASTM B88M), Type L (B), Drawn (H).
   1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
   2. Joints: ASTM B32, alloy Sn95 solder.

2.5 FLANGES, UNIONS, AND COUPLINGS

A. Unions for Pipe Sizes 3 Inches and Under:
   1. Ferrous pipe: Class 150 malleable iron threaded unions.
   2. Copper tube and pipe: Class 150 bronze unions with soldered joints.

B. Flanges for Pipe Size Over 1 Inch:
   1. Ferrous pipe: Class 150 malleable iron threaded or forged steel slip-on flanges; preformed neoprene gaskets.
   2. Copper tube and pipe: Class 150 slip-on bronze flanges; preformed neoprene gaskets.

C. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

2.6 PIPE HANGERS AND SUPPORTS

A. Manufacturers:
   1. Tolco Inc.
   2. Anvil.
   3. Hubbard Enterprises/Holdrite.

4. Michigan Hanger Company, Inc.
5. PHD Manufacturing Co.
6. Superstrut.
7. Unistrut.
8. Substitutions: See Section 01 60 00 - Administrative Requirements.

B. Provide hangers and supports that comply with MSS SP-58.
1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
2. Overhead Supports: Individual steel rod hangers attached to structure or to trapeze hangers.
   a. Cold and Hot Pipe Sizes 6 Inches and Over: Double hangers.
3. Trapeze Hangers: Welded steel channel frames attached to structure.
4. Vertical Pipe Support: Steel riser clamp.
5. Floor Supports: Concrete pier or steel pedestal with floor flange; fixture attachment.

C. Plumbing Piping - Drain, Waste, and Vent:
1. Hangers for Pipe Sizes 1/2 Inch to 1-1/2 Inches: Malleable iron, adjustable swivel, split ring.
2. Hangers for Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
3. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
4. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

D. Plumbing Piping - Water:
1. Hangers for Pipe Sizes 1/2 Inch to 1-1/2 Inches: Malleable iron, adjustable swivel, split ring.
2. Hangers for Cold Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
3. Hangers for Hot Pipe Sizes 2 Inches to 4 Inches: Carbon steel, adjustable, clevis.
4. Hangers for Hot Pipe Sizes 6 Inches and Over: Adjustable steel yoke, cast iron pipe roll, double hanger.
5. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
6. Floor Support for Hot Pipe Sizes to 4 Inches: Cast iron adjustable pipe saddle, locknut, nipple, floor flange, and concrete pier or steel support.
7. Floor Support for Hot Pipe Sizes 6 Inches and Over: Adjustable cast iron pipe roll and stand, steel screws, and concrete pier or steel support.
8. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
9. Use non-metallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.
10. For vertical midspan support of piping 4 inches and under, use Hubbard Enterprises/Holdrite Stout Bracket in conjunction with Hubbard Enterprises/Holdrite Stout Clamp or industry standard two-hole pipe clamp (MSS Type 26).
11. Secondary Pipe Positioning and Supports:
    a. Makeshift, field-devised methods of plumbing pipe support, such as the use of scrap framing materials, are not allowed. Support and positioning of piping shall be by means of engineered methods that comply with IAPMO PS 42-96. These are to be Hubbard Enterprises/Holdrite support systems or approved equal.

E. Hanger Fasteners: Attach hangers to structure using appropriate fasteners, as follows:
   1. Concrete Wedge Expansion Anchors: Complying with ICC-ES AC193.
   2. Masonry Wedge Expansion Anchors: Complying with ICC-ES AC01.
   3. Concrete Screw Type Anchors: Complying with ICC-ES AC193.
   4. Masonry Screw Type Anchors: Complying with ICC-ES AC106.
   5. Concrete Adhesive Type Anchors: Complying with ICC-ES AC308.
   6. Other Types: As required.
   7. Manufacturers:
      a. Powers Fasteners, Inc.: www.powers.com.
      b. Substitutions: See Section 01 60 00 - Product Requirements.

2.7 ACCESSORIES

A. Hanger Rods: Mild steel, threaded both ends, threaded on one end, or continuous threaded.

2.8 INSERTS

A. Manufacturers:
   1. Anvil Fig. 281.
   2. PHD Fig 951.
   3. Michigan Hanger Model 355EG.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Inserts: Carbon steel 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.

2.9 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.

D. Flexible Flashing: 1.85 inch thick sheet butyl; compatible with roofing.

E. Caps: Steel, 22 gage minimum; 16 gage at fire resistant elements.

2.10 SLEEVES

A. Sleeves for Pipes Through Non-fire Rated Floors and Walls.
   1. ProSet
   2. Hilti

B. ASTM E-184 Sleeves for Pipes Through Rated Floors and Walls.
   1. ProSet "Firestop Penetrators".
   2. Hilti "Firestop" Systems.

C. Sealant: Acrylic; refer to Section 07 92 00 - Joint Sealant.

2.11 MECHANICAL SLEEVE SEALS

A. Manufacturers:
   1. Thunderline Link-Seal, Inc. Model Series LS.
   2. NMP Corporation.
   3. Substitutions: See 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.

2.12 FORMED STEEL CHANNEL

A. Manufacturers:
   1. Unistrut Model Series P1000.
   2. Superstrut Model Series 1200.
   3. Michigan Hanger “O-Strut” Model A-12.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Product Description: Galvanized 12 gage thick steel. With holes 1-1/2 inches on center.

2.13 FIRESTOPPING

A. Manufacturers:
   1. Specified Technology Inc. (STI) Model SpecSeal Series 100.
   2. Dow Corning Corp.
   3. Hilti Corp.
   4. International Protective Coating Corp.
   5. 3M fire Protection Products.
   6. Metacaulk by Rectorseal.
   7. Substitutions: See 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: Single or multiple component silicone elastomeric compound and compatible silicone sealant.
   2. Foam Firestopping Compounds: Single or Multiple component foam compound.

3. Formulated Firestopping Compound of Incombustible Fibers: Formulated compound mixed with incombustible non-asbestos fibers.
4. Fiber Stuffing and Sealant Firestopping: Composite of mineral or ceramic fiber stuffing insulation with silicone elastomer for smoke stopping.
5. Mechanical Firestopping Device with Fillers: Mechanical device with incombustible fillers and silicone elastomer, covered with sheet stainless steel jacket, joined with collars, penetration sealed with flanged stops.
6. Intumescent Firestopping: Intumescent putty compound which expands on exposure to surface heat gain.
7. Firestop Pillows: Formed mineral fiber pillows.

C. Color: As selected from manufacturer's full range of colors.

2.14 FIRESTOPPING ACCESSORIES

A. Primer: Type recommended by firestopping manufacturer for specific substrate surfaces and suitable for required fire ratings.

B. Dam Material: Permanent:
1. Mineral fiberboard.
2. Mineral fiber matting.
3. Sheet metal.
4. Plywood or particle board.
5. Alumina silicate fire board.

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.
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 piping is exposed.
2. For exterior wall openings below grade, furnish mechanical sealing device to continuously fill annular space between piping and cored opening or water-stop type wall sleeve.

2.15 GATE VALVES

A. Manufacturers:
1. Hammond Valve Co.; Model IB640: www.hammondvalve.com.
2. Nibco, Inc.; T-111: www.nibco.com.
3. Milwaukee Valve Company; Model 148: www.milwaukeevalve.com.
4. Stockham; Model B-100: www.stockham.com.
5. Apollo Valve: Model 101SLF: www.apollovalves.com.
6. Substitutions: See Section 01 60 00 - Product Requirements.

B. Up To and Including 3 Inches:
   1. MSS SP-80, Class 150, bronze body, bronze trim, rising stem, handwheel, inside screw, solid wedge disc, solder or threaded ends.

2.16 BALL VALVES

A. Manufacturers:
   1. Hammond Valve Co.; Model 8501: www.hammondvalve.com.
   2. Nibco, Inc.; T-FP-600: www.nibco.com.
   3. Watts; Model FBV-1: www.watts.com.
   4. Stockham; Model S216-BR-R-T: www.stockham.com.
   5. Apollo; Model 77CLF: www.apollovalves.com.
   6. Milwaukee Valve Company; Model BA-125: www.milwaukeevalve.com.
   7. Substitutions: See Section 01 60 00 - Product Requirements.

B. Up to and including 3 inches:
   1. MSS SP 110, Class 150, 600 WOG, bronze, two piece body, chrome plated brass ball, full port, teflon seats and stuffing box ring, blow-out proof stem, lever handle solder or threaded ends.

2.17 BUTTERFLY VALVES

A. Manufacturers:
   1. Hammond Valve; Model 6200: www.hammondvalve.com.
   2. Nibco, Inc.; Model LD-3110: www.nibco.com.
   3. Watts; Model BF-03: www.watts.com.
   4. Stockham; Model LG-712: www.stockham.com.
   5. Milwaukee Valve Company; Model "C" Series: www.milwaukeevalve.com.
   6. Apollo Valve; Model LD141 Series: www.apollovalves.com.
   7. Substitutions: See Section 01 60 00 - Product Requirements.

B. Construction 3 Inches and Larger: MSS SP-67, 200 psi CWP, cast or ductile iron body, aluminum bronze disc, resilient replaceable EPDM seat, lug ends, extended neck, 10 position lever handle.

C. Provide gear operators for valves 8 inches and larger, and chain-wheel operators for valves mounted over 8 feet above floor.

2.18 FLOW CONTROLS

A. Manufacturers:
   1. ITT Bell & Gossett: www.bellgossett.com.
   2. Griswold Controls: www.griswoldcontrols.com.
   3. Taco, Inc.: www.taco-hvac.com.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Construction: Class 125, Brass or bronze body with union on inlet and outlet, temperature and pressure test plug on inlet and outlet, blowdown/backflush drain.

C. Calibration: Control flow within 5 percent of selected rating, over operating pressure range of 10 times minimum pressure required for control, maximum minimum pressure 3.5 psi.

2.19 SWING CHECK VALVES

A. Manufacturers:
1. Hammond Valve; Model IB940: www.hammondvalve.com.
2. Nibco, Inc.; T-418: www.nibco.com.
3. Stockham; Model B-320: www.stockham.com.
4. Milwaukee Valve Company; Model F-2974: www.milwaukeevalve.com.
5. Apollo Valve; Model 910F: www.apollovalves.com.
6. Substitutions: See Section 01 60 00 - Product Requirements.

B. Up to 3 Inches:
1. 1, Class 125, bronze body and cap, bronze swing disc with rubber seat, solder or threaded ends.

2.20 SPRING LOADED CHECK VALVES

A. Manufacturers:
1. Hammond Valve; IR9354: www.hammondvalve.com.
2. Nibco, Inc.; Model F-910: www.nibco.com.
3. Milwaukee Valve Company; Model Series 1800: www.milwaukeevalve.com.
4. Apollo Valve; Model 910WB: www.apollovalves.com.
5. Substitutions: See Section 01 60 00 - Product Requirements.

B. Class 125, globe style, iron body, bronze trim, stainless steel springs, bronze disc, seals, lug style ends.

2.21 WATER PRESSURE REDUCING VALVES

A. Manufacturers:
1. Watts Regulator Company: www.wattsregulator.com.
2. Cash-Acme: www.cashacme.com.
3. Zurn/Wilkins: www.zurn.com.
4. Apollo Valve: www.apollovalves.com.
5. Substitutions: See Section 01 60 00 - Product Requirements.

B. Up to 2 Inches:
1. ASSE 1003, bronze body, stainless steel and thermoplastic internal parts, fabric reinforced diaphragm, strainer, threaded single union ends.

C. Over 2 Inches:

1. ASSE 1003, cast iron body, bronze fitted, elastomeric diaphragm and seat disc, flanged.

2.22 RELIEF VALVES

A. Pressure Relief:
   1. Manufacturers:
      a. Watts Regulator Company: www.wattsregulator.com.
      b. Cash-Acme: www.cashacme.com.
      c. Zurn/Wilkins: www.zurn.com.
      d. Apollo Valve: www.apollovalves.com.
      e. Substitutions: See Section 01 60 00 - Product Requirements.
   2. AGA Z21.22 certified, bronze body, teflon seat, steel stem and springs, automatic, direct pressure actuated.

B. Temperature and Pressure Relief:
   1. Manufacturers:
      a. Watts Regulator Company: www.wattsregulator.com.
      b. Cash-Acme: www.cashacme.com.
      c. Zurn/Wilkins: www.zurn.com.
      d. Apollo Valve: www.apollovalves.com.
      e. Substitutions: See Section 01 60 00 - Product Requirements.
   2. AGA Z21.22 certified, bronze body, teflon seat, stainless steel stem and springs, automatic, direct pressure actuated, temperature relief maximum 210 degrees F, capacity ASME (BPV IV) certified and labelled.

2.23 STRAINERS

A. Manufacturers:
   1. Watts Regulator Company: www.wattsregulator.com.
   2. Hammond Valve: www.hammondvalve.com.
   3. Milwaukee Valve Company: www.milwaukeevalve.com.
   4. Apollo: www.apollovalves.com.
   5. Stockham: www.stockham.com.
   6. Nibco, Inc.: www.nibco.com.
   7. Substitutions: See Section 01 60 00 - Product Requirements.

B. Size 2 inch and Under:
   1. Threaded brass body for 175 psi CWP, Y pattern with 1/32 inch stainless steel perforated screen.
   2. Class 150, threaded bronze body 300 psi CWP, Y pattern with 1/32 inch stainless steel perforated screen.

C. Size 1-1/2 inch to 4 inch:
   1. Class 125, flanged iron body, Y pattern with 1/16 inch stainless steel perforated screen.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that excavations are to required grade, dry, and not over-excavated.

3.2 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and dirt, on inside and outside, before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.

C. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.

D. Install piping to maintain headroom, conserve space, and not interfere with use of space.

E. Group piping whenever practical at common elevations.

F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

G. 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 19.

H. Provide access where valves and fittings are not exposed. Coordinate size and location of access doors with Section 08 31 00.

I. Establish elevations of buried piping outside the building to ensure not less than 2 ft of cover.

J. Provide tracer wire over top of piping.
   1. Construction:
      a. Conductor: Solid or stranded copper per spec ASTM B-1.
      b. Insulation: High Molecular Weight Polyethylene (HMWPE) ASTM D-1248. Various insulation colors dependant on usage.
      c. Temperature: 70 degrees C dry and wet.
      d. Voltage: 20 and 30 Mil = 30 to 300 volts. 45 Mil = 600 volts.

K. Install vent piping penetrating roofed areas to maintain integrity of roof assembly.

L. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.

M. Provide support for utility meters in accordance with requirements of utility companies.

N. Prepare exposed, unfinished pipe, fittings, supports, and accessories ready for finish painting. Refer to Section 09 90 00.

O. Excavate in accordance with specifications.

P. Backfill in accordance with specifications.

Q. Install valves with stems upright or horizontal, not inverted.

R. Install water piping to ASME B31.9.

S. PVC Pipe: Make solvent-welded joints in accordance with ASTM D2855.

T. Sleeve pipes passing through partitions, walls and floors.

U. Inserts:
   1. Provide inserts for placement in concrete formwork.
   2. Provide 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.
   5. For pipe runs of 1 inch or less and ran high and tight to the structure, use Hubbard Enterprises/Holdrite #121 or #125 Series Brackets in conjunction with Hubbard Enterprises/Holdrite #260 or #400 Series Inserts or approved equal.
   6. 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.

V. Pipe Hangers and Supports:
   1. Install in accordance with ASME B31.9.
   2. Support horizontal piping as scheduled.
   3. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
   4. Place hangers within 12 inches of each horizontal elbow.
   5. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
   6. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.

7. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
8. Provide copper plated hangers and supports for copper piping or sheet lead packing between hanger or support and piping.
9. Prime coat exposed steel hangers and supports. Refer to Section 09 90 00. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.
10. Provide hangers adjacent to motor driven equipment with vibration isolation; refer to Section 22 05 48.
11. Support cast iron drainage piping at every joint.
12. Support of pipe tubing and equipment is to be accomplished by means of engineered products specific to each application. Makeshift field devised methods will not be allowed.

3.4 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. Solder adapters to pipe.

C. Install gate, ball, or butterfly valves for shut-off and to isolate equipment, part of systems, or vertical risers.

D. Install ball or butterfly valves for throttling, bypass, or manual flow control services.

E. Provide lug end butterfly valves adjacent to equipment when provided to isolate equipment.

F. Provide spring loaded check valves on discharge of water pumps.

G. Provide flow controls in water recirculating systems where indicated.

3.5 TOLERANCES

A. Drainage Piping: Establish invert elevations within 1/2 inch vertically of location indicated and slope to drain at minimum of 1/4 inch per foot slope.

B. Water Piping: Slope at minimum of 1/32 inch per foot and arrange to drain at low points.

3.6 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

A. Prior to starting work, verify system is complete, flushed and clean.

B. Ensure Ph of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).

C. Inject disinfectant, free chlorine in liquid, powder, tablet or gas form, throughout system to obtain 50 to 80 mg/L residual.

D. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 percent of outlets.

E. Maintain disinfectant in system for 24 hours.

F. If final disinfectant residual tests less than 25 mg/L, repeat treatment.

G. Flush disinfectant from system until residual equal to that of incoming water or 1.0 mg/L.

H. Take samples no sooner than 24 hours after flushing, from 10 percent of outlets and from water entry, and analyze in accordance with AWWA C651.

END OF SECTION 22 10 05

PLUMBING PIPING SPECIALTIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Floor drains.

B. Cleanouts.

C. Backflow preventers.

D. Water hammer arrestors.

E. Interceptors.

1.2 RELATED REQUIREMENTS

A. Section 22 10 05 - Plumbing Piping.

B. Section 22 40 00 - Plumbing Fixtures.

C. Section 22 30 00 - Plumbing Equipment.

D. Division 26 - Equipment Wiring: Electrical characteristics and wiring connections.

1.3 REFERENCE STANDARDS

A. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines; current edition.

B. ASME A112.6.3 - Floor and Trench Drains; 2001 (R2007).

C. ASSE 1012 - Backflow Preventer with Intermediate Atmospheric Vent; 2009.

D. PDI-WH 201 - Water Hammer Arresters; 2010.

1.4 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide component sizes, rough-in requirements, service sizes, and finishes.

C. Shop Drawings: Indicate dimensions, weights, and placement of openings and holes.

D. Certificates: Certify that grease interceptors meet or exceed specified requirements.

E. Manufacturer's Instructions: Indicate Manufacturer's Installation Instructions: Indicate assembly and support requirements.

F. Project Record Documents: Record actual locations of equipment, cleanouts, backflow preventers, water hammer arrestors.

G. Operation Data: Indicate frequency of treatment required for interceptors.

H. Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views.

I. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. Extra Loose Keys for Outside Hose Bibbs: Two.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Accept specialties on site in original factory packaging. Inspect for damage.

PART 2 PRODUCTS

2.1 DRAINS

A. Floor Drain (FD-1):
   1. Manufacturers:
      a. Jay R. Smith Manufacturing Company; Model 2005-A/2005-B: www.jayrsmith.com.
      b. MIFAB Inc.: www.mifab.com.
      c. Wade: www.wadedrains.com.
      d. Zurn Industries, Inc.: www.zurn.com.
      e. Sioux Chief Finish Line; Model 833-NR/833-NQ: www.siouxchief.com.
      f. Substitutions: See Section 01 60 00 - Product Requirements.
   2. ASME A112.6.3; lacquered cast iron or stainless steel, two piece body with double drainage flange, weep holes, reversible clamping collar, and round, adjustable nickel-bronze strainer.

B. Floor Drain (FD-2):
   1. Manufacturers:
      a. Jay R. Smith Manufacturing Company; Model 2110/2130: www.jayrsmith.com.
      b. MIFAB Inc.: www.mifab.com.
      c. Wade: www.wadedrains.com.
      d. Zurn Industries, Inc.: www.zurn.com.
      e. Sioux Chief Finish Line; Model 860-i: www.siouxchief.com.

f. Substitutions: See Section 01 60 00 - Product Requirements.

2. ASME A112.6.3; lacquered cast iron two piece body with double drainage flange, weep holes, reversible clamping collar, and round, adjustable cast iron strainer with acid resistant coating.

C. Floor Sink (FS-1):
1. Manufacturers:
a. Jay R. Smith Manufacturing Company: www.jayrsmith.com.
b. MIFAB Inc.: www.mifab.com.
c. Wade: www.wadedrains.com.
d. Zurn Industries, Inc.: www.zurn.com.
e. Sioux Chief; 861 Series: www.siouxchief.com.
f. Substitutions: See Section 01 60 00 - Product Requirements.
2. Lacquered cast iron body with dome strainer and seepage flange.

2.2 CLEANOUTS

A. Manufacturers:
1. Jay R. Smith Manufacturing Company: www.jayrsmith.com.
2. MIFAB Inc.: www.mifab.com.
3. Wade: www.wadedrains.com.
4. Zurn Industries, Inc.: www.zurn.com.
5. Sioux Chief Finish Line: www.siouxchief.com.
6. Substitutions: See Section 01 60 00 - Product Requirements.

B. Cleanouts at Exterior Surfaced Areas (CO-1):
1. Manufacturers:
a. Jay R. Smith Manufacturing Company; Model 4250: www.jayrsmith.com.
b. Sioux Chief; Model 834-DNR: www.siouxchief.com.
2. Round cast nickel bronze access frame and non-skid cover.

C. Cleanouts at Interior Finished Floor Areas (CO-2):
1. Lacquered cast iron body with anchor flange, threaded top assembly, and round gasketed scored cover in service areas and round gasketed depressed cover to accept floor finish in finished floor areas.

D. Cleanouts at Interior Finished Wall Areas (CO-3):
1. Line type with lacquered cast iron body and round epoxy coated gasketed cover, and round stainless steel access cover secured with machine screw.

E. Cleanouts at Interior Unfinished Accessible Areas (CO-4): Calked or threaded type. Provide bolted stack cleanouts on vertical rainwater leaders.

2.3 BACKFLOW PREVENTERS

A. Manufacturers:
1. Febco: www.febcoonline.com.

2. Zurn Industries, Inc.: www.zurn.com.
3. Apollo Valves: www.apollovalves.com.
4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Reduced Pressure Backflow Preventers:
1. ASSE 1013; bronze body with bronze internal parts and stainless steel springs; two independently operating, spring loaded check valves; diaphragm type differential pressure relief valve located between check valves; third check valve that opens under back pressure in case of diaphragm failure; non-threaded vent outlet; assembled with two gate valves, strainer, and four test cocks.

2.4 DOUBLE CHECK VALVE ASSEMBLIES

A. Manufacturers:
1. Febco: www.febcoonline.com.
2. Zurn Industries, Inc.: www.zurn.com.
3. Apollo Valves: www.apollovalves.com.
4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Double Check Valve Assemblies:
1. ASSE 1012; Bronze body with corrosion resistant internal parts and stainless steel springs; two independently operating check valves with intermediate atmospheric vent.

2.5 WATER HAMMER ARRESTORS

A. Manufacturers:
1. Jay R. Smith Manufacturing Company; Model Hydrotol: www.jayrsmith.com.
2. MIFAB Inc.: www.mifab.com.
3. Zurn Industries, Inc.: www.zurn.com.
4. Precision Plumbing Products, Inc.: www.ppcinc.net.
5. Sioux Chief: www.siouxchief.com.
6. Substitutions: See Section 01 60 00 - Product Requirements.

B. Water Hammer Arrestors:
1. Stainless steel construction, bellows type sized in accordance with PDI-WH 201, precharged suitable for operation in temperature range -100 to 300 degrees F and maximum 250 psi working pressure.

2.6 SUMPS AND INTERCEPTORS

A. Grease Interceptors:
1. Manufacturer:
   a. Endura Interceptors; Model XL 75: www.canplas.com.
2. Flow Rate: 75 US Gallons per Minute.
3. Minimum Grease Capacity: 150 lb.
4. Grease Capacity Actual: 559 lb.
5. Average Efficiency % (ASME 112.14.3): 98%.

6. Unit Weight (Empty): 223 lb.
7. Liquid Capacity: 158 gal.
8. Connection size: 4 inches.
9. Modular Riser Extensions: For use with infloor installations; sized during installation to project requirements. Use up to three (3) full risers per installations (18" maximum height adjustment). Provide with 1 inch markers/ribs on riser to aid height adjustment. All installation components to be supplied by the manufacturer.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Ensure clearance at cleanout for rodding of drainage system.

C. Encase exterior cleanouts in concrete flush with grade.

D. Install floor cleanouts at elevation to accommodate finished floor.

E. Install approved portable water protection devices on plumbing lines where contamination of domestic water may occur.

F. Pipe relief from backflow preventer to nearest drain.

G. Install water hammer arrestors complete with accessible isolation valve on hot and cold water supply piping to lavatories sinks washing machine outlets.

H. Install air chambers on hot and cold water supply piping to each fixture or group of fixtures (each washroom). Fabricate same size as supply pipe or 3/4 inch minimum, and minimum 18 inches long.

I. Install service shut-off valve for trap primers.

END OF SECTION 22 10 06

BASIC HVAC REQUIREMENTS

PART 1 GENERAL

1.1 DESCRIPTION OF WORK

A. This Section specifies the basic requirements for all Contractor installed equipment. It applies to all sections included in Division 23. The requirements herein are an expansion upon the requirements of Division 1.

B. Provide all materials, labor and equipment required to install complete and fully operational HVAC systems as indicated by the contract drawings and this specification.

C. Obtain and pay for all permits, licenses, fees and taxes applicable to this project as required by law.

D. Cooperate with other trades in furnishing material and information required for installation and operation of mechanical items.

E. Requirements for the following are included:
   1. Related work (other Contract Documents and specification sections) that must be combined with the requirements of this Section.
   2. Design performance.
   3. Delivery, storage, and handling.
   4. Quality assurance and standards.
   5. Submittals.
   6. Product quality, basic type, and finishes.
   7. Equipment identification.
   8. Design criteria.
   9. Installation.
   10. Mounting and shimming.
   11. Inspection.
   12. Safety considerations.
   13. Cleaning, startup, and adjustments.

1.2 RELATED WORK

A. This general section shall be used in conjunction with the following other specifications and related Contract Documents to establish the total requirements for the project equipment and systems:
   1. Division 1 sections included in this Project specifications.
   2. The Contract.
   3. General and specific mechanical specifications and drawings included in the project.

1.3 DEFINITIONS

A. “Indicated”: Refers to graphic representations, notes or schedules in the Drawings; or to other paragraphs or schedules in Specifications and similar requirements in the Contract Documents.
   1. Terms such as “shown”, “noted”, “scheduled”, and “specified”, are used to notify or help the user to locate reference. Location is not limited.

B. “Directed”: Terms such as “directed”, Requested”, “authorized”, “selected”, “approved”, “required”, and “permitted” mean directed by Architect/Engineer, approved by Architect/Engineer and similar phrases.

C. “Approved”: When used in conjunction with Architect/Engineer's action on contract submittals, applications, requests, is limited to Architect/Engineer's duties and responsibilities as stated in the Conditions of the Contract.

D. “Regulations”: Includes laws, ordinances, statutes and lawful orders issued by authorities having jurisdiction, as well as rules, conventions and agreements within the construction industry that control performance of Work.

E. “Furnish”: Means to supply and deliver to the Project site, ready for unloading, unpacking, assembly, installation and similar operations.

F. “Install”: Describes operations at Project site including actual unloading, temporary storage, unpacking, assembling, erecting, placing, anchoring, supporting, isolating, applying, working to dimension, finishing, curing, protecting, cleaning and similar operations.

G. “Provide”: Means to furnish and install.

H. “Installer”: A contractor, or another entity engaged by the contractor, either as an employee, subcontractor, or contractor of a lower tier, to perform a particular construction activity including installation, erection, application or similar operations.
   1. Installers are required to be experienced in operations they are engaged to perform.
   2. The term “experience” means having successfully completed a minimum of three previous projects similar in scope and size to this Project and within the time frame indicated in the “Quality Assurance” section of the Specifications. In addition, in means being familiar with special requirements indicated and having complied with requirements of authorities having jurisdiction.

I. “Project Site”: Is defined as the space available to the Contractor for performing construction activities, either exclusively or in conjunction with others performing other work as part of Project.

1.4 DESIGN PERFORMANCE

A. Compliance by the Contractor and/or Vendor with the provisions of this Specification does not relieve him of the responsibilities of furnishing equipment and materials of proper design, mechanically suited to meet operating guarantees at the specified service conditions.

1.5 SUBMITTALS

A. Product Data: Submit complete sets of manufacturer's product data in .PDF format for approval. All submittals are to be received in no more than (3) three packages. See Division 1 for further information regarding submittal requirements. Literature submitted shall clearly indicate the model number, capacity, rated operating conditions, noise levels, size, weight, support requirements, rough-in data and dimensions, electrical power requirements, wiring diagrams, utility (fuel, air, cooling water, etc.) requirements, and options furnished. Submittals shall include, but are not necessarily limited to the following;
   1. HVAC: Fans; piping; valves; supports and anchors; roof hoods; grilles; diffusers; controls and the like.
   2. Calculations: Provide for sizing of all thermal expansion and seismic restraints; and all other calculations consistent with good engineering practice. Include design criteria used and assumptions made.

B. Operation and Maintenance Data: Submit three complete sets of manufacturer's literature bound in a three ring binder for approval. Data shall include installation, start-up, and maintenance instructions, parts lists, and wiring diagrams. Include all material on a CD-ROM or USB device.

C. Substitutions: System design was based upon the equipment and materials listed on the drawings and specifications herein. At contractor's option, another manufacturer's equipment of similar quality, capacity and features may be submitted for prior approval per Section 01 60 00. Prior permission to substitute does not relieve the contractor of the responsibility of including this information in the bound submittal packages.

D. Air Balancing Report: Provide .PDF reports stating the design air and hydronic flow requirements per, air inlet and air outlet and the final adjusted airflow volume for the same.

1.6 QUALITY ASSURANCE

A. Codes and Standards: Comply with the provisions of the following codes, standards and specifications, except where more stringent requirements are shown or specified:
   1. State of Oregon "IBC".
   2. State of Oregon "IMC".
   3. State of Oregon "UPC".
   4. State of Oregon "IFC".
   5. ANSI/ASHRAE 90 - “Energy Efficient Design of New Buildings….”
   6. ANSI/ASHRAE 62 - “Ventilation for Acceptable Indoor Air Quality.”
   7. NEBB - “Procedural Standard for Testing, Adjusting and Balancing of Environmental Systems.”

8. ANSI B31.9 "Building Service Piping".
9. SMACNA - "HVAC Duct Construction Standards".
10. NFPA - Section 90B.

B. Drawings: All drawings are diagrammatic and show general design, arrangement, and extent of the systems. Do not scale drawings for rough-in dimensions, nor use as shop drawings.

C. Installer Qualifications: Company specializing in performing the work required with a minimum of five years documented experience.

D. Contractor shall furnish and install all work in accordance with manufacturers' recommendations and instructions.

1.7 DELIVERY, STORAGE AND PROTECTION

A. Delivery: Deliver to site with manufacturer's labels intact and legible.

B. Preparation for shipment:
1. Each unit shall be suitably prepared for the shipment specified and for storage in accordance with manufacturer's instructions in a manner requiring no disassembly prior to operation.
2. The Contractor shall be solely responsible for the adequacy of the Preparation for Shipment provisions employed with respect to materials and application.
3. One complete set of Installations, Operating and Maintenance Instructions shall be packed and shipped with the equipment. This set is in addition to the sets that are to be sent directly to the Owner.

C. Handling: Avoid damage. Comply with manufacturer's installation instruction requirements for rigging, unloading and transporting units.

D. Storage: Inside protected from weather, dirt and construction dust. Where necessary to store outside, elevate well above grade and enclose with durable, waterproof wrapping. Cap all pipe ends. Taping pipe ends is not adequate or allowable.

1.8 PROJECT CONDITIONS

A. General: Provide products which are compatible with other portions of the work and provide products with the proper power characteristics and similar adaptations for the project.

B. Arrangement: Arrange ductwork and piping parallel with primary lines of the building construction and with a minimum 7 feet overhead clearance in unfinished equipment rooms where possible. Conceal all piping and ductwork where possible unless indicated otherwise. Locate operating and control equipment properly to provide easy access for operation and maintenance. Give right-of-way to piping which must be sloped for drainage. Set all equipment level or as recommended by manufacturer.

C. Coordination: Where several elements of the work must be sequenced and positioned in order to fit the available space, prepare shop drawings showing the actual physical dimensions (at accurate scale) required for installation and submit prior to purchase/fabrication/installation of any of the elements involved in the coordination.

1.9 STANDARDS

A. General: Provide all new materials and equipment, identical to apparatus or equipment in successful operation for a minimum of five years. Provide materials of comparable quality omitted here but necessary to complete the work. Maximum allowable variation from stated capacities, minus 5% to plus 10% as approved in each case.

B. Governing Standards: The following are typical standards generally referenced in these specifications and identified by their acronym. Federal Specifications (FS), American Society for Testing Materials (ASTM), American National Standards Institute (ANSI), Manufacturer's Standardization Society of the Valve and Fitting Industry, Standard Practice (MSS SP-69), Cast Iron Soil Pipe Institute (CISPI), Underwriters Laboratory (UL) numbers are given.

1.10 WARRANTIES

A. Contractor shall provide a 1 year warranty on all equipment, materials and workmanship for a period of one year from the date of owner's acceptance.

B. Provide five year warranty on all refrigeration compressors.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.1 LAYOUT AND COORDINATION

A. Site Examination: Before starting work, carefully examine site and all Contract Drawings. Become thoroughly familiar with conditions governing work on this project. Verify all indicated elevations, building measurements, rough-in dimensions and equipment locations before proceeding with any work.

B. Utility Locations: The location of all utilities, wires, conduits, pipes, ducts, or other service facilities are shown in a general way only on the drawings and in some instances are taken from existing drawings. Ascertain whether any additional facilities other than those shown on the plans may be present and determine the exact location and elevations of all utilities prior to commencing installation.

C. Discrepancies: Any error, conflict or discrepancy in Drawings, Specifications and/or existing conditions shall be reported immediately. Do not proceed with any questionable items of work until clarification of same has been made. Should rearrangement or re-routing of piping or ductwork be necessary, provide for approval the simplest layout possible for that particular

portion of the work. Under no circumstances shall beams, girders, footings or columns be cut for mechanical items. Casting of pipes into concrete is prohibited unless so shown on Drawings.

D. The Contractor shall cooperate with others to avoid interferences and delays in the construction work.

E. Interference as a result of poor coordination or lack of cooperation with other trades shall be corrected at the Contractor's expense.

3.2 CONTINUITY OF EXISTING SERVICES

A. Existing water, power, heat, ventilation, air conditioning and other services shall remain in service during new construction work. Coordinate any interruption in service during new construction work. Coordinate any interruption of these services with the Owner's representative a minimum of twenty-four (24) hours in advance.

B. Protect from damage active utilities existing and evident by reasonable inspection of the site whether shown or not on the Drawings. Protect, relocate or abandon utilities encountered in the work which were not shown on the Drawings or evident by inspection of the work as directed by the Architect. Maintain continuity of all utility services to existing buildings.

3.3 CUTTING AND PATCHING

A. General: Perform cutting and patching in accordance with Division 1.

B. Protection: During cutting and patching, protect adjacent installations. Provide temporary barriers to prevent the spread of dust and dirt outside of the immediate work area.

C. Repair: Patch finished surfaces and building components using new materials to match the existing.

D. Inspection: Upon written direction from the Architect, uncover and restore work to provide for observation of concealed work.

3.4 EQUIPMENT REMOVAL

A. All removed equipment is the property of the Contractor unless indicated otherwise. Disconnect and remove all such equipment from the property. Cap all piping in walls, below floors, and/or above ceilings in finished rooms.

B. Where equipment is to be reused, reconnect piping, wiring and/or controls to allow this equipment to function as it had prior to this renovation unless indicated otherwise.

3.5 MECHANICAL EQUIPMENT WIRING

A. Provide all motor starters, control devices, and wiring complete from power source indicated on Drawings.

B. Equipment and systems shown on the Drawings and/or specifications, are based upon requirements of specific manufacturers which are intended as somewhat typical of several makes which may be approved. Provide all field wiring and/or devices necessary for a complete and operable system controls for the actual selected equipment/system.

3.6 INSTALLATION

A. Locating and Positioning Equipment: Observe all Codes and Regulations and good common practice in locating and installing mechanical equipment and material so that completed installation presents the least possible hazard. Maintain recommended clearances for repair and service to all equipment.

B. Anchorage: Anchor and/or brace all mechanical equipment, piping and ductwork to resist displacement due to seismic action, include snubbers on equipment mounted on spring isolators.

C. Where mounting heights or locations are not identified, install systems, equipment and materials to provide maximum headroom.

D. Provide clearance for installation of insulation and access to valves, fittings, damper actuators, etc. on pipe and duct systems.

E. Install systems, materials and equipment giving right of way to systems required to be installed at a specific slope or operation by gravity.

F. Provide condensate drain piping to over nearest floor drain for all coils, furnaces, boilers, domestic water heaters and the likes.

G. Provide all sheaves required for final air balance. Contractor shall not make assumptions or exceptions concerning the number of sheave replacements or adjustments necessary to meet the design requirements. Balance all HVAC systems to provide the amount of air indicated at each diffuser, grille or register.

H. Do not operate fans for any purpose until ductwork is clean, filters in place, bearings lubricated, and the fan has been test run under observation. Fans shall not be used during construction unless specifically authorized by the Owner and reviewed by the Engineer.

I. Provide balancing dampers on duct take-off to diffusers, grilles, and registers, regardless of whether dampers are specified as part of the diffuser, grille, or register assembly.

J. Installation shall be in accordance with the requirements of the equipment manufacturer, including special requirements for seismic restraints.

K. Equipment Manufacturer's Responsibility and Services:
   1. A manufacturer's representative for major equipment and operating systems shall be provided as necessary to assist the Contractor during installation, and to provide written

certification that the equipment has been installed as specified and in accordance with the manufacturer's representative.

2. The manufacturer's representative shall provide the initial startup of equipment in the presence of the Owner.
   a. Provide a pre-start check of all piping, valves, control devices, control panels, and equipment.
   b. Calibrate and adjust equipment and controls for operation at the specified design and conditions.
   c. Provide a record of all startup events noting problems and their resolution.
   d. Provide a record of all set points for operational controls and devices.
3. Upon the completion of the equipment startup, provide instructional time with the Owner's personnel to review the operations and maintenance manuals and perform each step necessary for startup, shutdown, troubleshooting, and routine maintenance. The instructional time shall be scheduled through the Owner.
4. Upon completion of the inspections, startup, testing, and checkout procedures, the equipment manufacturer shall submit written notice to the Owner that the units are ready for use by the Owner. Provide a certificate of calibration for all equipment.

3.7 MOUNTING AND SHIMMING

A. Mount equipment as shown on the Drawings. Provisions for mounting special equipment on spring isolators, snubbers, and inertia bases are specified in Section 23 05 48, Vibration Isolation and Sound and Seismic Controls for HVAC Piping and Equipment.

B. Level the equipment by means of 304 stainless steel wedges (stainless steel plates and stainless steel shims). Wedge taper shall not be greater than 1/4 inch per foot. Use double wedges to provide a level bearing surface for the equipment. Secure each pair of wedges in their final positions with one tack weld on each side after leveling is complete. Wedging shall be executed in a manner that will prevent a change in level or springing of the Baseplate when the anchor bolts are tightened.
   1. Adjust rotating equipment assemblies such that the driving units are properly aligned, plumb and level with the driven units and all interconnecting shafts and couplings.
   2. All rotating equipment shall be checked for proper alignment with dial indicators or laser after completion of grouting. The alignment must be within the tolerances required by the equipment manufacturer. The final alignment check shall be witnessed by the Owner.

3.8 INSPECTION

A. The Contractor shall inspect his work to ensure the installation and workmanship is in accordance with these specifications and acceptable industry standards for the work being done.

B. All materials, equipment, and workmanship shall be subject to inspection at any time by the Owner. Contractor shall correct any work, materials, or equipment not in accordance with the Contract Documents.

3.9 SAFETY CONSIDERATIONS

A. All equipment shall be installed with suitable access clearances that satisfy OSHA and code requirements for maintenance or removal of replaceable parts and components, and with necessary unions or flanges to perform the maintenance or removal without removing the connecting appurtenances.

B. Where equipment requiring periodic maintenance cannot be reached by normal walkways because of interference with ductwork, piping, or other obstructions the Contractor shall notify the Owner and propose an alternate safe means of access. These may include construction of an overhead platform with stairway or ladder ends and safety railings or handholds, or walk-through duct plenums with hinged access doors, or as required to meet OSHA standards for safe maintenance procedures.

3.10 CLEANING, START-UP, AND ADJUSTING

A. The Contractors shall be responsible for proper operation of all systems, minor subsystems, and services provided under this section. He shall coordinate start-up procedures, calibration, and system checkout with all project managers. Any system operational problems shall be diagnosed; all correctional procedures shall be initiated as required to bring out the system into compliance with the design, and the problem then shall be rechecked to verify that the system operates normally.

B. Thoroughly clean all parts of the installation at the completion of the work. The Contractor shall clean up and remove from the premises all refuse material, crates, and rubbish arising from his work. Remove, clean, and reinstall all filters. Belt-drive tensions and alignments shall be checked. All motors and bearings shall be lubricated in accordance with the manufacturer's service manuals prior to equipment start-up. Provide a lubrication schedule for every item of equipment furnished under this section. The schedule shall include the type of lubricant and the application frequency.

END OF SECTION 23 00 00

COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Single phase electric motors.

B. Three phase electric motors.

1.2 RELATED REQUIREMENTS

A. Division 26 - Electrical.

1.3 REFERENCE STANDARDS

A. ABMA STD 9 - Load Ratings and Fatigue Life for Ball Bearings; 2015.

B. IEEE 112 - IEEE Standard Test Procedure for Polyphase Induction Motors and Generators; 2004.

C. NEMA MG 1 - Motors and Generators; 2014.

D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.4 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide wiring diagrams with electrical characteristics and connection requirements.

C. Test Reports: Indicate test results verifying nominal efficiency and power factor for three phase motors larger than 1/2 horsepower.

D. Manufacturer's Installation Instructions: Indicate setting, mechanical connections, lubrication, and wiring instructions.

E. Operation Data: Include instructions for safe operating procedures.

F. Maintenance Data: Include assembly drawings, bearing data including replacement sizes, and lubrication instructions.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacture of electric motors and their accessories, with minimum three years documented product development, testing, and manufacturing experience.

B. Conform to NFPA 70.

C. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect motors stored on site from weather and moisture by maintaining factory covers and suitable weather-proof covering. For extended outdoor storage, remove motors from equipment and store separately.

1.7 WARRANTY

A. See Section 01 78 00 - Closeout Procedures, for additional warranty requirements.

B. Provide five year manufacturer warranty for motors larger than 20 horsepower.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. G.E. Model ECM.

B. Reliance Electric/Rockwell Automation; Model E-Master: www.reliance.com.

C. Baldor Model; Super-E: www.baldor.com.

D. Marathon Model XRI.

2.2 GENERAL CONSTRUCTION AND REQUIREMENTS

A. Electrical Service: Refer to Section 26 for required electrical characteristics.

B. Nominal Efficiency:

C. Construction:
1. Open drip-proof type except where specifically noted otherwise.
2. Design for continuous operation in 40 degrees C environment.
3. Design for temperature rise in accordance with NEMA MG 1 limits for insulation class, service factor, and motor enclosure type.

4. Motors with frame sizes 254T and larger: Energy efficient type.

D. Explosion-Proof Motors: UL approved and labelled for hazard classification, with over temperature protection.

E. Visible Nameplate: Indicating motor horsepower, voltage, phase, cycles, RPM, full load amps, locked rotor amps, frame size, manufacturer's name and model number, service factor, power factor.

F. Wiring Terminations:
1. Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70, threaded for conduit.
2. For fractional horsepower motors where connection is made directly, provide threaded conduit connection in end frame.

2.3 APPLICATIONS

A. Exception: Motors less than 250 watts, for intermittent service may be the equipment manufacturer's standard and need not conform to these specifications.

B. Single phase motors for shaft mounted fans, oil burners, and centrifugal pumps: Split phase type.

C. Single phase motors for shaft mounted fans or blowers: Permanent split capacitor type.

D. Single phase motors for fans, pumps, blowers, and air compressors: Capacitor start type.

E. Single phase motors for fans, blowers, and pumps: Capacitor start, capacitor run type.

F. Motors located in exterior locations, wet air streams downstream of sprayed coil dehumidifiers, draw through cooling towers, air cooled condensers, humidifiers, direct drive axial fans, roll filters, explosion proof environments, and dust collection systems: Totally enclosed type.

G. Motors located in outdoors, in wet air streams downstream of sprayed coil dehumidifiers, in draw through cooling towers, and in humidifiers: Totally enclosed weatherproof epoxy-treated type.

H. Motors located outdoors and in draw through cooling towers: Totally enclosed weatherproof epoxy-sealed type.

2.4 SINGLE PHASE POWER - SPLIT PHASE MOTORS

A. Starting Torque: Less than 150 percent of full load torque.

B. Starting Current: Up to seven times full load current.

C. Breakdown Torque: Approximately 200 percent of full load torque.

D. Drip-proof Enclosure: Class A (50 degrees C temperature rise) insulation, NEMA Service Factor, prelubricated sleeve or ball bearings.

E. Enclosed Motors: Class A (50 degrees C temperature rise) insulation, 1.0 Service Factor, prelubricated ball bearings.

2.5 SINGLE PHASE POWER - PERMANENT-SPLIT CAPACITOR MOTORS

A. Starting Torque: Exceeding one fourth of full load torque.

B. Starting Current: Up to six times full load current.

C. Multiple Speed: Through tapped windings.

D. Open Drip-proof or Enclosed Air Over Enclosure: Class A (50 degrees C temperature rise) insulation, minimum 1.0 Service Factor, prelubricated sleeve or ball bearings, automatic reset overload protector.

2.6 SINGLE PHASE POWER - CAPACITOR START MOTORS

A. Starting Torque: Three times full load torque.

B. Starting Current: Less than five times full load current.

C. Pull-up Torque: Up to 350 percent of full load torque.

D. Breakdown Torque: Approximately 250 percent of full load torque.

E. Motors: Capacitor in series with starting winding; provide capacitor-start/capacitor-run motors with two capacitors in parallel with run capacitor remaining in circuit at operating speeds.

F. Drip-proof Enclosure: Class A (50 degrees C temperature rise) insulation, NEMA Service Factor, prelubricated sleeve bearings.

G. Enclosed Motors: Class A (50 degrees C temperature rise) insulation, 1.0 Service Factor, prelubricated ball bearings.

2.7 THREE PHASE POWER - SQUIRREL CAGE MOTORS

A. Starting Torque: Between 1 and 1-1/2 times full load torque.

B. Starting Current: Six times full load current.

C. Power Output, Locked Rotor Torque, Breakdown or Pull Out Torque: NEMA Design B characteristics.

D. Design, Construction, Testing, and Performance: Conform to NEMA MG 1 for Design B motors.

E. Insulation System: NEMA Class B or better.

F. Testing Procedure: In accordance with IEEE 112. Load test motors to determine free from electrical or mechanical defects in compliance with performance data.

G. Motor Frames: NEMA Standard T-Frames of steel, aluminum, or cast iron with end brackets of cast iron or aluminum with steel inserts.

H. Thermistor System (Motor Frame Sizes 254T and Larger): Three PTC thermistors embedded in motor windings and epoxy encapsulated solid state control relay for wiring into motor starter; refer to Section 26 29 13.

I. Bearings: Grease lubricated anti-friction ball bearings with housings equipped with plugged provision for relubrication, rated for minimum ABMA STD 9, L-10 life of 20,000 hours. Calculate bearing load with NEMA minimum V-belt pulley with belt center line at end of NEMA standard shaft extension. Stamp bearing sizes on nameplate.

J. Sound Power Levels: To NEMA MG 1.

K. Part Winding Start Above 254T Frame Size: Use part of winding to reduce locked rotor starting current to approximately 60 percent of full winding locked rotor current while providing approximately 50 percent of full winding locked rotor torque.

L. Weatherproof Epoxy Sealed Motors: Epoxy seal windings using vacuum and pressure or coat windings with rotor and starter surfaces protected with epoxy enamel; bearings double shielded with waterproof non-washing grease.

M. Nominal Efficiency: As scheduled at full load and rated voltage when tested in accordance with IEEE 112.

N. Nominal Power Factor: As scheduled at full load and rated voltage when tested in accordance with IEEE 112.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install securely on firm foundation. Mount ball bearing motors with shaft in any position.

C. Check line voltage and phase and ensure agreement with nameplate.

3.2 SCHEDULE

A. NEMA Open Motor Service Factors.
   1. 1/6-1/3 hp:
      a. 3600 rpm: 1.35.
      b. 1800 rpm: 1.35.
      c. 1200 rpm: 1.35.
      d. 900 rpm: 1.35.
   2. 1/2 hp:
      a. 3600 rpm: 1.25.
      b. 1800 rpm: 1.25.
      c. 1200 rpm: 1.25.
      d. 900 rpm: 1.15.
   3. 3/4 hp:
      a. 3600 rpm: 1.25.
      b. 1800 rpm: 1.25.
      c. 1200 rpm: 1.15.
      d. 900 rpm: 1.15.
   4. 1 hp:
      a. 3600 rpm: 1.25.
      b. 1800 rpm: 1.15.
      c. 1200 rpm: 1.15.
      d. 900 rpm: 1.15.
   5. 1.5-150 hp:
      a. 3600 rpm: 1.15.
      b. 1800 rpm: 1.15.
      c. 1200 rpm: 1.15.
      d. 900 rpm: 1.15.

B. Minimum Motor Efficiencies:
   1. Conform with applicable State Energy Code.

END OF SECTION 23 05 13

VIBRATION AND SEISMIC CONTROLS FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Vibration isolators.

B. Seismic snubber assemblies.

C. Seismic restraints for suspended components and equipment..

1.2 RELATED REQUIREMENTS

A. Section 23 05 49 - HVAC Seismic Restraint.

B. Section 23 33 00 - Air Duct Accessories.

C. Section 23 55 33 - Fuel-Fired Unit Heaters.

1.3 REFERENCE STANDARDS

A. ASHRAE (HVACA) - ASHRAE Handbook - HVAC Applications; 2015.

B. FEMA 412 - Installing Seismic Restraints for Mechanical Equipment; 2002.

C. FEMA 413 - Installing Seismic Restraints for Electrical Equipment; 2004.

D. FEMA 414 - Installing Seismic Restraints for Duct and Pipe; 2004.

E. FEMA E-74 - Reducing the Risks of Nonstructural Earthquake Damage; 2011.

F. SMACNA (SRM) - Seismic Restraint Manual Guidelines for Mechanical Systems; Sheet Metal and Air Conditioning Contractors' National Association; 2008.

1.4 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data:
   1. Provide manufacturer's product literature documenting compliance with PART 2 PRODUCTS.
   2. Include seismic rating documentation for each isolator and restraint component accounting for horizontal, vertical, and combined loads.

C. Shop Drawings:

1. Provide schedule of vibration isolator type with location and load on each.
2. Fully dimensioned fabrication drawings and installation details for vibration isolation bases, member sizes, attachments to isolators, and supported equipment.
3. Include auxiliary motor slide bases and rails, base weights, inertia bases, concrete weights, equipment static loads, support points, vibration isolators, and detailed layout of isolator location and orientation with static and dynamic load on each isolator.
4. Include selections from prescriptive design tables that indicate compliance with the applicable building code and the vibration isolator manufacturer's requirements.
5. Clearly indicate the load and capacity assumptions selected. Include copies of any calculations.
6. Include the calculations that indicate compliance with the applicable building code for seismic controls and the vibration isolator manufacturer's requirements.
7. Include the seal of the Professional Structural Engineer registered in the State of Oregon on the drawings and calculations which at a minimum include the following:
    a. Seismic Restraint Details: Detailed drawings of seismic restraints and snubbers including anchorage details that indicate quantity, diameter, and depth of penetration, edge distance, and spacing of anchors.
    b. Equipment Seismic Qualification Certification: Certification by the manufacturer or responsible party that each piece of equipment provided will withstand seismic force levels as specified in the applicable building code for seismic controls.

        1) Basis for Certification: Indicate whether the withstand certification is based on actual testing of assembled components, on calculations, or on historic data.

        2) Indicate equipment to be sufficiently durable to resist design forces and or remain functional after the seismic event.
    c. Dimensioned outline drawings of equipment identifying center of gravity, locations, and provisions for mounting and anchorage.
    d. Detailed description of the equipment anchorage devices on which the certifications are based.

D. Manufacturer's Instructions: Indicate installation instructions with special procedures and setting dimensions.

1.5 QUALITY ASSURANCE

A. Perform design and installation in accordance with applicable codes.

B. Designer Qualifications: Perform design under direct supervision of a Professional Structural Engineer experienced in design of this type of work and registered and licensed in Oregon.

C. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.
    1. Member of Vibration Isolation and Seismic Control Manufacturers Association (VISCMA).

D. Installer Qualifications: Company specializing in performing the work of this section with minimum three years of documented experience.

E. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Kinetics Noise Control, Inc.: www.kineticsnoise.com.

B. Mason Industries: www.mason-ind.com.

C. M.W. Saussé & Co., Inc.; www.vibrex.net.

D. Amber/Booth Company: www.amberbooth.com.

E. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 PERFORMANCE REQUIREMENTS

A. General:
1. All vibration isolators, base frames and inertia bases to conform to all uniform deflection and stability requirements under all operating loads.
2. Steel springs to function without undue stress or overloading.
3. Steel springs to operate in the linear portion of the load versus deflection curve over deflection range of not less than 50 percent above specified deflection.
4. Lateral to vertical stiffness ratio to not exceed 0.08 with spring deflection at minimum 75 percent of specified deflection.
5. All equipment mounted on vibration isolated bases to have minimum operating clearance of 2 inches between the base and floor or support beneath unless noted otherwise.

B. Provide vibration isolation on motor driven equipment over 2.0 hp, plus connected piping and ductwork.

C. Provide minimum static deflection of isolators for equipment as follows:
1. Upper Floors, Normal
   a. 400 - 600 rpm: 3.5 inch
   b. 600 - 800 rpm: 2 inch
   c. 800 - 900 rpm: 1 inch
   d. 1100 - 1500 rpm: 0.5 inch
   e. Over 1500 rpm: 0.2 inch
2. Upper Floors, Critical
   a. 600 - 800 rpm: 3.5 inch
   b. 800 - 900 rpm: 2 inch

c. 1100 - 1500 rpm: 1 inch
d. Over 1500 rpm: 0.5 inch

D. Consider upper floor locations critical unless otherwise indicated.

E. Maintain sound level of spaces at levels not to exceed those listed below by utilizing acoustical devices.

F. Maintain rooms at following maximum sound levels, in Noise Criteria (NC) as defined by ASHRAE Handbook, HVAC Applications.
1. Offices:
a. Executive: 25
b. Conference rooms: 25
c. Private: 30
d. Open-plan areas: 35
e. Computer/business machine areas: 40
f. Public circulation: 40

2.3 VIBRATION ISOLATORS

A. Non-Seismic Type:
1. All Elastomeric-Fiber Glass Pads:
a. Configuration: Flat or molded.
b. Thickness: 0.25 inch minimum.
c. Assembly: Single or multiple layers using bonded, galvanized sheet metal separation plate between each layer with load plate providing evenly distributed load over pad surface.
2. Elastomeric Mounts:
a. Material: Oil, ozone, and oxidant resistant compounds.
b. Assembly: Encapsulated load transfer plate bolted to equipment and base plate with anchor hole bolted to supporting structure.
3. Steel Springs:
a. Assembly: Freestanding, laterally stable without housing.
b. Leveling Device: Rigidly connected to equipment or frame.
4. Restrained Steel Springs:
a. Housing: Rigid blocking during rigging prevents equipment installed and operating height from changing during temporary weight reduction.
b. Equipment Wind Loading: Adequate means for fastening isolator top to equipment and isolator base plate to supporting structure.
5. Elastomeric Hangers:
a. Housing: Steel construction containing elastomeric isolation element to prevent rod contact with housing and short-circuiting of isolating function.
b. Furnish steel load distribution plate sandwiching elastomeric element to housing.
6. Spring Hanger:
a. Housing: Steel construction containing stable steel spring and integral elastomeric element preventing metal to metal contact.
b. Bottom Opening: Sized to allow plus/minus 15 degrees rod misalignment.
7. Combination Elastomeric-Spring Hanger:

a. Housing: Steel construction containing stable steel spring with elastomeric element in series isolating upper connection of hanger box to building structure.
b. Bottom Opening: Sized to allow plus/minus 15 degrees rod misalignment.

8. Thrust Restraints:
   a. Housing: Steel construction containing stable steel spring and integral elastomeric element installed in pairs to resist air pressure thrusts.
   b. Bottom Openings: Sized to allow plus/minus 15 degrees rod misalignment.

B. Seismic Type:
1. Coil Springs Consisting of Multiple Elements:
   a. Housing: Manufactured from cast iron, cast aluminum, or steel material.
   b. Ductile Material: Designed and rated for seismic applications.
   c. Spring: Restrained by housing without significant degradation of vibration isolation capabilities during normal equipment operating conditions.
   d. Resilient Snubbing Grommet System: Incorporated and designed with clearances of no more than 0.25 inch in any direction preventing direct metal-to-metal contact between supported member and fixed restraint housing.
   e. Resilient Pad: Located in series with spring.
   f. Coil Springs: Color coded elements to have a lateral stiffness greater than 0.8 times the rated vertical stiffness with 50 percent overload capacity.
   g. Finish: Suitable for the application.
2. All Directional Elastomeric:
   a. Material: Molded from oil, ozone, and oxidant resistant compounds.
   b. Operating Parameters: Designed to operate within the isolator strain limits providing maximum performance and service life.
   c. Attachment Method: Encapsulated load transfer plate bolted to equipment and base plate with anchor hole bolted to supporting structure.
   d. Rating: Cast iron and aluminum housings rated for seismic restraint applications.
   e. Minimum Operating Static Deflections: Deflections indicated in project documents are not to exceed published load capacities.

2.4 SEISMIC SNUBBER ASSEMBLIES

A. Comply with:
1. ASHRAE Handbook - HVAC Applications
2. FEMA 412
3. FEMA 413
4. FEMA 414
5. FEMA E-74
6. SMACNA - Seismic Duct Restraint Manual

B. All Directional External:
1. Application: Minimum three (3) snubbers are required for each equipment installation, oriented properly to restrain isolated equipment in all directions.
2. Construction: Interlocking steel construction attached to the building structure and equipment in a manner consistent with anticipated design loads.

3. Performance: Equipment movement at each snubber location limited to a maximum of 0.25 inches in any direction without significantly degrading the vibration isolation capability of the isolator during normal operating conditions.
4. Resilient Pad: Minimum 0.25 inch thick cushions any impact and prevents metal-to-metal contact.

C. Lateral External:
1. Application: Minimum three (3) snubbers are required for each stable equipment installation, oriented properly to restrain isolated equipment in all lateral directions where uplift forces are zero or addressed by other restraints.
2. Construction: Steel construction attached to the building structure and equipment in a manner consistent with anticipated design loads.
3. Performance: Equipment movement at each snubber location limited to a maximum of 0.25 inches in any direction without significantly degrading the vibration isolation capability of the isolator during normal operating conditions.
4. Resilient Pad: Minimum 0.25 inch thick cushions any impact and prevents metal-to-metal contact.

D. Omni Directional External:
1. Application: Minimum four (4) snubbers are required for each stable equipment installation, oriented properly to restrain isolated equipment in all lateral directions.
2. Construction: Steel construction attached to the building structure and equipment in a manner consistent with anticipated design loads.
3. Performance: Equipment movement at each snubber location limited to a maximum of 0.25 inches in any direction without significantly degrading the vibration isolation capability of the isolator during normal operating conditions.
4. Resilient Pad: Minimum 0.25 inch thick cushions any impact and prevents metal-to-metal contact.

E. Horizontal Single Axis External:
1. Application: Minimum four (4) snubbers are required for each stable equipment installation, oriented properly to restrain isolated equipment in all lateral directions where uplift forces are zero or addressed by other restraints.
2. Construction: Steel construction attached to the building structure and equipment in a manner consistent with anticipated design loads.
3. Performance: Equipment movement at each snubber location limited to a maximum of 0.25 inches in any direction without significantly degrading the vibration isolation capability of the isolator during normal operating conditions.
4. Resilient Pad: Minimum 0.25 inch thick cushions any impact and prevents metal-to-metal contact.

2.5 SEISMIC RESTRAINTS FOR SUSPENDED COMPONENTS AND EQUIPMENT

A. Comply with:
1. ASHRAE Handbook - HVAC Applications
2. FEMA 412
3. FEMA 413
4. FEMA 414

5. FEMA E-74
6. SMACNA - Seismic Duct Restraint Manual

B. Cable Restraints:
1. Wire Rope: Steel wire strand cables sized to resist seismic loads in all lateral directions.
2. Protective Thimbles: Eliminates potential for dynamic cable wear and strand breakage.
3. Size: Based on the lesser of cable capacity or anchor load taking into account bracket geometry.
4. Connections:
   a. Use overlapping wire rope U clips, cable clamping bolts, swaged sleeves or seismically rated tool-less wedge insert lock connectors.
   b. Internally brace clevis hanger bracket cross bolt to prevent deformation.
5. Vertical Suspension Rods: Attach required bracing of sufficient strength to prevent rod buckling from vertical compression forces utilizing series of attachment clips.

C. Rigid Restraints:
1. Structural Element: Sized to resist seismic loads in all lateral directions and carry both compressive and tensile loading.
2. Size: Based on the lesser of cable capacity or anchor load taking into account bracket geometry.
3. Connections: Internally brace clevis hanger bracket cross bolt to prevent deformation.
4. Static Support System: Anchorage capable of carrying additional tension loads generated by the vertical component of the rigid brace compression which is additive to any static load requirements on the system.
5. Vertical Suspension Rods: Attached required bracing of sufficient strength to prevent rod buckling from vertical compression forces utilizing series of attachment clips.

PART 3 EXECUTION

3.1 INSTALLATION - GENERAL

A. Install in accordance with manufacturer's instructions.

B. Attach ductwork to acoustic louvers with flexible duct connections. Refer to Section 23 33 00.

C. Bases:
1. Set steel bases for one inch clearance between housekeeping pad and base.
2. Set concrete inertia bases for 2 inches clearance between housekeeping pad and base.
3. Adjust equipment level.

D. On closed spring isolators, adjust so side stabilizers are clear under normal operating conditions.

E. Prior to making piping connections to equipment with operating weights substantially different from installed weights, block up equipment with temporary shims to final height. When full load is applied, adjust isolators to load to allow shim removal.

F. Provide pairs of horizontal limit springs on fans with more than 6.0 inches WC static pressure, and on hanger supported, horizontally mounted axial fans.

G. Support piping connections to equipment mounted on isolators using isolators or resilient hangers as follows:
   1. Up to 4 Inches Pipe Size: First three points of support.
   2. 5 to 8 Inches Pipe Size: First four points of support.
   3. 10 inches Pipe Size and Over: First six points of support.
   4. Select three hangers closest to vibration source for minimum 1.0 inch static deflection or static deflection of isolated equipment. Select remaining isolators for minimum 1.0 inch static deflection or 1/2 static deflection of isolated equipment.

3.2 INSTALLATION - SEISMIC

A. Refer to Section 23 05 49.

3.3 FIELD QUALITY CONTROL

A. Inspect isolated equipment after installation and submit report. Include static deflections.

3.4 SCHEDULE

A. Pipe Isolation Schedule.
   1. 1 Inch Pipe Size: Isolate 120 diameters from equipment.
   2. 2 Inch Pipe Size: Isolate 90 diameters from equipment.

END OF SECTION 23 05 48

HVAC SEISMIC RESTRAINT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Seismic restraint of equipment, piping and ductwork.

1.2 RELATED SECTIONS

A. Section 23 00 00 - Basic HVAC Requirements.

B. Section 23 05 48 - Vibration Isolation and Sound and Seismic Controls for HVAC Piping and Equipment.

C. Section 23 31 00 - HVAC Ducts and Casings.

D. Section 23 55 33 - Fuel-Fired Unit Heaters.

1.3 QUALITY ASSURANCE

A. Seismic Restraints:
   1. The Anchorage and/or seismic restraint of permanent equipment and associated systems listed below shall be designed to resist the total design seismic forces prescribed in the latest edition of the International Building Code.
      a. All floor or roof-mounted equipment weighing 400 lbs. or greater.
      b. All suspended or wall-mounted equipment weighing 20 lbs. or greater.
      c. All vibration-isolated equipment weighing 20 lbs. or greater.
      d. All piping 1 1/4 inches nominal diameter and larger located in boiler, mechanical equipment and refrigeration mechanical rooms.
      e. All piping 2 1/2" inches nominal diameter and larger.
      f. All ductwork 6 square feet and larger in cross sectional area.
      g. All round ductwork 28 inches in diameter and larger.
      h. Pipes, electrical conduit and ducts supported by a trapeze where none of those elements would individually require bracing, require bracing when the combined operating weight of all elements supported by the trapeze is 10 lbs/ft or greater.

B. All calculations shall be in accordance with Chapter 16 of the latest edition of the International Building Code.

1.4 SUBMITTALS

A. Submit the following in accordance with Section 01 30 00:
   1. All anchorage and seismic restraints shall be designed and stamped by a professional engineer licensed in the state of the project location. Design shall include:
      a. Number, size and location of anchors for floor or roof-mounted equipment. For curb-mounted equipment, provide design of attachment of both the unit to the curb

and the curb to the structure. In addition, provide calculations or test data verifying the curb can accept the seismic loads.

b. Number, size and location of seismic restraint devices and anchors for vibration-isolated and suspended equipment. Provide calculations or test data verifying the horizontal and vertical ratings of the seismic restraint devices.

c. Number, size and location of braces and anchors for suspended piping and ductwork on shop drawings. In addition:

1) The contractor must select a single seismic restraint system pre-designed to meet the requirements of the latest edition of the International Building Code such as the 2011 Mason Industries Seismic Restraint Guidelines for Suspended Piping, Ductwork, Electrical Systems and floor and roof mounted equipment.

2) Details or designs from separate seismic restraint guidelines are not acceptable. Installations not addressed by the selected system must be designed, detailed and submitted along with the shop drawings.

3) Maximum seismic loads shall be indicated on drawings at each brace location. Drawings shall bear the stamp and signature of the registered professional engineer licensed in the state of the project location who designed the layout of the braces.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Amber Booth.

B. Mason Industries, Inc.

C. Kinetics Corporation.

D. Vibrex.

E. Substitutions: Under provisions of Section 01 60 00.

2.2 SEISMIC RESTRAINTS

A. General Requirements:
1. Seismic restraints shall be provided for all equipment, both supported and suspended, piping and ductwork as listed above.
2. Bracing of piping and ductwork shall be in accordance with provisions set forth in SMACNA seismic restraint manual.
3. Structural requirements for restraints, including their attachment to building structure, shall be reviewed and approved by the structural engineer.

4. Attachments to supported or suspended equipment must be coordinated with the equipment manufacturer.

B. Supported Equipment Products:
1. Seismic restraints shall consist of interlocking steel members restrained by shock absorbent neoprene materials compounded to bridge bearing specifications as previously noted in paragraph 1.3. Elastomeric materials shall be replaceable and be a minimum 3/4-inch thick. Snubbers shall be manufactured with an air gap between hard and resilient material of not less than 1/8-inch, nor more than 1/4-inch. Type 1 - Seismic Snubbers: All-directional seismic snubbers shall consist of interlocking steel members restrained by a one-piece molded neoprene bushing of bridge bearing neoprene. Bushing shall be replaceable and a minimum of 1/4 inch thick. A minimum air gap of 1/8 inch shall be incorporated in the snubber design in all directions before contact is made between the rigid and resilient surfaces. Snubber end caps shall be removable to allow inspection of internal clearances. The snubber shall be designed to accept horizontal and vertical seismic loads as defined in Section 1.03.B. Mason Type Z-1225 or Z-1011.
2. Each snubber shall be capable of restraint in all three mutually orthogonal directions. Type 2 - Seismic Sway Braces - Seismic sway braces shall consist of galvanized steel aircraft cables or steel angles/channels. Cables braces shall be designed to resist seismic tension loads and steel braces shall be designed to resist both tension and compression loads with a minimum safety factor of 2. Brace end connections shall be steel assemblies that swivel to the final installation angle. Do not mix cable and steel braces to brace the same system or equipment. Steel angles, when required, shall be clamped to the threaded hanger rods at the seismic sway brace locations utilizing a minimum of two ductile iron clamps. Sway braces shall be designed to accept horizontal and vertical seismic loads as defined in Section 1.03.B. Mason Type SCB, SSB, SRC and UC.
3. Submittals shall include load versus deflection curves up to 1/2-inch on the x, y and z planes.
4. Mason Model Z-1011

C. Bracing of Pipes:
1. Provide seismic bracing of all piping as detailed below. (Exception: Piping suspended by individual hangers 12 inches or less in length, as measured from the top of the pipe to the bottom of the support where the hanger is attached, need not be braced).
   a. Brace all gas piping.
   b. Brace all piping located in boiler rooms, mechanical equipment rooms, and refrigeration mechanical rooms that is 1-1/4-inch nominal diameter and larger.
   c. Brace all pipes 2-1/2-inch nominal diameter and larger.
2. For all gas piping, as specified in 1(a) the bracing details, schedules, and notes may be used, except that transverse bracing shall be at 20 feet maximum, and longitudinal bracing shall be at 40 feet maximum.
3. Seismic braces for pipes on trapeze hangers may be used.
4. Provide flexibility in joints where pipes pass through building seismic joints or expansion joints or where rigidly supported pipes connect to equipment with vibration isolators. For threaded piping, the flexibility may be provided by the installation of swing joints.
5. Cast iron pipe of all types, glass pipe, and any other pipe jointed with a shield and clamp assembly, where the top of the pipe is 12 inches or more from the supporting structure,

shall be braced on each side of a change in direction of 90 degrees or more. Riser joints shall be braced or stabilized between floors.

6. Vertical risers shall be laterally supported with a riser clamp at each floor. For buildings greater than six stories high, all risers shall be engineered individually.

D. Bracing of Ductwork:
1. Brace rectangular ducts with cross sectional areas of 6 square feet and larger. Brace flat oval ducts in the same manner as rectangular ducts. Brace round ducts with diameters of 28 inches and larger. Brace flat oval ducts the same as rectangular ducts of the same nominal size (Exception: No bracing is required if the duct is suspended by hangers 12 inches or less in length, as measured from the top of the duct to the bottom of the support where the hanger is attached).
2. Transverse bracing shall occur at the interval specified in the SMACNA tables or at both ends if the duct run is less than the specified interval. Transverse bracing shall be installed at each duct turn and at each end of a duct run, with a minimum of one brace at each end.
3. Longitudinal bracing shall occur at the interval specified in the SMACNA tables with at least one brace per duct run. Transverse bracing for one duct section may also act as longitudinal bracing for a duct section connected perpendicular to it if the bracing is installed within four feet of the intersection of the ducts and if the bracing is sized for the larger duct. Duct joints shall conform to SMACNA duct construction standards.

E. Suspended Equipment and Piping and Ductwork:
1. Cable Method: The seismic restraint shall consist of a combination of stranded steel aircraft cable and the specified vibration isolation hanger with an added nut and neoprene and steel washer. The cable resists lateral and downward motion. The modified vibration hanger resists upward motion.
2. Cable attachment details, cable size, and the neoprene and steel washers shall be sized by the manufacturer and are to be indicated in the Shop Drawings.
3. Provide detailed Shop Drawings for approval in sufficient time to allow structural attachment work to be incorporated into the normal work sequence.

PART 3 EXECUTION

3.1 SEISMIC RESTRAINTS

A. General:
1. Install and adjust seismic restraints so that the equipment, piping, and ductwork supports are not degraded by the restraints.
2. Restraints must not short circuit vibration isolation systems or transmit objectionable vibration or noise.

B. Supported Equipment:
1. Each vibration isolation frame for supported equipment shall have a minimum of four seismic snubbers mounted as close as possible to the vibration isolators and/or the frame extremities.
2. Care must be taken so that a minimum 1/8-inch air gap in the seismic restraint snubber is preserved on all sides in order that the vibration isolation potential of the isolator is not

compromised. This requires that the final snubber adjustment be completed after the vibration isolators are properly installed and the installation approved.

C. Bracing of Pipes:
   1. Branch lines may not be used to brace main lines.
   2. Transverse bracing shall be at 40 feet maximum except where a lesser spacing is indicated in the SMACNA tables for bracing of pipes.
   3. Longitudinal bracing shall be at 80 feet maximum except where a lesser spacing is indicated in the tables. In pipes where thermal expansion is a consideration, an anchor point may be used as the specified longitudinal brace provided that it has a capacity equal to or greater than a longitudinal brace. The longitudinal braces and connections must be capable of resisting the additional force induced by expansion and contraction.
   4. A rigid piping system shall not be braced to dissimilar parts of the building or to two dissimilar building systems that may respond differently during an earthquake.
   5. Transverse bracing for one pipe section may also act as longitudinal bracing for a pipe section of the same size connected perpendicular to it if the bracing is installed within 24 inches of the elbow or tee.

D. Bracing of Ductwork:
   1. Hangers must be positively attached to the duct within 2 inches of the top of the duct with a minimum of two #10 sheet metal screws.
   2. Group of ducts may be combined in larger frame so that the combined weights and dimensions of the ducts are less than or equal to the maximum weight and dimensions of the duct for which bracing details are selected.
   3. Walls, including gypsum board nonbearing partitions, which have ducts running through them, may replace a typical transverse brace. Provide solid blocking around duct penetrations at stud wall construction.
   4. Unbraced ducts shall be installed with a 6-inch minimum clearance to vertical ceiling hanger wires.

E. Suspended Equipment, Piping, and Ductwork Cable Method:
   1. Cables shall be adjusted to a degree of slackness approved by the Structural Engineer.
   2. Uplift and downward restraint nuts and washers for the Type HST hangers shall be adjusted so that there is a minimum 1/4-inch clearance.

END OF SECTION 23 05 49

IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Nameplates.

B. Tags.

C. Pipe Markers.

D. Labels.

E. Lockout devices.

1.2 RELATED REQUIREMENTS

A. Section 09 90 00 - Painting and Coating: Identification painting.

1.3 REFERENCE STANDARDS

A. ASME A13.1 - Scheme for the Identification of Piping Systems; 2015.

B. ASTM D709 - Standard Specification for Laminated Thermosetting Materials; 2016.

1.4 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. List: Submit list of wording, symbols, letter size, and color coding for mechanical identification.

C. Chart and Schedule: Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.

D. Product Data: Provide manufacturers catalog literature for each product required.

E. Manufacturer's Installation Instructions: Indicate special procedures, and installation.

F. Project Record Documents: Record actual locations of tagged valves.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Brady Corporation: www.bradycorp.com.

B. Safety Sign Company: www.safetysignco.com.

C. Seton Identification Products: www.seton.com/aec.

D. Substitutions: Not permitted.

2.2 NAMEPLATES

A. Description: Laminated three-layer plastic with engraved letters.
   1. Letter Color: Black.
   2. Letter Height: 1/2 inch.
   3. Background Color: Yellow.
   4. Plastic: Conform to ASTM D709.

2.3 TAGS

A. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inch diameter.

B. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch diameter with smooth edges.

C. Valve Tag Chart: Typewritten letter size list in anodized aluminum frame.

2.4 PIPE MARKERS

A. Color: Conform to ASME A13.1.

B. Plastic Pipe Markers: Factory fabricated, flexible, semi- rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.

C. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

D. Underground Plastic Pipe Markers: Bright colored continuously printed plastic ribbon tape, minimum 6 inches wide by 4 mil thick, manufactured for direct burial service.

2.5 LABELS

A. Description: Aluminum, size 1.9 x 0.75 inches, adhesive backed with printed identification.

2.6 LOCKOUT DEVICES

A. Lockout Hasps:

1. Manufacturers:
    a. Anodized aluminum or Reinforced nylon hasp with erasable label surface; size minimum 7-1/4 x 3 inches.

B. Valve Lockout Devices:
1. Steel device preventing access to valve operator, accepting lock shackle.

PART 3 EXECUTION

3.1 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

B. Prepare surfaces in accordance with Section 09 90 00 for stencil painting.

3.2 INSTALLATION

A. Install nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.

B. Install tags with corrosion resistant chain.

C. Install plastic pipe markers in accordance with manufacturer's instructions.

D. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.

E. Install underground plastic pipe markers 6 to 8 inches below finished grade, directly above buried pipe.

F. Identify air handling units, pumps, heat transfer equipment, tanks, and water treatment devices with 8 x 4 inch plastic nameplates. Small devices, such as in-line pumps, may be identified with tags.

G. Identify control panels and major control components outside panels with plastic nameplates.

H. Tag automatic controls, instruments, and relays. Key to control schematic.

I. Identify piping, concealed or exposed, with plastic pipe markers, 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.

J. Install ductwork with plastic nameplates. 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 23 05 53

TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Testing, adjustment, and balancing of air systems.

B. Measurement of final operating condition of HVAC systems.

C. Sound measurement of equipment operating conditions.

D. Vibration measurement of equipment operating conditions.

1.2 REFERENCE STANDARDS

A. AABC MN-1 - AABC National Standards for Total System Balance; 2002.

B. ASHRAE Std 111 - Measurement, Testing, Adjusting, and Balancing of Building HVAC Systems; 2008.

1.3 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Qualifications: Submit name of adjusting and balancing agency and TAB supervisor for approval within 30 days after award of Contract.

C. TAB Plan: Submit a written plan indicating the testing, adjusting, and balancing standard to be followed and the specific approach for each system and component.
   1. Submit to Architect.

D. Control System Coordination Reports: Communicate in writing to the controls installer all setpoint and parameter changes made or problems and discrepancies identified during TAB that affect, or could affect, the control system setup and operation.

E. Final Report: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.
   1. Submit to the Commissioning Authority, Construction Manager, and HVAC controls contractor within two weeks after completion of testing, adjusting, and balancing.
   2. Revise TAB plan to reflect actual procedures and submit as part of final report.
   3. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Architect and for inclusion in operating and maintenance manuals.
   4. Provide reports in 3-ring binder manuals, complete with index 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.

5. Include actual instrument list, with manufacturer name, serial number, and date of calibration.
6. Form of Test Reports: Where the TAB standard being followed recommends a report format use that; otherwise, follow ASHRAE Std 111.
7. Units of Measure: Report data in I-P (inch-pound) units only.
8. Include the following on the title page of each report:
    a. Name of Testing, Adjusting, and Balancing Agency.
    b. Address of Testing, Adjusting, and Balancing Agency.
    c. Telephone number of Testing, Adjusting, and Balancing Agency.
    d. Project name.
    e. Project location.
    f. Project Architect.
    g. Project Engineer.
    h. Project Contractor.
    i. Project altitude.
    j. Report date.

F. Project Record Documents: Record actual locations of flow measuring stations and balancing valves and rough setting.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

A. Perform total system balance in accordance with one of the following:
    1. AABC MN-1, AABC National Standards for Total System Balance.
    2. ASHRAE Std 111, Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning, and Refrigeration Systems.

B. Begin work after completion of systems to be tested, adjusted, or balanced and complete work prior to Substantial Completion of the project.

C. Where HVAC systems and/or components interface with life safety systems, including fire and smoke detection, alarm, and control, coordinate scheduling and testing and inspection procedures with the authorities having jurisdiction.

D. TAB Agency Qualifications:
    1. Company specializing in the testing, adjusting, and balancing of systems specified in this section.
    2. Having minimum of three years documented experience.

E. TAB Supervisor and Technician Qualifications: Certified by same organization as TAB agency.

F. TAB Supervisor Qualifications: Professional Engineer licensed in Oregon.

G. Pre-Qualified TAB Agencies:

1. Northwest Engineering Service, Inc.
2. Air Balancing Specialty.
3. Pacific Air Coast Balancing.
4. Neudorfer Engineers.
5. Substitutions: See Section 01 60 00 - Product Requirements.

3.2 EXAMINATION

A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:
   1. Systems are started and operating in a safe and normal condition.
   2. Temperature control systems are installed complete and operable.
   3. Proper thermal overload protection is in place for electrical equipment.
   4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
   5. Duct systems are clean of debris.
   6. Fans are rotating correctly.
   7. Fire and volume dampers are in place and open.
   8. Air coil fins are cleaned and combed.
   9. Access doors are closed and duct end caps are in place.
   10. Air outlets are installed and connected.
   11. Duct system leakage is minimized.
   12. Proper strainer baskets are clean and in place.
   13. Service and balance valves are open.

B. Submit field reports. Report defects and deficiencies that will or could prevent proper system balance.

C. Beginning of work means acceptance of existing conditions.

3.3 PREPARATION

A. Hold a pre-balancing meeting at least one week prior to starting TAB work.
   1. Require attendance by all installers whose work will be tested, adjusted, or balanced.

B. Provide instruments required for testing, adjusting, and balancing operations. Make instruments available to Architect to facilitate spot checks during testing.

C. Provide additional balancing devices as required.

3.4 ADJUSTMENT TOLERANCES

A. Air Handling Systems: Adjust to within plus or minus 5 percent of design for supply systems and plus or minus 10 percent of design for return and exhaust systems.

B. Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 5 percent of design to space. Adjust outlets and inlets in space to within plus or minus 10 percent of design.

3.5 RECORDING AND ADJUSTING

A. Field Logs: Maintain written logs including:
   1. Running log of events and issues.
   2. Discrepancies, deficient or uncompleted work by others.
   3. Contract interpretation requests.
   4. Lists of completed tests.

B. Ensure recorded data represents actual measured or observed conditions.

C. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.

D. Mark on the drawings the locations where traverse and other critical measurements were taken and cross reference the location in the final report.

E. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.

F. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

G. At final inspection, recheck random selections of data recorded in report. Recheck points or areas as selected and witnessed by the Owner.

H. Check and adjust systems approximately six months after final acceptance and submit report.

3.6 AIR SYSTEM PROCEDURE

A. Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities at site altitude.

B. Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.

C. Measure air quantities at air inlets and outlets.

D. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.

E. Use volume control devices to regulate air quantities only to extend that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.

F. Vary total system air quantities by adjustment of fan speeds. Provide drive changes required. Vary branch air quantities by damper regulation.

G. Provide system schematic with required and actual air quantities recorded at each outlet or inlet.

H. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters.

I. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.

J. Measure temperature conditions across outside air, return air, and exhaust dampers to check leakage.

K. Where modulating dampers are provided, take measurements and balance at extreme conditions. Balance variable volume systems at maximum air flow rate, full cooling, and at minimum air flow rate, full heating.

L. Measure building static pressure and adjust supply, return, and exhaust air systems to provide required relationship between each to maintain approximately 0.03 inches positive static pressure near the building entries.

3.7 SCOPE

A. Test, adjust, and balance the following:
   1. Fans
   2. Air Filters
   3. Air Inlets and Outlets
   4. Duct Heaters.

3.8 MINIMUM DATA TO BE REPORTED

A. Electric Motors:
   1. Manufacturer
   2. Model/Frame
   3. HP/BHP
   4. Phase, voltage, amperage; nameplate, actual, no load
   5. RPM
   6. Service factor
   7. Starter size, rating, heater elements
   8. Sheave Make/Size/Bore

B. V-Belt Drives:
   1. Identification/location
   2. Required driven RPM
   3. Driven sheave, diameter and RPM

4. Belt, size and quantity
5. Motor sheave diameter and RPM
6. Center to center distance, maximum, minimum, and actual

C. Air Moving Equipment:
1. Location
2. Manufacturer
3. Model number
4. Serial number
5. Arrangement/Class/Discharge
6. Air flow, specified and actual
7. Return air flow, specified and actual
8. Outside air flow, specified and actual
9. Total static pressure (total external), specified and actual
10. Inlet pressure
11. Discharge pressure
12. Sheave Make/Size/Bore
13. Number of Belts/Make/Size
14. Fan RPM

D. Return Air/Outside Air:
1. Identification/location
2. Design air flow
3. Actual air flow
4. Design return air flow
5. Actual return air flow
6. Design outside air flow
7. Actual outside air flow
8. Return air temperature
9. Outside air temperature
10. Required mixed air temperature
11. Actual mixed air temperature
12. Design outside/return air ratio
13. Actual outside/return air ratio

E. Exhaust and Supply Fans:
1. Location
2. Manufacturer
3. Model number
4. Serial number
5. Air flow, specified and actual
6. Total static pressure (total external), specified and actual
7. Inlet pressure
8. Discharge pressure
9. Sheave Make/Size/Bore
10. Number of Belts/Make/Size
11. Fan RPM

F. Duct Traverses:
   1. System zone/branch
   2. Duct size
   3. Area
   4. Design velocity
   5. Design air flow
   6. Test velocity
   7. Test air flow
   8. Duct static pressure
   9. Air temperature
   10. Air correction factor

G. Duct Leak Tests:
   1. Description of ductwork under test
   2. Duct design operating pressure
   3. Duct design test static pressure
   4. Duct capacity, air flow
   5. Maximum allowable leakage duct capacity times leak factor
   6. Test apparatus
      a. Blower
      b. Orifice, tube size
      c. Orifice size
      d. Calibrated
   7. Test static pressure
   8. Test orifice differential pressure
   9. Leakage

H. Air Distribution Tests:
   1. Air terminal number
   2. Room number/location
   3. Terminal type
   4. Terminal size
   5. Area factor
   6. Design velocity
   7. Design air flow
   8. Test (final) velocity
   9. Test (final) air flow
   10. Percent of design air flow

I. Sound Level Reports:
   1. Location
   2. Octave bands - equipment off
   3. Octave bands - equipment on

J. Vibration Tests:
   1. Location of points:
      a. Fan bearing, drive end

   b. Fan bearing, opposite end
   c. Motor bearing, center (if applicable)
   d. Motor bearing, drive end
   e. Motor bearing, opposite end
   f. Casing (bottom or top)
   g. Casing (side)
   h. Duct after flexible connection (discharge)
   i. Duct after flexible connection (suction)
2. Test readings:
   a. Horizontal, velocity and displacement
   b. Vertical, velocity and displacement
   c. Axial, velocity and displacement
3. Normally acceptable readings, velocity and acceleration
4. Unusual conditions at time of test
5. Vibration source (if non-complying)

END OF SECTION 23 05 93

DUCT INSULATION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Duct insulation.

B. Duct Liner.

C. Insulation jackets.

1.2 RELATED REQUIREMENTS

A. Section 07 84 00 - Firestopping.

B. Section 09 90 00 - Painting and Coating: Painting insulation jackets.

C. Section 23 05 53 - Identification for HVAC Piping and Equipment.

D. Section 23 31 00 - HVAC Ducts and Casings: Glass mineral wool ducts.

1.3 REFERENCE STANDARDS

A. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.

B. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric); 2014.

C. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2010.

D. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2013.

E. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation; 2014.

F. ASTM C916 - Standard Specification for Adhesives for Duct Thermal Insulation; 2014.

G. ASTM C1071 - Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material); 2012.

H. ASTM C 1338 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2010.

I. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.

J. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2014.

K. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015.

L. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2005 (Rev. 2009).

M. American Society of Heating, Refrigerating, and Air Conditioning Engineers, Inc. (ASHRAE).

N. North American Insulation Manufacturers Association (NAIMA).

O. National Fire Protection Association (NFPA).

P. Underwriter's Laboratories (UL Environment).

Q. Underwriter's Laboratories Environmental (UL Environment).

1.4 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

C. Manufacturer's Instructions: Indicate installation procedures necessary to ensure acceptable workmanship and that installation standards will be achieved.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section with not less than three years of documented experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified in this section.

C. Surface-Burning Characteristics: For insulation and related materials, UL/ULC Classified per UL 723 or meeting ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.

D. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.

E. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

F. Biosoluble: As determined by research conducted by the International Agency for Research on Cancer (IARC) and supported by revised reports from the National Toxicology Program (NTP) and the California Office of Environmental Health Hazard Assessment. Certified by European Certification Board for Mineral Wool Products (EUCEB).

G. Low Emitting Materials: For all thermal and acoustical applications of Glass Mineral Wool Insulation Products, provide materials complying with the testing and products requirements of UL GREENGUARD Gold Certification.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site in original factory packaging, labelled with manufacturer's identification, including product density and thickness.

B. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

1.7 FIELD CONDITIONS

A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.

B. Maintain temperature during and after installation for minimum period of 24 hours.

1.8 **DEFINITIONS**

A. Thermal Conductivity (K value): Units of Btu-inch/hour per square foot per degree F.

B. ASJ+: All Service Jacket composed of aluminum foil reinforced with glass scrim bonded to a kraft paper interleaving with an outer film layer leaving no paper exposed.

C. ASJ: All Service Jacket (no outer film).

D. SSL+: Self-Sealing Lap with Advanced Closure System.

E. SSL: Self-Sealing Lap.

F. FSK: Foil Scrim Kraft; jacketing.

G. PSK: Poly Scrim Kraft; jacketing.

H. PVC: PolyVinyl Chloride.

I. Glass Mineral Wool: Interchangeable with fiber glass, but replacing the term in the attempt to disassociate and differentiate Glass Mineral Wool from the potential health and safety of special purpose or reinforcement products that do not meet the bio solubility criteria of insulation made from glass. Rock Mineral Wool will replace the traditional Mineral Wool label. Both are used in lieu of the Mineral Mineral Wool label.

J. UL GREENGUARD Gold Certification: (formerly known as GREENGUARD Children & Schools Certification) offers stricter certification criteria, considers safety factors to account for sensitive individuals (such as children and the elderly), and ensures that a product is acceptable for use in environments such as schools and healthcare facilities. It is referenced by both The Collaborative for High Performance Schools (CHPS) and the Leadership in Energy Environmental Design (LEED) Building Rating Systems.

K. Declare and The Living Building Challenge - The Living Building Challenge is a philosophy, advocacy tool and certification program that addresses development at all scales. The purpose of The Living Building Challenge is to define the most advanced measure of sustainability in the built environment today and acts to diminish the gap between current limits and ideal solutions. Declare supports The Living Building Challenge by providing a transparent materials database that project teams can select from to meet Imperative 11.

L. Imperative 11, Red List - requires that manufacturers disclose the ingredients in their products to insure that they are free of Red List chemicals and materials. The Red List represents the "worst in class" materials, chemicals and elements known to pose serious risks to human health and the greater ecosystem.

M. UL Classified: UL has tested and evaluated samples of the product with respect to certain properties of the product. UL Classifies products to:
   1. Applicable UL requirements.
   2. Standards for safety.
   3. Standards of other National and International organizations.

PART 2 PRODUCTS

2.1 **REQUIREMENTS FOR ALL PRODUCTS OF THIS SECTION**

A. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84.

2.2 GLASS MINERAL WOOL, FLEXIBLE

A. Manufacturer:
   1. Knauf Insulation; Atmosphere Duct Wrap with Ecose Technology: www.knaufusa.com.
   2. Johns Manville: www.jm.com.
   3. Owens Corning Corporation: www.ocbuildingspec.com.
   4. CertainTeed Corporation: www.certainteed.com.
   5. Substitutions: See Section 01 60 00 - Product Requirements.

B. Insulation: ASTM C553; flexible, noncombustible blanket.
   1. 'K' value: 0.29 at 75 degrees F, when tested in accordance with ASTM C177.
   2. Maximum Service Temperature: 250 degrees F.
   3. Maximum Water Vapor Sorption: <5.0 percent by weight per ASTM C1104.

C. Vapor Barrier Jacket:
   1. Kraft paper with glass fiber yarn and bonded to aluminized film (FSK).
   2. Moisture Vapor Permeability: 0.02 perm inch, when tested in accordance with ASTM E96/E96M.
   3. Secure with pressure sensitive tape.

D. Vapor Barrier Tape:
   1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.

E. Outdoor Vapor Barrier Mastic:
   1. Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.

F. Tie Wire: Annealed steel, 16 gage.

2.3 GLASS FIBER, RIGID

A. Manufacturer:
   1. Knauf Insulation: www.knaufusa.com.
   2. Johns Manville Corporation: www.jm.com.
   3. CertainTeed Corporation; Model "ToughGard® Rigid Liner Board": www.certainteed.com.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Insulation: ASTM C612; rigid, noncombustible blanket.
   1. ASTM C1071, Type II.
   2. 'K' value: 0.24 at 75 degrees F, when tested in accordance with ASTM C518.
   3. Maximum service temperature: 450 degrees F.
   4. Maximum Water Vapor Sorption: 5.0 percent.
   5. Maximum Density: 8.0 lb/cu ft.

C. Vapor Barrier Jacket:
   1. Kraft paper with glass fiber yarn and bonded to aluminized film.
   2. Moisture Vapor Permeability: 0.02 perm inch, when tested in accordance with ASTM E96/E96M.
   3. Secure with pressure sensitive tape.

D. Vapor Barrier Tape:
   1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.

E. Indoor Vapor Barrier Finish:
   1. Cloth: Untreated; 9 oz/sq yd weight, glass fabric.
   2. Vinyl emulsion type acrylic, compatible with insulation, black color.

F. UL/ULC Classified per UL 723. Comply with ASTM C 1071 Type I and Type II, NFPA 90A, and NFPA 90B; and with NAIMA AH124, "Fibrous Glass Duct Liner Standard." UL GREENGUARD Certified does not support the growth of mold, fungi, or bacteria per ASTM C 1338 and meets UL Environment GREENGUARD Microbial Resistance Listing per UL 2824-"GREENGUARD Certification Program Method for Measuring Microbial Resistance ". UL/E validated to be formaldehyde free. DecaBDP Free.

2.4 GLASS MINERAL WOOL, RIGID

A. Manufacturer:
   1. Knauf Insulation: www.knaufinsulation.com.
   2. Johns Manville: www.jm.com.
   3. Owens Corning Corp: www.owenscorning.com.
   4. CertainTeed Corporation; Model "ToughGard® Rigid Liner Board": www.certainteed.com.
   5. Substitutions: See Section 01 60 00 - Product Requirements.

B. Insulation: ASTM C612; rigid, noncombustible blanket.
   1. ASTM C1071, Type II.
   2. 'K' value: 0.24 at 75 degrees F, when tested in accordance with ASTM C177.
   3. Maximum service temperature: 250 degrees F.
   4. Maximum Water Vapor Sorption: 5.0 percent.
   5. Maximum Density: 4.25 lb/cu ft.

C. UL/ULC Classified per UL 723. Comply with ASTM C 1071 Type I and Type II, NFPA 90A, and NFPA 90B; and with NAIMA AH124, "Fibrous Glass Duct Liner Standard." UL GREENGUARD Certified does not support the growth of mold, fungi, or bacteria per ASTM C 1338 and meets UL Environment GREENGUARD Microbial Resistance Listing per UL 2824-"GREENGUARD Certification Program Method for Measuring Microbial Resistance ". UL/E validated to be formaldehyde free. DecaBDP Free.

2.5 INSULATION BOARD

A. Manufacturer:
   1. Knauf Insulation: w/ECOSE Technology: www.knaufusa.com.
   2. Johns Manville Corporation: www.jm.com.
   3. Owens Corning Corp: www.owenscorning.com.
   4. CertainTeed Corporation: www.certainteed.com.
   5. Substitutions: See Section 01 60 00 - Product Requirements.

B. Insulation: ASTM C612; rigid, noncombustible blanket.
   1. ASTM C795.

2. 'K' value: 0.24 at 75 degrees F, when tested in accordance with ASTM C177.
3. Maximum service temperature: 250 degrees F.
4. Maximum Water Vapor Sorption: 5.0 percent.
5. Maximum Density: 4.25 lb/cu ft.

2.6 JACKETS

A. Canvas Jacket: UL listed 6 oz/sq yd plain weave cotton fabric treated with dilute fire retardant lagging adhesive.
   1. Lagging Adhesive:
      a. Compatible with insulation.

B. Glass Mineral Wool (Outdoor) Jacket: Asphalt impregnated and coated sheet, 50 lb/square.

C. Aluminum Jacket: ASTM B209 (ASTM B209M).
   1. Thickness: 0.020 inch sheet.
   2. Finish: Embossed.
   3. Joining: Longitudinal slip joints and 2 inch laps.
   4. Fittings: 0.016 inch thick die shaped fitting covers with factory attached protective liner.
   5. Metal Jacket Bands: 3/8 inch wide; 0.015 inch thick aluminum.
   6. Metal Jacket Bands: 3/8 inch wide; 0.010 inch thick stainless steel.

2.7 DUCT LINER

A. Manufacturers:
   1. Knauf Insulation: www.knaufinsulation.com.
   2. Johns Manville: www.jm.com.
   3. Owens Corning Corp: www.owenscorning.com.
   4. CertainTeed Corporation; Model "ToughGard® Duct Liner": www.certainteed.com.
   5. Substitutions: See Section 01 60 00 - Product Requirements.

B. Insulation: Non-corrosive, incombustible glass mineral wool complying with ASTM C 1071; mat faced air stream surface and edges coated with acrylic polymer.
   1. Fungi Resistance: ASTM G 21.
   2. UL GREENGUARD Certified does not support the growth of mold, fungi, or bacteria per ASTM C 1338
   3. Meets UL Environment GREENGUARD Microbial Resistance Listing per UL 2824-“GREENGUARD Certification Program Method for Measuring Microbial Resistance “
   4. DecaBDP Free.
   5. Apparent Thermal Conductivity: Maximum of 0.31 at 75 degrees F.
   6. Service Temperature: Up to 250 degrees F.
   7. Rated Velocity on Coated Air Side for Air Erosion: 5,000 fpm, minimum.
   8. Minimum Noise Reduction Coefficients:
      a. 1/2 inch Thickness: 0.45.

b. 1 inch Thickness: 0.70.
c. 1-1/2 inches Thickness: 0.80.
d. 2 inch Thickness: 0.85.

C. Liner Fasteners: Galvanized steel.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that ducts have been tested before applying insulation materials.

B. Verify that surfaces are clean, foreign material removed, and dry.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with NAIMA National Insulation Standards.

C. Insulated ducts conveying air below ambient temperature:
1. Provide insulation with integral vapor barrier jackets.
2. Finish with tape and vapor barrier jacket.
3. Continue insulation through walls, sleeves, hangers, and other duct penetrations.
4. Insulate entire system including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.

D. Insulated ducts conveying air above ambient temperature:
1. Provide with or without standard vapor barrier jacket.
2. Insulate fittings and joints. Where service access is required, bevel and seal ends of insulation.

E. Ducts Exposed in Mechanical Equipment Rooms or Finished Spaces (below 10 feet above finished floor): Finish with canvas jacket sized for finish painting.

F. External Duct Insulation Blanket or Board Application:
1. Secure insulation with vapor barrier with mechanical fasteners and seal jacket joints with vapor barrier tape to match jacket.
2. Secure board insulation without vapor barrier with mechanical fasteners (pins and speed washers).
3. Install without sag on underside of duct. Use mechanical fasteners where necessary to prevent sagging. Lift duct off trapeze hangers and insert spacers.
4. Seal vapor barrier penetrations by mechanical fasteners with vapor barrier adhesive or FSK tape made for duct wrap or FSK board.
5. Stop and point insulation around access doors and damper operators to allow operation without disturbing wrapping.

G. Duct and Plenum Liner Application:
   1. Adhere insulation with adhesive for 100 percent coverage.
   2. Secure insulation with mechanical liner fasteners. Refer to SMACNA HVAC Duct Construction Standards for spacing.
   3. Seal and smooth joints. Seal and coat transverse joints.
   4. Seal liner surface penetrations with adhesive.
   5. Duct dimensions indicated are net inside dimensions required for air flow. Increase duct size to allow for insulation thickness.
   6. Refer to SMACNA publication for transverse edges for velocities over 2500 fpm.

3.3 SCHEDULES

A. Exhaust Ducts Within 10 ft of Exterior Openings:
   1. Flexible Glass Mineral Wool Duct Insulation: Minimum 2 inches thick or R-Value of 8.

B. Outside Air Intake Ducts:
   1. Flexible Glass Mineral Wool Duct Insulation: Minimum 2 inches thick or R-Value of 8.

C. Supply and Return Ducts:
   1. Flexible Glass Mineral Wool Duct Insulation: Minimum 1.5 inches thick or R-Value of 5.

END OF SECTION 23 07 13

FUEL PIPING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Pipe, pipe fittings, valves, and connections for piping systems.
   1. Gas.

1.2 RELATED REQUIREMENTS

A. Section 07 84 00 - Firestopping.

B. Section 08 31 00 - Access Doors and Panels.

C. Section 09 90 00 - Painting and Coating.

D. Section 23 05 48 - Vibration Isolation and Sound and Seismic Controls for HVAC Piping and Equipment.

E. Section 23 05 49 - HVAC Seismic Restraint.

F. Section 23 05 53 - Identification for HVAC Piping and Equipment.

G. Section 26: Electrical characteristics and wiring connections.

1.3 REFERENCE STANDARDS

A. ASME B16.3 - Malleable Iron Threaded Fittings; The American Society of Mechanical Engineers; 2013.

B. ASME B31.1 - Power Piping; The American Society of Mechanical Engineers; 2013 (ANSI/ASME B31.1).

C. ASME B31.9 - Building Services Piping; The American Society of Mechanical Engineers; 2013 (ANSI/ASME B31.9).

D. ASME (BPV IX) - Boiler and Pressure Vessel Code, Section IX - Welding and Brazing Qualifications; The American Society of Mechanical Engineers; 2013.

E. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2013.

F. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service; 2013.

G. ICC-ES AC01 - Acceptance Criteria for Expansion Anchors in Masonry Elements; 2009.

H. ICC-ES AC106 - Acceptance Criteria for Predrilled Fasteners (Screw Anchors) in Masonry Elements; 2006.

I. ICC-ES AC193 - Acceptance Criteria for Mechanical Anchors in Concrete Elements; 2010.

J. ICC-ES AC308 - Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements; 2009.

K. MSS SP-89 - Pipe Hangers and Supports - Fabrication and Installation Practices; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; 2003.

L. NFPA 54 - National Fuel Gas Code; National Fire Protection Association; 2012.

1.4 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.

C. Project Record Documents: Record actual locations of valves.

D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.
   2. Valve Repacking Kits: Two for each type and size of valve.

1.5 QUALITY ASSURANCE

A. Perform work in accordance with all applicable local codes and standards.

B. Valves: Manufacturer's name and pressure rating marked on valve body.

C. Welding Materials and Procedures: Conform to ASME (BPV IX) .

D. Welder Qualifications: Certified in accordance with ASME (BPV IX).

E. Identify pipe with marking including size, ASTM material classification, ASTM specification, water pressure rating.

1.6 REGULATORY REQUIREMENTS

A. Perform Work in accordance with applicable plumbing code.

B. Conform to applicable code for installation of backflow prevention devices.

C. Provide certificate of compliance from authority having jurisdiction indicating approval of installation of backflow prevention devices.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.

B. Provide temporary protective coating on cast iron and steel valves.

C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system. Store pipe on sleepers, a minimum of 4 inches above surrounding grade, at all times.

1.8 FIELD CONDITIONS

A. Do not install underground piping when bedding is wet or frozen.

PART 2 PRODUCTS

2.1 NATURAL GAS PIPING, ABOVE GRADE

A. Steel Pipe: ASTM A 53/A 53M Schedule 40 black.
   1. Fittings: ASME B16.3, malleable iron, or ASTM A 234/A 234M, wrought steel welding type.
   2. Joints: NFPA 54, threaded or welded to ASME B31.1.

2.2 FLANGES, UNIONS, AND COUPLINGS

A. Unions for Pipe Sizes 3 Inches and Under:
   1. Ferrous pipe: Class 150 malleable iron threaded unions.
   2. Copper tube and pipe: Class 150 bronze unions with soldered joints.

B. Flanges for Pipe Size Over 1 Inch:
   1. Ferrous pipe: Class 150 malleable iron threaded or forged steel slip-on flanges; preformed neoprene gaskets.
   2. Copper tube and pipe: Class 150 slip-on bronze flanges; preformed neoprene gaskets.

C. Dielectric Connections: Bronze threaded nipple, minimum 3 inches long, with impervious isolation liner. Victaulic "Clearflow".

2.3 PIPE HANGERS AND SUPPORTS

A. Manufacturers:

1. Tolco Inc.
2. Anvil.
3. Hubbard Enterprises/Holdrite.
4. Michigan Hanger Company, Inc.
5. PHD Manufacturing Co.
6. Superstrut.
7. Unistrut.
8. Substitutions: See Section 01 60 00 - Product Requirements.

B. Fuel Piping:
1. Conform to ASME B31.9.
2. Hangers for Pipe Sizes 1/2 Inch to 1-1/2 Inches: Malleable iron, adjustable swivel, split ring.
3. Hangers for Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
4. Multiple or Trapeze Hangers: Steel channels with welded supports or spacers and hanger rods.
5. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
6. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp.
7. Vertical Support: Steel riser clamp.
    a. Isolate riser clamp from structure by use of Hubbard Enterprises/Holdrite #274 or #278 riser pad or Owner-approved equivalent.
8. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
9. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
10. Use non-metallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.
11. For vertical midspan support of piping 4 inches and under, use Hubbard Enterprises/Holdrite Stout Bracket in conjunction with Hubbard Enterprises/Holdrite Stout Clamp or industry standard two-hole pipe clamp (MSS Type 26).
12. Secondary Pipe Positioning and Supports:
    a. Makeshift, field-devised methods of plumbing pipe support, such as the use of scrap framing materials, are not allowed. Support and positioning of piping shall be by means of engineered methods that comply with IAPMO PS 42-96. These are to be Hubbard Enterprises/Holdrite support systems or approved equal.

C. Hanger Fasteners: Attach hangers to structure using appropriate fasteners, as follows:
1. Concrete Wedge Expansion Anchors: Complying with ICC-ES AC193.
2. Masonry Wedge Expansion Anchors: Complying with ICC-ES AC01.
3. Concrete Screw Type Anchors: Complying with ICC-ES AC193.
4. Masonry Screw Type Anchors: Complying with ICC-ES AC106.
5. Concrete Adhesive Type Anchors: Complying with ICC-ES AC308.
6. Other Types: As required.
7. Manufacturers:
    a. Powers Fasteners, Inc.: www.powers.com.
    b. Substitutions: See Section 01 60 00 - Product Requirements.

2.4 ACCESSORIES

A. Hanger Rods: Mild steel, threaded both ends, threaded on one end, or continuous threaded.

2.5 INSERTS

A. Manufacturers:
   1. Anvil Fig. 281.
   2. PHD Fig 951.
   3. Michigan Hanger Model 355EG.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Inserts: Carbon steel 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.

2.6 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.

D. Flexible Flashing: 1.85 inch thick sheet butyl; compatible with roofing.

E. Caps: Steel, 22 gage minimum; 16 gage at fire resistant elements.

2.7 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; refer to Section 07 90 05.

2.8 MECHANICAL SLEEVE SEALS

A. Manufacturers:
   1. Thunderline Link-Seal, Inc. Model Series LS.
   2. NMP Corporation.
   3. Substitutions: See 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.

2.9 FORMED STEEL CHANNEL

A. Manufacturers:
1. Unistrut Model Series P1000.
2. Superstrut Model Series 1200.
3. Michigan Hanger “O-Strut” Model A-12.
4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Product Description: Galvanized 12 gage thick steel. With holes 1-1/2 inches on center.

2.10 FIRESTOPPING

A. Manufacturers:
1. Specified Technology Inc. (STI) Model SpecSeal Series 100.
2. Dow Corning Corp.
3. Hilti Corp.
4. International Protective Coating Corp.
5. 3M fire Protection Products.
6. Metacaulk Fire Stopping: www.rectorseal.com.
7. Substitutions: See 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: Single or multiple component silicone elastomeric compound and compatible silicone sealant.
2. Foam Firestopping Compounds: Single or Multiple component foam compound.
3. Formulated Firestopping Compound of Incombustible Fibers: Formulated compound mixed with incombustible non-asbestos fibers.
4. Fiber Stuffing and Sealant Firestopping: Composite of mineral or ceramic fiber stuffing insulation with silicone elastomer for smoke stopping.
5. Mechanical Firestopping Device with Fillers: Mechanical device with incombustible fillers and silicone elastomer, covered with sheet stainless steel jacket, joined with collars, penetration sealed with flanged stops.
6. Intumescent Firestopping: Intumescent putty compound which expands on exposure to surface heat gain.
7. Firestop Pillows: Formed mineral fiber pillows.

C. Color: As selected from manufacturer's full range of colors.

2.11 FIRESTOPPING ACCESSORIES

A. Primer: Type recommended by firestopping manufacturer for specific substrate surfaces and suitable for required fire ratings.

B. Dam Material: Permanent:
   1. Mineral fiberboard.
   2. Mineral fiber matting.
   3. Sheet metal.
   4. Plywood or particle board.
   5. Alumina silicate fire board.

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.
   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 piping is exposed.
   2. For exterior wall openings below grade, furnish mechanical sealing device to continuously fill annular space between piping and cored opening or water-stop type wall sleeve.

2.12 BALL VALVES

A. Manufacturers:
   1. Hammond Valve Co.; Model 8501: www.hammondvalve.com.
   2. Nibco, Inc.; Model T-FP-600: www.nibco.com.
   3. Watts; Model FBV-1: www.watts.com.
   4. Stockham; Model S216-BR-R-T: www.stockham.com.
   5. Apollo Valves; Model 77C: www.apollovalves.com.
   6. Milwaukee Valve Company; Model BA-125: www.milwaukeevalve.com.
   7. Substitutions: See Section 01 60 00 - Product Requirements.

B. Up to and including 3 inches:
   1. MSS SP 110, Class 150, 600 WOG, bronze, two piece body, chrome plated brass ball, full port, teflon seats and stuffing box ring, blow-out proof stem, lever handle solder or threaded ends.

PART 3 EXECUTION

3.1 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and dirt, on inside and outside, before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.

C. Install piping to maintain headroom, conserve space, and not interfere with use of space.

D. Group piping whenever practical at common elevations.

E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

F. Provide access where valves and fittings are not exposed. Coordinate size and location of access doors with Section 08 31 00.

G. Establish elevations of buried piping outside the building to ensure not less than 2 ft of cover.

H. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.

I. Prepare exposed, unfinished pipe, fittings, supports, and accessories ready for finish painting. Refer to Section 09 90 00.

J. Install valves with stems upright or horizontal, not inverted.

K. Pipe vents from gas pressure reducing valves to outdoors and terminate in weather proof hood.

L. Install fuel oil piping to ASME B31.9.

M. Inserts:
   1. Provide inserts for placement in concrete formwork.
   2. Provide 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.
   5. For pipe runs of 1 inch or less and ran high and tight to the structure, use Hubbard Enterprises/Holdrite #121 or #125 Series Brackets in conjunction with Hubbard Enterprises/Holdrite #260 or #400 Series Inserts or approved equal.

6. 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.

N. Pipe Hangers and Supports:
1. Install in accordance with ASME B31.9 and MSS SP-89.
2. Support horizontal piping as scheduled.
3. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
4. Place hangers within 12 inches of each horizontal elbow.
5. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
6. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.
7. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
8. Provide copper plated hangers and supports for copper piping or sheet lead packing between hanger or support and piping.
9. Prime coat exposed steel hangers and supports. Refer to Section 09 90 00. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.
10. Provide hangers adjacent to motor driven equipment with vibration isolation; refer to Section 23 05 48.
11. Support of pipe tubing and equipment is to be accomplished by means of engineered products specific to each application. Makeshift field devised methods will not be allowed.

3.3 APPLICATION

A. Install unions downstream of valves and at equipment or apparatus connections.

B. Install ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.

END OF SECTION 23 10 05

HVAC DUCTS AND CASINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Metal ductwork.

B. Casing and plenums.

C. Kitchen hood ductwork.

D. Duct cleaning.

E. Duct systems have been designed for metal duct.

1.2 RELATED REQUIREMENTS

A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 07 84 00 - Firestopping.

C. Section 09 90 00 - Painting and Coating: Weld priming, weather resistant, paint or coating.

D. Section 11 40 00 - Foodservice Equipment: Supply of kitchen range hoods for placement by this Section.

E. Section 23 05 48 - Vibration Isolation and Sound and Seismic Controls for HVAC Piping and Equipment.

F. Section 23 05 49 - HVAC Seismic Restraint.

G. Section 23 05 93 - Testing, Adjusting, and Balancing for HVAC.

H. Section 23 07 13 - Duct Insulation: External insulation and duct liner.

I. Section 23 33 00 - Air Duct Accessories.

J. Section 23 37 00 - Air Outlets and Inlets.

1.3 REFERENCE STANDARDS

A. ASHRAE (FUND) - ASHRAE Handbook - Fundamentals; 2013.

B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.

C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.

D. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable; 2015.

E. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2014.

F. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.

G. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric); 2014.

H. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.

I. ICC-ES AC01 - Acceptance Criteria for Expansion Anchors in Masonry Elements; 2015.

J. ICC-ES AC106 - Acceptance Criteria for Predrilled Fasteners (Screw Anchors) in Masonry Elements; 2012.

K. ICC-ES AC193 - Acceptance Criteria for Mechanical Anchors in Concrete Elements; 2015.

L. ICC-ES AC308 - Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements; 2015.

M. ASTM E 2336-04 - Standard Test Methods for Fire Resistive Grease Duct Enclosure Systems; 2009.

N. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2015.

O. NFPA 90B - Standard for the Installation of Warm Air Heating and Air-Conditioning Systems; 2015.

P. NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations; 2014.

Q. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2005 (Rev. 2009).

R. SMACNA (KVS) - Kitchen Ventilation Systems and Food Service Equipment Fabrication and Installation Guidelines; 2001.

1.4 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data for duct materials, duct liner, duct connections, and duct fittings.

C. Shop Drawings: Submit duct fabrication drawings, drawn to scale not smaller than 1/4 inch 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. Penetrations through fire rated and other walls.
   7. Terminal unit, coil, and humidifier installations.
   8. Hangers and supports, including methods for building attachment, vibration isolation, and duct attachment.

D. Manufacturer's Installation Instructions: Indicate special procedures for glass fiber ducts.

E. Manufacturer's Certificate: Certify that installation of glass fiber ductwork meet or exceed recommended fabrication and installation requirements.

F. Project Record Documents: Record actual locations of ducts and duct fittings. Record changes in fitting location and type. Show additional fittings used.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

B. Installer Qualifications: Company specializing in performing the type of work specified in this section, with minimum three years of documented experience.

1.6 REGULATORY REQUIREMENTS

A. Construct ductwork to NFPA 90A, NFPA 90B, and NFPA 96 standards.

1.7 FIELD CONDITIONS

A. Do not install duct sealants when temperatures are less than those recommended by sealant manufacturers.

B. Maintain temperatures within acceptable range during and after installation of duct sealants.

PART 2 PRODUCTS

2.1 MATERIALS

A. Galvanized Steel for Ducts: Hot-dipped galvanized steel sheet, ASTM A653/A653M FS Type B, with G90/Z275 coating.

B. Aluminum for Ducts: ASTM B209 (ASTM B209M); aluminum sheet, alloy 3003-H14. Aluminum Connectors and Bar Stock: Alloy 6061-T651 or of equivalent strength.

C. Joint Sealers and Sealants: Non-hardening, water resistant, mildew and mold resistant.
   1. Type: Heavy mastic or liquid used alone or with tape, suitable for joint configuration and compatible with substrates, and recommended by manufacturer for pressure class of ducts.
   2. VOC Content: Not more than 250 g/L, excluding water.
   3. Surface Burning Characteristics: Flame spread of zero, smoke developed of zero, when tested in accordance with ASTM E84.
   4. For Use With Flexible Ducts: UL labeled.
   5. Products:
      a. Duro-Dyne; Model DSW: www.durodyne.com.
      b. Hard Cast; Model RTA 50: www.hardcast.com.
      c. Hard Cast; Model "Versa-Grip" 102: www.hardcast.com.
      d. Sika; Model "Sikaflex": www.sika.com.
      e. Substitutions: See Section 01 60 00 - Product Requirements.

D. Hanger Rod: ASTM A36/A36M; steel, galvanized; threaded both ends, threaded one end, or continuously threaded.

E. Hanger Fasteners: Attach hangers to structure using appropriate fasteners, as follows:
   1. Concrete Wedge Expansion Anchors: Complying with ICC-ES AC193.
   2. Masonry Wedge Expansion Anchors: Complying with ICC-ES AC01.
   3. Concrete Screw Type Anchors: Complying with ICC-ES AC193.
   4. Masonry Screw Type Anchors: Complying with ICC-ES AC106.
   5. Concrete Adhesive Type Anchors: Complying with ICC-ES AC308.
   6. Other Types: As required.
   7. Manufacturers:
      a. Powers Fasteners, Inc.: www.powers.com.
      b. Substitutions: See Section 01 60 00 - Product Requirements.

F. All Ducts: Galvanized steel, unless otherwise indicated.

2.2 DUCTWORK FABRICATION

A. Fabricate and support in accordance with SMACNA HVAC Duct Construction Standards and as indicated.

B. Transfer Air and Sound Boots: 1/2 inch w.g. pressure class, fibrous glass.

C. No variation of duct configuration or size permitted except by written permission. Size round duct installed in place of rectangular ducts in accordance with ASHRAE Handbook - Fundamentals.

D. Duct systems have been designed for metal duct. At the Contractor's option, fibrous glass duct may be substituted for metal duct.

E. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.

F. Construct T's, bends, and elbows with radius of not less than 1-1/2 times width of duct on centerline. Where not possible and where rectangular elbows must be used, provide air foil turning vanes of perforated metal with glass fiber insulation.

G. Provide turning vanes of perforated metal with glass fiber insulation when acoustical lining is indicated.

H. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.

I. Fabricate continuously welded round and oval duct fittings in accordance with SMACNA HVAC Duct Construction Standards.

J. Provide standard 45 degree lateral wye takeoffs unless otherwise indicated where 90 degree conical tee connections may be used.

K. Where ducts are connected to exterior wall louvers and duct outlet is smaller than louver frame, provide blank-out panels sealing louver area around duct. Use same material as duct, painted black on exterior side; seal to louver frame and duct.

2.3 DUCT MANUFACTURERS

A. Streimer Sheet Metal: www.streimer.com.

B. General Sheet Metal: www.gsmw.com.

C. Arctic Sheet Metal: www.arcticsheetmetal.com.

D. Arjae Sheet Metal: www.arjae.com.

E. Robert Lloyd Sheet Metal: www.rlsm.net.

F. Substitutions: See Section 01 60 00 - Product Requirements.

2.4 MANUFACTURED DUCTWORK AND FITTINGS

A. Flexible Ducts: UL 181, Class 1, aluminum laminate and polyester film with latex adhesive supported by helically wound spring steel wire.
   1. Insulation: Fiberglass insulation with polyethylene or aluminized vapor barrier film.
   2. Pressure Rating: 10 inches WG positive and 1.0 inches WG negative.
   3. Maximum Velocity: 4000 fpm.
   4. Temperature Range: -20 degrees F to 210 degrees F.
   5. Minimum Insulation: R-6
   6. Manufacturers:
      a. Thermaflex.
      b. Substitutions: See Section 01 60 00 - Product Requirements.

B. Transverse Duct Connection System: SMACNA "E" rated rigidly class connection, interlocking angle and duct edge connection system with sealant, gasket, cleats, and corner clips.

2.5 CASINGS

A. Fabricate casings in accordance with SMACNA HVAC Duct Construction Standards and construct for operating pressures indicated.

B. Mount floor mounted casings on 4 inch high concrete curbs. At floor, rivet panels on 8 inch centers to angles. Where floors are acoustically insulated, provide liner of 18 gage galvanized expanded metal mesh supported at 12 inch centers, turned up 12 inches at sides with sheet metal shields.

C. Reinforce door frames with steel angles tied to horizontal and vertical plenum supporting angles. Install hinged access doors where indicated or required for access to equipment for cleaning and inspection.
   1. Provide clear wire glass observation ports, minimum 6 X 6 inch size.

D. Fabricate acoustic casings with reinforcing turned inward. Provide 16 gage back facing and 22 gage perforated front facing with 3/32 inch diameter holes on 5/32 inch centers. Construct panels 3 inches thick packed with 4.5 lb/cu ft minimum glass fiber media, on inverted channels of 16 gage.

2.6 KITCHEN HOOD EXHAUST DUCTWORK

A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards, SMACNA Kitchen Ventilation Systems and Food Service Equipment Fabrication & Installation Guidelines and NFPA 96.

B. Grease Exhaust: Construct of 16 gage carbon steel or 18 gage stainless steel, using continuous external welded joints.

C. Vapor Exhaust: Construct of 18 gage stainless steel, using continuous external welded joints.

2.7 GREASE EXHAUST SYSTEM

A. The grease duct shall be factory prefabricated, double wall type, and listed per ASTM E2336 for the venting of grease laden air from kitchen hoods requiring grease duct as described in NFPA 96. The grease duct shall be rated for continuous operation of 500 degrees F and intermittent operation at 2,000 degrees F.

B. The inner wall shall be constructed of 0.035” thick Type 304 (or optional 316) stainless steel. The outer wall (casing) shall be constructed of 0.025” thick aluminized steel (or optional 0.024” thick Type 304 or 316 stainless steel).

C. The grease duct shall have a 4” wide annular space between the inner and outer walls that is filled with 4” of high temperature ceramic fiber insulation.

D. The grease duct shall be sealed liquid tight by means of a mechanical joining consisting of integral flanges on adjoining sections of pipe, held together with a stainless steel flange band and sealed with Type P080 sealant.

E. The grease duct shall include hood and fan transitions, pipe supports and guides, fittings, cleanout ports, ports for the introduction of fire suppression or wash-down nozzles. Expansion joints and thimbles for penetration of non-fire rated building members, all as shown on plans or as required to meet local building code requirements. All components of the grease duct system shall be provided by the grease manufacturer to ensure that the system meets the requirements of the listing.

F. The grease duct shall be listed with ICBO, SBCCI PST and ESI, BOCA EVALUATON SERVICE, or approved by the local building code authority, as a Two-Hour fire rated system which can be installed at 0 inch clearance to combustible surfaces. The grease duct shall be listed to penetrate interior walls or partitions rated up to 2 hours. Such penetrations must be fire stopped in accordance with the manufacturer's instruction using the Model PICPPK fire stop kit.

G. All grease duct supports or guides that shall be anchored with FM-Stainless Fasteners FIX Epoxy Anchoring System or equal, approved by the building code official. Anchors shall be minimum of 5/8” diameter.

H. The grease duct shall be installed in complete compliance with the manufacturer's listed installation instructions.

I. The grease duct shall be Model No. Chase, Series 4G, Grease Duct as manufactured by Metal-Fab, Inc. of Wichita, Kansas.

J. Alternate Construction: Provide ASTM E2336-04 listed fiber wrap acceptable to authority having jurisdiction.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install, support, and seal ducts in accordance with SMACNA HVAC Duct Construction Standards.

B. Install in accordance with manufacturer's instructions.

C. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.

D. Flexible Ducts: Connect to metal ducts with adhesive and draw bands

E. Kitchen Hood Exhaust: Provide residue traps at base of vertical risers with provisions for clean out.

F. Use sealant on all lapped round duct joint connections. Seal all ducts in accordance with State Energy Code.

G. Duct sizes indicated are inside clear dimensions. For lined ducts, maintain sizes inside lining.

H. Provide openings in ductwork where required to accommodate thermometers and controllers. Provide pilot tube openings where required for testing of systems, complete with metal can with spring device or screw to ensure against air leakage. Where openings are provided in insulated ductwork, install insulation material inside a metal ring.

I. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

J. Use crimp joints with or without bead for joining round duct sizes 8 inch and smaller with crimp in direction of air flow.

K. Install duct hangers and supports in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.

L. Use double nuts and lock washers on threaded rod supports.

M. Connect terminal units to supply ducts with one foot maximum length of flexible duct. Do not use flexible duct to change direction.

N. Connect diffusers or light troffer boots to low pressure ducts with 5 feet maximum length of flexible duct held in place with strap or clamp.

O. Set plenum doors 6 to 12 inches above floor. Arrange door swings so that fan static pressure holds door in closed position.

P. At exterior wall louvers, seal duct to louver frame.

3.2 CLEANING

A. Clean duct system and force air at high velocity through duct to remove accumulated dust. To obtain sufficient air, clean half the system at a time. Protect equipment that could be harmed by excessive dirt with temporary filters, or bypass during cleaning.

3.3 SCHEDULES

A. Ductwork Material Schedule:

AIR SYSTEM	MATERIAL
Supply (Heating Systems)	Steel, Aluminum
Supply (System with Cooling Coils)	Steel, Aluminum
Return and Relief	Steel, Aluminum
General Exhaust	Steel, Aluminum
Kitchen Hood Exhaust	Steel, Stainless Steel
Outside Air Intake	Steel

B. Ductwork Pressure Class Schedule:

AIR SYSTEM	PRESSURE CLASS
Supply (Heating Systems)	1 inch wg
Supply (System with Cooling Coils)	1 inch wg
Return and Relief	1 inch wg
General Exhaust	1/2 inch wg
Grease Hood Exhaust	2 inch wg

END OF SECTION 23 31 00

AIR DUCT ACCESSORIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Air turning devices/extractors.

B. Backdraft dampers - metal.

C. Duct access doors.

D. Duct test holes.

E. Flexible duct connections.

F. Volume control dampers.

1.2 RELATED REQUIREMENTS

A. Section 07 84 00 - Firestopping.

B. Section 23 05 48 - Vibration Isolation and Sound and Seismic Controls for HVAC Piping and Equipment.

C. Section 23 31 00 - HVAC Ducts and Casings.

D. Division 26 - Electrical characteristics and wiring connections.

1.3 REFERENCE STANDARDS

A. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2015.

B. NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations; 2014.

C. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2005 (Rev. 2009).

1.4 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide for shop fabricated assemblies including volume control dampers, duct access doors, duct test holes, and hardware used. Include electrical characteristics and connection requirements.

C. Shop Drawings: Indicate for shop fabricated assemblies including volume control dampers, duct access doors, and duct test holes.

D. Manufacturer's Installation Instructions: Provide instructions for fire dampers and combination fire and smoke dampers.

E. Project Record Drawings: Record actual locations of access doors, test holes, fire dampers, and fire and smoke dampers.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect dampers from damage to operating linkages and blades.

PART 2 PRODUCTS

2.1 AIR TURNING DEVICES/EXTRACTORS

A. Manufacturers:
1. Carlisle HVAC Products: www.carlislehvac.com.
2. Elgen Manufacturing: www.elgenmfg.com.
3. Krueger: www.krueger-hvac.com.
4. Ruskin Company: www.ruskin.com.
5. Titus: www.titus-hvac.com.
6. Substitutions: See Section 01 60 00 - Product Requirements.

B. Multi-blade device with blades aligned in short dimension; steel or aluminum construction; with individually adjustable blades, mounting straps.

C. Multi-blade device with radius blades attached to pivoting frame and bracket, steel construction, with push-pull operator strap.

2.2 BACKDRAFT DAMPERS - METAL

A. Manufacturers:
1. PCI Industries, Inc.; Pottorff Brand Model Series BD60: www.pottorff.com.
2. Cesco; Model BAP-1: www.cescoproducts.com.
3. Greenheck; Model Series EM: www.greenheck.com.
4. Ruskin Company; BD/BDR: www.ruskin.com.

5. Nailor; Model 1370/1380: www.nailor.com.
6. Tamco; Model BDD Series 7000 (aluminum): www.tamco.ca.
7. Substitutions: See Section 01 60 00 - Product Requirements.

B. Gravity Backdraft Dampers, Size 18 x 18 inches or Smaller, Furnished with Air Moving Equipment: Air moving equipment manufacturer's standard construction.

C. Multi-Blade, Parallel Action Gravity Balanced Backdraft Dampers: Galvanized steel or Extruded aluminum, with center pivoted blades of maximum 6 inch width, with felt or flexible vinyl sealed edges, linked together in rattle-free manner with 90 degree stop, steel ball bearings, and plated steel pivot pin; adjustment device to permit setting for varying differential static pressure.

2.3 DUCT ACCESS DOORS

A. Manufacturers:
1. Cesco; Model Series HF: www.cescoproducts.com.
2. Greenheck; Model Series HAD/CAD: www.greenheck.com.
3. Ruskin Company: www.ruskin.com.
4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Fabrication: Rigid and close-fitting of galvanized steel with sealing gaskets and quick fastening locking devices. For insulated ducts, install minimum 1 inch thick insulation with sheet metal cover.
1. Less Than 12 inches Square: Secure with sash locks.
2. Up to 18 inches Square: Provide two hinges and two sash locks.
3. Up to 24 x 48 inches: Three hinges and two compression latches with outside and inside handles.
4. Larger Sizes: Provide an additional hinge.

C. Access doors with sheet metal screw fasteners are not acceptable.

2.4 DUCT TEST HOLES

A. Temporary Test Holes: Cut or drill in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.

B. Permanent Test Holes: Factory fabricated, air tight flanged fittings with screw cap. Provide extended neck fittings to clear insulation.

2.5 FLEXIBLE DUCT CONNECTIONS

A. Manufacturers:
1. Carlisle HVAC Products; Dynair Connector Plus G90 Steel Offset Seam Neoprene Fabric: www.carlislehvac.com/sle.
2. Elgen Manufacturing: www.elgenmfg.com.
3. Substitutions: See Section 01 60 00 - Product Requirements.

B. Fabricate in accordance with SMACNA HVAC Duct Construction Standards and as indicated.

C. Flexible Duct Connections: Fabric crimped into metal edging strip.
   1. Fabric: UL listed fire-retardant neoprene coated woven glass fiber fabric to NFPA 90A, minimum density 30 oz per sq yd.
      a. Net Fabric Width: Approximately 3 inches wide.
   2. Metal: 3 inches wide, 24 gage thick galvanized steel.

D. Leaded Vinyl Sheet: Minimum 0.55 inch thick, 0.87 lbs per sq ft, 10 dB attenuation in 10 to 10,000 Hz range.

E. Maximum Installed Length: 14 inch.

2.6 VOLUME CONTROL DAMPERS

A. Manufacturers:
   1. Cesco; Model Series MGF/MGG: www.cescoproducts.com.
   2. Greenheck; Model Series MBD/MBDR: www.greenheck.com.
   3. Nailor: Model 1110/1120 galvanized: www.nailor.com.
   4. Tamco: Series 1000 (aluminum): www.tamco.com.
   5. Substitutions: See Section 01 60 00 - Product Requirements.

B. Fabricate in accordance with SMACNA HVAC Duct Construction Standards and as indicated.

C. Splitter Dampers:
   1. Material: Same gage as duct to 24 inches size in either direction, and two gages heavier for sizes over 24 inches.
   2. Blade: Fabricate of single thickness sheet metal to streamline shape, secured with continuous hinge or rod.
   3. Operator: Minimum 1/4 inch diameter rod in self aligning, universal joint action, flanged bushing with set screw.
   4. Manufacturers:
      a. Krueger.

D. Single Blade Dampers: Fabricate for duct sizes up to 6 x 30 inch.
   1. Fabricate for duct sizes up to 6 x 30 inch.
   2. Blade: 24 gage, minimum.
   3. Manufacturers:

E. Multi-Blade Damper: Fabricate of opposed blade pattern with maximum blade sizes 8 x 72 inch. Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.
   1. Blade: 18 gage, minimum.
   2. Manufacturers:
      a. Ruskin.

F. End Bearings: Except in round ducts 12 inches and smaller, provide end bearings. On multiple blade dampers, provide oil-impregnated nylon, thermoplastic elastomer, or sintered bronze bearings.
   1. Product: 515A manufactured by Young Regulator.

G. Quadrants:
   1. Provide locking, indicating quadrant regulators on single and multi-blade dampers.
   2. On insulated ducts mount quadrant regulators on stand-off mounting brackets, bases, or adapters.
   3. Where rod lengths exceed 30 inches provide regulator at both ends.
   4. Products:
      a. 443 Valcalox Regulator manufactured by Young Regulator.
      b. Substitutions: See Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.1 PREPARATION

A. Verify that electric power is available and of the correct characteristics.

3.2 INSTALLATION

A. Install accessories in accordance with manufacturer's instructions, NFPA 90A, and follow SMACNA HVAC Duct Construction Standards. Refer to Section 23 31 00 for duct construction and pressure class.

B. Provide backdraft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.

C. Provide duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, at fire dampers, combination fire and smoke dampers, and elsewhere as indicated. Provide for cleaning kitchen exhaust ducts in accordance with NFPA 96. Provide minimum 8 x 8 inch size for hand access, 18 x 18 inch size for shoulder access, and as indicated. Provide 4 x 4 inch for balancing dampers only. Review locations prior to fabrication.

D. Provide duct test holes where indicated and required for testing and balancing purposes.

E. Demonstrate re-setting of fire dampers to Owner's representative.

F. At fans and motorized equipment associated with ducts, provide flexible duct connections immediately adjacent to the equipment.

G. At equipment supported by vibration isolators, provide flexible duct connections immediately adjacent to the equipment; see Section 23 05 48.

H. Provide balancing dampers at points on supply, return, and exhaust systems where branches are taken from larger ducts as required for air balancing. Install minimum 2 duct widths from duct take-off.

I. Use splitter dampers only where indicated.

J. Provide balancing dampers on duct take-off to diffusers, grilles, and registers, regardless of whether dampers are specified as part of the diffuser, grille, or register assembly.

END OF SECTION 23 33 00

HVAC POWER VENTILATORS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Roof exhausters.

B. In-line supply fans.

1.2 RELATED REQUIREMENTS

A. Section 23 05 13 - Common Motor Requirements for HVAC Equipment.

B. Section 23 05 48 - Vibration and Seismic Controls for HVAC Piping and Equipment.

C. Section 23 33 00 - Air Duct Accessories: Backdraft dampers.

D. Section 26 27 17 - Equipment Wiring: Electrical characteristics and wiring connections.

1.3 REFERENCE STANDARDS

A. AMCA 99 - Standards Handbook; 2010.

B. AMCA 204 - Balance Quality and Vibration Levels for Fans; 2005.

C. AMCA 210 - Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating; 2007.

D. AMCA (DIR) - [Directory of] Products Licensed Under AMCA International Certified Ratings Program; Air Movement and Control Association International, Inc.; http://www.amca.org/certified/search/company.aspx.

E. AMCA 300 - Reverberant Room Method for Sound Testing of Fans; 2014.

F. AMCA 301 - Methods for Calculating Fan Sound Ratings from Laboratory Test Data; 2014.

G. NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations; 2014.

H. UL 705 - Power Ventilators; Current Edition, Including All Revisions.

I. UL 762 - Outline of Investigation for Power Roof Ventilators for Restaurant Exhaust Appliances; Current Edition, Including All Revisions.

1.4 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on fans and accessories including fan curves with specified operating point clearly plotted, power, RPM, sound power levels at rated capacity, and electrical characteristics and connection requirements.

C. Manufacturer's Instructions: Indicate installation instructions.

D. Maintenance Data: Include instructions for lubrication, motor and drive replacement, spare parts list, and wiring diagrams.

E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.
   2. Extra Fan Belts: Two sets for each individual fan.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.1 POWER VENTILATORS - GENERAL

A. Static and Dynamically Balanced: AMCA 204 - Balance Quality and Vibration Levels for Fans.

B. Performance Ratings: Determined in accordance with AMCA 210 and bearing the AMCA Certified Rating Seal.

C. Sound Ratings: AMCA 301, tested to AMCA 300, and bearing AMCA Certified Sound Rating Seal.

D. Fabrication: Conform to AMCA 99.

E. UL Compliance: UL listed and labeled, designed, manufactured, and tested in accordance with UL 705.

F. Electrical Components: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

G. Kitchen Hood Exhaust Fans: Comply with requirements of NFPA 96 and UL 762.

2.2 ROOF EXHAUSTERS (KITCHEN)

A. Manufacturers:
   1. Greenheck; Model CUE/CUBE: www.greenheck.com.
   2. Carnes; Model Series VR: www.carnes.com.
   3. Loren Cook Company; Model Series ACRU: www.lorencook.com.
   4. JenCoFan; Model NBRTD: www.jencofan.com.
   5. PennBarry; Model Fumex: www.pennbarry.com.
   6. Twin City Fan Company; Model DCRUR/BCRUR: www.tcf.com.
   7. Substitutions: See Section 01 60 00 - Product Requirements.

B. Product Requirements:
   1. Performance Ratings: Determined in accordance with AMCA 210 and bearing the AMCA Certified Rating Seal.
   2. Sound Ratings: AMCA 301, tested to AMCA 300, and bearing AMCA Certified Sound Rating Seal.
   3. Fabrication: Conform to AMCA 99.
   4. UL Compliance: UL listed and labeled, designed, manufactured, and tested in accordance with UL 705.

C. Performance
   1. Air Flow: As indicated in the Drawing Schedule.
   2. Electrical Characteristics:
      a. Refer to Division 26.
   3. Motor: NEMA MG 1, 2006.

D. Fan Unit: V-belt or direct driven as indicated, with spun aluminum housing; resilient mounted motor; 1/2 inch mesh, 0.62 inch thick aluminum wire birdscreen; square base to suit roof curb with continuous curb gaskets.

E. Roof Curb: 12 inch high self-flashing of galvanized steel with continuously welded seams, built-in cant strips, insulation and curb bottom, interior baffle with acoustic insulation, curb bottom, ventilated double wall, hinged curb adapter, and factory installed nailer strip.

F. Disconnect Switch: Factory wired, non-fusible, in housing for thermal overload protected motor and wall mounted multiple speed switch.

G. Backdraft Damper: Gravity actuated, aluminum multiple blade construction, felt edged with offset hinge pin, nylon bearings, blades linked, and line voltage motor drive, power open, spring return.

H. Sheaves: Cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheave selected so required rpm is obtained with sheaves set at mid-position; fan shaft with self-aligning pre-lubricated ball bearings.

2.3 SUPPLY FANS

A. Manufacturers:
   1. Greenheck; Model Series SQ/BSQ: www.greenheck.com.
   2. Carnes; Model Series VIDK/VIBK: www.carnes.com.
   3. Loren Cook Company; Model Series SQN: www.lorencook.com.
   4. JenCoFan; Model Series JID/JIB: www.jencofan.com.
   5. PennBarry; Model Centrex Inliner: www.pennbarry.com.
   6. Twin City Fan Company; Type DSI and BSI: www.tcf.com.
   7. Substitutions: See Section 01 60 00 - Product Requirements.

B. Construction:
   1. Centrifugal Fan Unit: V-belt or direct driven backward incline wheel with galvanized steel housing and support lugs, lined with 1/2 inch acoustic insulation, resilient mounted motor, gravity backdraft damper in discharge.
   2. Disconnect Switch: Cord and plug in housing for thermal overload protected motor and wall mounted switch.
   3. Sheaves: Cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheaves selected so required rpm is obtained with sheaves set at mid-position; fan shaft with self-aligning pre-lubricated ball bearings.

C. Performance:
   1. As indicated on the Drawing Schedule.

D. Electrical Characteristics and Components:
   1. Electrical Characteristics: In accordance with Division 26.
   2. Motors: In accordance with Section 22 05 13/23 05 13. Type: NEMA MG1.
   3. Disconnect Switch: Factory mount disconnect switch on equipment.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Secure roof exhausters with stainless steel lag screws to roof curb.

C. Extend ducts to roof exhausters into roof curb. Counterflash duct to roof opening.

D. Hung Fans:
   1. Install fans with resilient mountings and flexible electrical leads. Refer to Section 23 05 48.
   2. Install flexible connections specified in Section 23 33 00 between fan and ductwork. Ensure metal bands of connectors are parallel with minimum one inch flex between ductwork and fan while running.

E. Provide sheaves required for final air balance.

F. Install backdraft dampers on inlet to roof exhausters.

END OF SECTION 23 34 23

AIR OUTLETS AND INLETS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Diffusers.

B. Registers/grilles.

1.2 RELATED REQUIREMENTS

A. Section 09 90 00 - Painting and Coating: Painting of ducts visible behind outlets and inlets.

1.3 REFERENCE STANDARDS

A. AMCA 500-L - Laboratory Methods of Testing Louvers for Rating; 2012.

B. ARI 890 - Standard for Air Diffusers and Air Diffuser Assemblies; Air-Conditioning and Refrigeration Institute; 2008.

C. ASHRAE Std 70 - Method of Testing the Performance of Air Outlets and Inlets; 2006 (R2011).

1.4 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data for equipment required for this project. Review outlets and inlets as to size, finish, and type of mounting prior to submission. Submit schedule of outlets and inlets showing type, size, location, application, and noise level.

C. Project Record Documents: Record actual locations of air outlets and inlets.

1.5 QUALITY ASSURANCE

A. Test and rate air outlet and inlet performance in accordance with ASHRAE Std 70.

B. Test and rate louver performance in accordance with AMCA 500-L.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Carnes, a division of Carnes Company Inc.: www.carnes.com.

B. Krueger: www.krueger-hvac.com.

C. Price Industries: www.price-hvac.com.

D. Titus: www.titus-hvac.com.

E. Nailor; www.nailor.com.

F. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 PERFORATED FACE CEILING DIFFUSERS

A. Manufacturers:
1. Carnes Model Series SPMB.
2. Price Model PDMC.
3. Krueger Model 1240P.
4. Titus Model PMC.
5. Nailor; Model 4320M.
6. Substitutions: See Section 01 60 00 - Product Requirements.

B. Type: Perforated face with fully adjustable pattern and removable face.

C. Frame: Surface mount type. In plaster ceilings, provide plaster frame and ceiling frame.

D. Fabrication: Steel with steel frame and baked enamel finish.

E. Accessories: Radial opposed blade damper and multi-louvered equalizing grid with damper adjustable from diffuser face.

2.3 CEILING EXHAUST AND RETURN GRILLES (PERFORATED)

A. Manufacturers:
1. Carnes Model Series RTFA.
2. Price Model PDDR.
3. Krueger Model 6290/6590.
4. Titus Model PAR.
5. Nailor; Model 51EC.
6. Substitutions: See Section 01 60 00 - Product Requirements.

B. Type: Perforated face with fully adjustable, round or square neck as indicated on the Drawings and removable face.

C. Frame: As required for the ceiling type. In plaster ceilings, furnish plaster frame and ceiling frame.

D. Fabrication: Steel with steel frame and baked enamel off-white finish.

E. Accessories: Radial opposed-blade or butterfly damper and multi-louvered equalizing grid with damper adjustable from diffuser face.

2.4 CEILING EGG CRATE EXHAUST AND RETURN GRILLES

A. Manufacturers:
1. Carnes Model Series RATB.
2. Price Model Series 81.
3. Krueger Model EGC5.
4. Titus Model 50F.
5. Nailor; Model 61DH.
6. Substitutions: See Section 01 60 00 - Product Requirements.

B. Type: Egg crate style face consisting of 1/2 x 1/2 x 1/2 inch grid core.

C. Fabrication: Grid core consists of aluminum with factory off-white enamel finish.

D. Frame: 1-1/4 inch margin with countersunk screw mounting.

E. Frame: Channel lay-in frame for suspended grid ceilings.

F. Accessories: Provide integral, gang & face operated opposed blade damper with removable key operator, operable from face.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Check location of outlets and inlets and make necessary adjustments in position to conform with architectural features, symmetry, and lighting arrangement.

C. Install diffusers to ductwork with air tight connection.

D. Provide balancing dampers on duct take-off to diffusers, and grilles and registers, despite whether dampers are specified as part of the diffuser, or grille and register assembly.

E. Paint ductwork visible behind air outlets and inlets matte black. Refer to Section 09 90 00.

END OF SECTION 23 37 00

FUEL-FIRED UNIT HEATERS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Gas fired duct furnaces.

1.2 RELATED REQUIREMENTS

A. Section 23 05 13 - Common Motor Requirements for HVAC Equipment: Fan motors.

B. Section 23 05 48 - Vibration Isolation and Sound and Seismic Controls for HVAC Piping and Equipment.

C. Section 23 05 49 - HVAC Seismic Restraint.

D. Section 23 07 13 - Duct Insulation: Duct Liner.

E. Section 23 31 00 - HVAC Ducts and Casings.

F. Division 26: Electrical characteristics and wiring connections.

1.3 REFERENCE STANDARDS

A. ASHRAE Std 103 - Methods of Testing for Annual Fuel Utilization Efficiency of Residential Central Furnaces and Boilers; 2007, Including All Amendments.

B. NFPA 54 - National Fuel Gas Code; 2015.

C. NFPA 90B - Standard for the Installation of Warm Air Heating and Air-Conditioning Systems; 2015.

D. NFPA 211 - Guide for Smoke and Heat Venting; 2013, Including All Amendments.

1.4 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's literature and data indicating rated capacities, weights, accessories, electrical nameplate data, and wiring diagrams.

C. Shop Drawings: Indicate assembly, required clearances, and locations and sizes of field connections.

D. Manufacturer's Instructions: Indicate rigging, assembly, and installation instructions.

E. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, maintenance and repair data, and parts listing.

F. Warranty: Submit manufacturers warranty and ensure forms have been filled out in Owner s name and registered with manufacturer.

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - Project Requirements, for additional provisions.
   2. Extra Filters: Two sets.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

1.6 REGULATORY REQUIREMENTS

A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

1.7 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Provide ten year manufacturers warranty for heat exchangers.

PART 2 PRODUCTS

2.1 GAS FIRED DUCT FURNACES (SEPARATED COMBUSTION)

A. Manufacturers:
   1. Reznor/Thomas & Betts Corporation; Model SC: www.reznoronline.com.
   2. Modine Manufacturing Company: www.modine.com.
   3. Sterling HVAC/Mestek Technology, Inc.: www.sterlinghvac.com.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Units: Self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, heat exchanger, burner, controls, and accessories.
   1. Gas control: Modulating (minimum 50-100%) - electric.
   2. Ignition System: Electric ignition pilot to main burner.
   3. Control Voltage: 24 volt, 60 hertz.
   4. Location: As indicated on the Drawings.

C. Cabinet: Galvanized steel, easily removed and secured access panels, insulated or double panel construction.

D. Heat Exchanger: Type E-3 stainless steel welded construction.

E. Gas Burner: Power vented with non-corrosive air blower with permanently lubricated motor.

F. Gas Burner Safety Controls:
   1. Thermocouple sensor: Prevents opening of gas valve until pilot flame is proven and stops gas flow on ignition failure.
   2. Flame rollout switch: Installed on burner box and prevents operation.
   3. Vent safety shutoff sensor: Temperature sensor installed on draft hood and prevents operation, manual reset.
   4. Limit Control: Fixed stop at maximum permissible setting, de-energizes burner on excessive bonnet temperature, automatic resets.

G. Controls: Adjustable, room thermostat, low voltage, to control burner operation.

H. Performance:
   1. Ratings: As indicated in the Drawing Schedule.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that space is ready for installation of units and openings are as indicated on shop drawings.

B. Verify that proper power supply is available.

C. Verify that proper fuel supply is available for connection.

3.2 INSTALLATION

A. Install in accordance with NFPA 90B.

B. Install gas fired units in accordance with NFPA 54 and applicable codes.

C. Provide vent connections in accordance with NFPA 211.

D. Install duct furnaces with vibration isolation. Refer to Section 23 05 48.

E. Provide operating controls; refer to Section 23 09 13.

F. Provide connection to electrical power systems.

END OF SECTION 23 55 33

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Single conductor building wire.

B. Metal-clad cable.

C. Wiring connectors.

D. Oxide inhibiting compound.

E. Wire pulling lubricant.

F. Cable ties.

1.2 RELATED REQUIREMENTS

A. Section 26 05 26 - Grounding and Bonding for Electrical Systems: Additional requirements for grounding conductors and grounding connectors.

B. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

C. Section 28 31 00 - Fire Alarm System: Fire alarm system conductors and cables.

1.3 REFERENCE STANDARDS

A. ASTM B3 - Standard Specification for Soft or Annealed Copper Wire; 2013.

B. ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft; 2011.

C. ASTM B33 - Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes; 2010 (Reapproved 2014).

D. ASTM B787/B787M - Standard Specification for 19 Wire Combination Unilay-Stranded Copper Conductors for Subsequent Insulation; 2004 (Reapproved 2014).

E. ASTM B800 - Standard Specification for 8000 Series Aluminum Alloy Wire for Electrical Purposes - Annealed and Intermediate Tempers; 2005 (Reapproved 2011).

F. ASTM B801 - Standard Specification for Concentric-Lay-Stranded Conductors of 8000 Series Aluminum Alloy Wire for Subsequent Covering of Insulation; 2007 (Reapproved 2012).

G. FS A-A-59544 - Cable and Wire, Electrical (Power, Fixed Installation); Federal Specification; Revision A, 2008.

H. NEC 210.4(B) - Multiwire Branch Circuits - Disconnecting Means; National Electrical Code; 2008

I. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

J. NECA 104 - Recommended Practice for Installing Aluminum Building Wire and Cable; 2012.

K. NECA 120 - Standard for Installing Armored Cable (AC) and Metal-Clad Cable (MC); 2012.

L. NEMA WC 70 - Nonshielded Power Cable 2000 V or Less for the Distribution of Electrical Energy; 2009.

M. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2013.

N. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

O. UL 44 - Thermoset-Insulated Wires and Cables; Current Edition, Including All Revisions.

P. UL 83 - Thermoplastic-Insulated Wires and Cables; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate sizes of raceways, boxes, and equipment enclosures installed under other sections with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop, material change, and quantity of conductors in conduit.
   2. Coordinate with electrical equipment installed under other sections to provide terminations suitable for use with the conductors to be installed.
   3. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

1.5 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for conductors and cables, including detailed information on materials, construction, ratings, listings, and available sizes, configurations, and stranding.

C. Design Data: Indicate voltage drop and ampacity calculations for aluminum conductors substituted for copper conductors. Include proposed modifications to raceways, boxes, wiring gutters, enclosures, etc. to accommodate substituted conductors.

D. Field Quality Control Test Reports.

E. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

F. Project Record Documents: Record actual installed circuiting arrangements. Record actual routing for underground circuits.

1.6 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store conductors and cables in accordance with manufacturer's instructions.

1.8 FIELD CONDITIONS

A. Do not install or otherwise handle thermoplastic-insulated conductors at temperatures lower than 14 degrees F, unless otherwise permitted by manufacturer's instructions. When installation below this temperature is unavoidable, notify Architect and obtain direction before proceeding with work.

PART 2 PRODUCTS

2.1 CONDUCTOR AND CABLE APPLICATIONS

A. Do not use conductors and cables for applications other than as permitted by NFPA 70 and product listing.

B. Provide single conductor building wire installed in suitable raceway unless otherwise indicated, permitted, or required.

C. Metal-clad cable is permitted only as follows:

1. Where not otherwise restricted, may be used:
    a. Where concealed in hollow stud walls, above accessible and non-accessible ceilings, and under raised floors for branch circuits up to 20 A.

        1) Exception: Provide single conductor building wire in raceway for circuit homerun from first outlet to panelboard.
2. In addition to other applicable restrictions, may not be used:
    a. Where not approved for use by the authority having jurisdiction.
    b. Where exposed to view, except in dedicated electrical, communications, and mechanical rooms where not subject to damage.
    c. Where exposed to damage.
    d. For damp, wet, or corrosive locations, unless provided with a PVC jacket listed as suitable for those locations.
    e. For isolated ground circuits, unless provided with an additional isolated/insulated grounding conductor.

2.2 CONDUCTOR AND CABLE MANUFACTURERS

A. Cerro Wire LLC: www.cerrowire.com.

B. Encore Wire Corporation: www.encorewire.com.

C. American Insulated Wire: www.leviton.com.

D. Southwire Company: www.southwire.com.

E. General Cable; www.generalcable.com.

F. Substitutions: See Section 01 60 00 - Product Requirements.

2.3 CONDUCTOR AND CABLE GENERAL REQUIREMENTS

A. Provide products that comply with requirements of NFPA 70.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Provide new conductors and cables manufactured not more than one year prior to installation.

D. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.

E. Comply with NEMA WC 70.

F. Comply with FS A-A-59544 where applicable.

G. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.

H. Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.

I. Conductors for Grounding and Bonding: Also comply with Section 26 05 26.

J. Conductors and Cables Installed in Cable Tray: Listed and labeled as suitable for cable tray use.

K. Conductors and Cables Installed Where Exposed to Direct Rays of Sun: Listed and labeled as sunlight resistant.

L. Conductors and Cables Installed Exposed in Spaces Used for Environmental Air (only where specifically permitted): Plenum rated, listed and labeled as suitable for use in return air plenums.

M. Conductor Material:
1. Provide copper conductors only. Aluminum conductors are not acceptable for this project. Conductor sizes indicated are based on copper.
2. Provide copper conductors except where aluminum conductors are specifically indicated. Substitution of aluminum conductors for copper is not permitted. Conductor sizes indicated are based on copper unless specifically indicated as aluminum. Conductors designated with the abbreviation "AL" indicate aluminum.
3. Provide copper conductors except where aluminum conductors are specifically indicated or permitted for substitution. Conductor sizes indicated are based on copper unless specifically indicated as aluminum. Conductors designated with the abbreviation "AL" indicate aluminum.
   a. Substitution of aluminum conductors for copper is permitted, when approved by Owner and authority having jurisdiction, only for the following:
      1) Services: Copper conductors size 1/0 AWG and larger.
      2) Feeders: Copper conductors size 1/0 AWG and larger.
   b. Where aluminum conductors are substituted for copper, comply with the following:
      1) Size aluminum conductors to provide, when compared to copper sizes indicated, equivalent or greater ampacity and equivalent or less voltage drop.
      2) Increase size of raceways, boxes, wiring gutters, enclosures, etc. as required to accommodate aluminum conductors.
      3) Provide copper equipment grounding conductor sized according to NFPA 70.
      4) Equip electrical distribution equipment with compression lugs for terminating aluminum conductors.
4. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B787M unless otherwise indicated.

5. Tinned Copper Conductors: Comply with ASTM B33.
6. Aluminum Conductors (only where specifically indicated or permitted for substitution): AA-8000 series aluminum alloy conductors recognized by ASTM B800 and compact stranded in accordance with ASTM B801 unless otherwise indicated.

N. Minimum Conductor Size:
1. Branch Circuits: 12 AWG.
   a. Exceptions:
      1) 20 A, 120 V circuits longer than 75 feet: 10 AWG, for voltage drop.
      2) 20 A, 120 V circuits longer than 150 feet: 8 AWG, for voltage drop.
      3) 20 A, 277 V circuits longer than 150 feet: 10 AWG, for voltage drop.
2. Control Circuits: 14 AWG.

O. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

P. Conductor Color Coding:
1. Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.
2. Color Coding Method: Integrally colored insulation.
   a. Conductors size 4 AWG and larger may have black insulation color coded using vinyl color coding electrical tape.
3. Color Code:
   a. 480Y/277 V, 3 Phase, 4 Wire System:
      1) Phase A: Brown.
      2) Phase B: Orange.
      3) Phase C: Yellow.
      4) Neutral/Grounded: Gray.
   b. 208Y/120 V, 3 Phase, 4 Wire System:
      1) Phase A: Black.
      2) Phase B: Red.
      3) Phase C: Blue.
      4) Neutral/Grounded: White.

c. Equipment Ground, All Systems: Green.
d. Isolated Ground, All Systems: Green with yellow stripe.
e. For control circuits, comply with manufacturer's recommended color code.

2.4 SINGLE CONDUCTOR BUILDING WIRE

A. Manufacturers:
1. Copper Building Wire:
a. Cerro Wire LLC: www.cerrowire.com.
b. Encore Wire Corporation: www.encorewire.com.
c. Southwire Company: www.southwire.com.
d. Substitutions: See Section 01 60 00 - Product Requirements.
2. Aluminum Building Wire (only where specifically indicated or permitted for substitution):
a. Alcan Products Corporation/Alcan Cable: www.cable.alcan.com.
b. Prysmian Power Cables and Systems: www.us.prysmian.com.
c. Southwire Company: www.southwire.com.
d. Substitutions: See Section 01 60 00 - Product Requirements.

B. Description: Single conductor insulated wire.

C. Conductor Stranding:
1. Feeders and Branch Circuits:
a. Size 10 AWG and Smaller: Solid or Stranded.
b. Size 8 AWG and Larger: Stranded.
2. Control Circuits: Stranded.

D. Insulation Voltage Rating: 600 V.

E. Insulation:
1. Copper Building Wire: Type THHN/THWN, THHN/THWN-2, or XHHW-2, except as indicated below.
a. Size 4 AWG and Larger: Type XHHW-2, THHN/THWN, or THHN/THWN-2.
b. Installed Underground: Type XHHW-2, THHN/THWN, or THHN/THWN-2.
2. Aluminum Building Wire (only where specifically indicated or permitted for substitution): Type XHHW-2 or RHH/RHW-2.

2.5 METAL-CLAD CABLE

A. Manufacturers:
1. AFC Cable Systems Inc: www.afcweb.com.
2. Encore Wire Corporation: www.encorewire.com.
3. Southwire Company: www.southwire.com.
4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Description: NFPA 70, Type MC cable listed and labeled as complying with UL 1569, and listed for use in classified firestop systems to be used.

C. Conductor Stranding:
   1. Size 10 AWG and Smaller: Solid or Stranded.
   2. Size 8 AWG and Larger: Stranded.

D. Insulation Voltage Rating: 600 V.

E. Insulation: Type THHN/THWN-2 or XHHW-2.

F. Provide dedicated neutral conductor for each phase conductor where indicated or required.

G. Grounding: Full-size integral equipment grounding conductor.

H. Armor: Aluminum or steel, interlocked tape.

I. Provide PVC jacket applied over cable armor where indicated or required for environment of installed location.

2.6 WIRING CONNECTORS

A. Description: Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable.

B. Connectors for Grounding and Bonding: Comply with Section 26 05 26.

C. Wiring Connectors for Splices and Taps:
   1. Copper Conductors Size 8 AWG and Smaller: Use twist-on insulated spring connectors or compression connectors.
   2. Copper Conductors Size 6 AWG and Larger: Use compression connectors.
   3. Connectors for Aluminum Conductors: Use compression connectors.

D. Wiring Connectors for Terminations:
   1. Provide terminal lugs for connecting conductors to equipment furnished with terminations designed for terminal lugs.
   2. Where over-sized conductors are larger than the equipment terminations can accommodate, provide connectors suitable for reducing to appropriate size, but not less than required for the rating of the overcurrent protective device.
   3. Provide motor pigtail connectors for connecting motor leads in order to facilitate disconnection.
   4. Copper Conductors Size 8 AWG and Larger: Use compression connectors where connectors are required OR for all connections.
   5. Aluminum Conductors: Use compression connectors where connectors are required.
   6. Stranded Conductors Size 10 AWG and Smaller: Use crimped terminals for connections to terminal screws.
   7. Conductors for Control Circuits: Use crimped terminals where connectors are required.

E. Do not use insulation-piercing or insulation-displacement connectors designed for use with conductors without stripping insulation.

F. Do not use push-in wire connectors as a substitute for twist-on insulated spring connectors.

G. Twist-on Insulated Spring Connectors: Rated 600 V, 221 degrees F for standard applications and 302 degrees F for high temperature applications; pre-filled with sealant and listed as complying with UL 486D for damp and wet locations.
   1. Manufacturers:
      a. 3M: www.3m.com.
      b. Ideal Industries, Inc: www.idealindustries.com.
      c. NSI Industries LLC: www.nsiindustries.com.
      d. Substitutions: See Section 01 60 00 - Product Requirements.

H. Mechanical Connectors: Provide bolted type or set-screw type.
   1. Manufacturers:
      a. Burndy: www.burndy.com.
      b. Ilsco: www.ilsco.com.
      c. Thomas & Betts Corporation: www.tnb.com.
      d. Substitutions: See Section 01 60 00 - Product Requirements.

I. Compression Connectors: Provide circumferential type or hex type crimp configuration.
   1. Manufacturers:
      a. Burndy: www.burndy.com.
      b. Ilsco: www.ilsco.com.
      c. Thomas & Betts Corporation: www.tnb.com.
      d. Substitutions: See Section 01 60 00 - Product Requirements.

J. Crimped Terminals: Nylon-insulated, with insulation grip and terminal configuration suitable for connection to be made.
   1. Manufacturers:
      a. Burndy: www.burndy.com.
      b. Ilsco: www.ilsco.com.
      c. Thomas & Betts Corporation: www.tnb.com.
      d. Substitutions: See Section 01 60 00 - Product Requirements.

2.7 WIRING ACCESSORIES

A. Oxide Inhibiting Compound: Listed; suitable for use with the conductors or cables to be installed.
   1. Manufacturers:
      a. Burndy: www.burndy.com.
      b. Ideal Industries, Inc: www.idealindustries.com.
      c. Ilsco: www.ilsco.com.
      d. Substitutions: See Section 01 60 00 - Product Requirements.

B. Wire Pulling Lubricant: Listed; suitable for use with the conductors or cables to be installed and suitable for use at the installation temperature.
   1. Manufacturers:
      a. 3M: www.3m.com.
      b. American Polywater Corporation: www.polywater.com.
      c. Ideal Industries, Inc: www.idealindustries.com.
      d. Substitutions: See Section 01 60 00 - Product Requirements.

C. Cable Ties: Material and tensile strength rating suitable for application.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that interior of building has been protected from weather.

B. Verify that work likely to damage wire and cable has been completed.

C. Verify that raceways, boxes, and equipment enclosures are installed and are properly sized to accommodate conductors and cables in accordance with NFPA 70.

D. Verify that field measurements are as shown on the drawings.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.2 PREPARATION

A. Clean raceways thoroughly to remove foreign materials before installing conductors and cables.

3.3 INSTALLATION

A. Circuiting Requirements:
   1. Unless dimensioned, circuit routing indicated is diagrammatic.
   2. When circuit destination is indicated and routing is not shown, determine exact routing required.
   3. Arrange circuiting to minimize splices.
   4. Include circuit lengths required to install connected devices within 10 ft of location shown.
   5. Maintain separation of Class 1, Class 2, and Class 3 remote-control, signaling, and power-limited circuits in accordance with NFPA 70.
   6. Maintain separation of wiring for emergency systems in accordance with NFPA 70.
   7. Circuiting Adjustments: Unless otherwise indicated, when branch circuits that originate in the same panelboard are shown as separate, combining them together in a single raceway is permitted, under the following conditions:
      a. Provide no more than six current-carrying conductors in a single raceway. Dedicated neutral conductors are considered current-carrying conductors.
      b. Increase size of conductors as required to account for ampacity derating.

c. Size raceways, boxes, etc. to accommodate conductors.

8. Common Neutrals: Unless otherwise indicated, sharing of neutral/grounded conductors among up to three single phase branch circuits of different phases installed in the same raceway is not permitted. Provide dedicated neutral/grounded conductor for each individual branch circuit.

B. Install products in accordance with manufacturer's instructions.

C. Install conductors and cable in a neat and workmanlike manner in accordance with NECA 1.

D. Install aluminum conductors in accordance with NECA 104.

E. Install metal-clad cable (Type MC) in accordance with NECA 120.

F. Installation in Raceway:
1. Tape ends of conductors and cables to prevent infiltration of moisture and other contaminants.
2. Pull all conductors and cables together into raceway at same time.
3. Do not damage conductors and cables or exceed manufacturer's recommended maximum pulling tension and sidewall pressure.
4. Use suitable wire pulling lubricant where necessary, except when lubricant is not recommended by the manufacturer.

G. Exposed Cable Installation (only where specifically permitted):
1. Route cables parallel or perpendicular to building structural members and surfaces.
2. Protect cables from physical damage.

H. Paralleled Conductors: Install conductors of the same length and terminate in the same manner.

I. Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by the authority having jurisdiction. Provide independent support from building structure. Do not provide support from raceways, piping, ductwork, or other systems.
1. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conductors and cables to lay on ceiling tiles.
2. Installation in Vertical Raceways: Provide supports where vertical rise exceeds permissible limits.

J. Terminate cables using suitable fittings.
1. Metal-Clad Cable (Type MC):
a. Use listed fittings.
b. Cut cable armor only using specialized tools to prevent damaging conductors or insulation. Do not use hacksaw or wire cutters to cut armor.
c. Do not use direct-bearing set-screw type fittings for cables with aluminum armor.

K. Install conductors with a minimum of 6 inches of slack at each outlet.

L. Where conductors are installed in enclosures for future termination by others, provide a minimum of 5 feet of slack.

M. Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.

N. Group or otherwise identify neutral/grounded conductors with associated ungrounded conductors inside enclosures in accordance with NFPA 70.

O. Make wiring connections using specified wiring connectors.
   1. Make splices and taps only in accessible boxes. Do not pull splices into raceways or make splices in conduit bodies.
   2. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors.
   3. Do not remove conductor strands to facilitate insertion into connector.
   4. Clean contact surfaces on conductors and connectors to suitable remove corrosion, oxides, and other contaminates. Do not use wire brush on plated connector surfaces.
   5. Connections for Aluminum Conductors: Fill connectors with oxide inhibiting compound where not pre-filled by manufacturer.
   6. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
   7. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.

P. Insulate splices and taps that are made with uninsulated connectors using methods suitable for the application, with insulation and mechanical strength at least equivalent to unspliced conductors.
   1. Dry Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.
      a. For taped connections, first apply adequate amount of rubber splicing electrical tape or electrical filler tape, followed by outer covering of vinyl insulating electrical tape.
      b. For taped connections likely to require re-entering, including motor leads, first apply varnished cambric electrical tape, followed by adequate amount of rubber splicing electrical tape, followed by outer covering of vinyl insulating electrical tape.
   2. Damp Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.
      a. For connections with insulating covers, apply outer covering of moisture sealing electrical tape.
      b. For taped connections, follow same procedure as for dry locations but apply outer covering of moisture sealing electrical tape.
   3. Wet Locations: Use heat shrink tubing.

Q. Insulate ends of spare conductors using vinyl insulating electrical tape.

R. Field-Applied Color Coding: Where vinyl color coding electrical tape is used in lieu of integrally colored insulation as permitted in Part 2 under "Color Coding", apply half overlapping turns of tape at each termination and at each location conductors are accessible.

S. Identify conductors and cables in accordance with Section 26 05 53.

T. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified.

U. Unless specifically indicated to be excluded, provide final connections to all equipment and devices, including those furnished by others, as required for a complete operating system.

V. Install wire and cable securely, in a neat and workmanlike manner, as specified in NECA 1. Contractor shall comply with NEC 210.4(B) by providing a separate neutral conductor for each circuit in a multi-wire branch circuit.

W. Support cables above accessible ceiling, using spring metal clips or plastic cable ties to support cables from structure or ceiling suspension system. Do not rest cable on ceiling panels. Do not attach cables to slack wires. Plastic cable ties shall be plenum rated in plenum spaces.

3.4 FIELD QUALITY CONTROL

A. Perform inspection, testing, and adjusting in accordance with Section 01 40 00.

B. Inspect and test in accordance with NETA ATS, except Section 4.

C. Perform inspections and tests listed in NETA STD ATS, Section 7.3.2. The insulation resistance test is only required for services and feeders.
   1. Disconnect surge protective devices (SPDs) prior to performing any high potential testing. Replace SPDs damaged by performing high potential testing with SPDs connected.

D. Correct deficiencies and replace damaged or defective conductors and cables.

END OF SECTION 26 05 19

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Grounding and bonding requirements.

B. Conductors for grounding and bonding.

C. Connectors for grounding and bonding.

D. Ground bars.

E. Ground rod electrodes.

1.2 RELATED REQUIREMENTS

A. Section 26 05 19 - Low Voltage Electrical Power Conductors and Cables: Additional requirements for conductors for grounding and bonding, including conductor color coding.

B. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

1.3 REFERENCE STANDARDS

A. IEEE 81 - IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Grounding System; 2012.

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

C. NEMA GR 1 - Grounding Rod Electrodes and Grounding Rod Electrode Couplings; 2007.

D. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2013.

E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. NFPA 99 - Health Care Facilities Code; 2015.

G. UL 467 - Grounding and Bonding Equipment; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Verify exact locations of underground metal water service pipe entrances to building.
2. Coordinate the work with other trades to provide steel reinforcement complying with specified requirements for concrete-encased electrode.
3. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

B. Sequencing:
1. Do not install ground rod electrodes until final backfill and compaction is complete.

1.5 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittals procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for grounding and bonding system connectors.

C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

D. Field quality control test reports.

E. Project Record Documents: Record actual locations of grounding electrode system components and connections.

1.6 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years experience.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.1 GROUNDING AND BONDING REQUIREMENTS

A. Existing Work: Where existing grounding and bonding system components are indicated to be reused, they may be reused only where they are free from corrosion, integrity and continuity are verified, and where acceptable to the authority having jurisdiction.

B. Do not use products for applications other than as permitted by NFPA 70 and product listing.

C. Unless specifically indicated to be excluded, provide all required components, conductors, connectors, conduit, boxes, fittings, supports, accessories, etc. as necessary for a complete grounding and bonding system.

D. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

E. Grounding System Resistance:
   1. Achieve specified grounding system resistance under normally dry conditions unless otherwise approved by Architect. Precipitation within the previous 48 hours does not constitute normally dry conditions.
   2. Grounding Electrode System: Not greater than 5 ohms OR 25 ohms to ground, when tested according to IEEE 81 using "fall-of-potential" method.
   3. Between Grounding Electrode System and Major Electrical Equipment Frames, System Neutral, and Derived Neutral Points: Not greater than 0.5 ohms, when tested according to IEEE 81 using "point-to-point" methods.

F. Grounding Electrode System:
   1. Provide connection to required and supplemental grounding electrodes indicated to form grounding electrode system.
      a. Provide continuous grounding electrode conductors without splice or joint.
      b. Install grounding electrode conductors in non-metallic raceway where exposed to physical damage.
   2. Metal Underground Water Pipe(s):
      a. Provide connection to underground metal domestic and fire protection (where present) water service pipe(s) that are in direct contact with earth for at least 10 feet at an accessible location not more than 5 feet from the point of entrance to the building.
      b. Provide bonding jumper(s) around insulating joints/pipes as required to make pipe electrically continuous.
      c. Provide bonding jumper around water meter of sufficient length to permit removal of meter without disconnecting jumper.
   3. Metal Building or Structure Frame:
      a. Provide connection to metal building or structure frame effectively grounded in accordance with NFPA 70 at nearest accessible location.
   4. Concrete-Encased Electrode:
      a. Provide connection to concrete-encased electrode consisting of not less than 20 feet of either steel reinforcing bars or bare copper conductor not smaller than 4 AWG embedded within concrete foundation or footing that is in direct contact with earth in accordance with NFPA 70.
   5. Ground Ring:
      a. Provide a ground ring encircling the building or structure consisting of bare copper conductor not less than 2 AWG in direct contact with earth, installed at a depth of not less than 30 inches.

b. Where location is not indicated, locate ground ring conductor at least 24 inches outside building perimeter foundation.
c. Provide connection from ground ring conductor to:

1) Perimeter columns of metal building frame.

2) Ground rod electrodes located as indicated, not more than 30 feet apart, and at each corner of the building/structure.

6. Provide additional ground electrode(s) as required to achieve specified grounding electrode system resistance.
7. Ground Bar: Provide ground bar, separate from service equipment enclosure, for common connection point of grounding electrode system bonding jumpers as permitted in NFPA 70. Connect grounding electrode conductor provided for service-supplied system grounding to this ground bar.
   a. Ground Bar Size: 1/4 by 4 by 12 inches unless otherwise indicated or required.
   b. Where ground bar location is not indicated, locate in accessible location as near as possible to service disconnect enclosure.
   c. Ground Bar Mounting Height: 18 inches above finished floor unless otherwise indicated.
8. Ground Riser: Provide common grounding electrode conductor not less than 3/0 AWG for tap connections to multiple separately derived systems as permitted in NFPA 70.

G. Service-Supplied System Grounding:
1. For each service disconnect, provide grounding electrode conductor to connect neutral (grounded) service conductor to grounding electrode system. Unless otherwise indicated, make connection at neutral (grounded) bus in service disconnect enclosure.
2. For each service disconnect, provide main bonding jumper to connect neutral (grounded) bus to equipment ground bus where not factory-installed. Do not make any other connections between neutral (grounded) conductors and ground on load side of service disconnect.

H. Grounding for Separate Building or Structure Supplied by Feeder(s) or Branch Circuits:
1. Provide grounding electrode system for each separate building or structure.
2. Provide equipment grounding conductor routed with supply conductors.
3. For each disconnecting means, provide grounding electrode conductor to connect equipment ground bus to grounding electrode system.
4. Do not make any connections and remove any factory-installed jumpers between neutral (grounded) conductors and ground.

I. Separately Derived System Grounding:
1. Separately derived systems include, but are not limited to:
   a. Transformers (except autotransformers such as buck-boost transformers).
   b. Uninterruptible power supplies (UPS), when configured as separately derived systems.
   c. Generators, when neutral is switched in the transfer switch.
2. Provide grounding electrode conductor to connect derived system grounded conductor to nearest effectively grounded metal building frame OR nearest effectively grounded metal water pipe OR common grounding electrode conductor ground riser. Unless otherwise

indicated, make connection at neutral (grounded) bus in source enclosure OR neutral (grounded) bus in first disconnecting means.

3. Provide bonding jumper to connect derived system grounded conductor to nearest metal building frame and nearest metal water piping in the area served by the derived system, where not already used as a grounding electrode for the derived system. Make connection at same location as grounding electrode conductor connection.
4. Where common grounding electrode conductor ground riser is used for tap connections to multiple separately derived systems, provide bonding jumper to connect the metal building frame and metal water piping in the area served by the derived system to the common grounding electrode conductor.
5. Outdoor Source: Where the source of the separately derived system is located outside the building or structure supplied, provide connection to grounding electrode at source in accordance with NFPA 70.
6. Provide system bonding jumper to connect system grounded conductor to equipment ground bus. Make connection at same location as grounding electrode conductor connection. Do not make any other connections between neutral (grounded) conductors and ground on load side of separately derived system disconnect.
7. Where the source and first disconnecting means are in separate enclosures, provide supply-side bonding jumper between source and first disconnecting means.

J. Bonding and Equipment Grounding:
1. Provide bonding for equipment grounding conductors, equipment ground busses, metallic equipment enclosures, metallic raceways and boxes, device grounding terminals, and other normally non-current-carrying conductive materials enclosing electrical conductors/equipment or likely to become energized as indicated and in accordance with NFPA 70.
2. Provide insulated equipment grounding conductor in each feeder and branch circuit raceway. Do not use raceways as sole equipment grounding conductor.
3. Where circuit conductor sizes are increased for voltage drop, increase size of equipment grounding conductor proportionally in accordance with NFPA 70.
4. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
5. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on neutral (grounded) or isolated/insulated ground bus.
6. Provide bonding jumper across expansion or expansion/deflection fittings provided to accommodate conduit movement.
7. Provide bonding for interior metal piping systems in accordance with NFPA 70. This includes, but is not limited to:
   a. Metal water piping where not already effectively bonded to metal underground water pipe used as grounding electrode.
   b. Metal gas piping.
   c. Metal process piping.
8. Provide bonding for interior metal air ducts.
9. Provide bonding for metal building frame where not used as a grounding electrode.
10. Provide bonding for metal siding not effectively bonded through attachment to metal building frame.
11. Provide bonding and equipment grounding for pools and fountains and associated equipment in accordance with NFPA 70.

12. Provide redundant grounding and bonding for patient care areas of health care facilities in accordance with NFPA 70 and NFPA 99.

K. Isolated Ground System:
1. Where isolated ground receptacles or other isolated ground connections are indicated, provide separate isolated/insulated equipment grounding conductors.
2. Connect isolated/insulated equipment grounding conductors only to separate isolated/insulated equipment ground busses.
3. Connect the isolated/insulated equipment grounding conductors to the solidly bonded equipment ground bus only at the service disconnect or separately derived system disconnect. Do not make any other connections between isolated ground system and normal equipment ground system on the load side of this connection.

L. Photovoltaic Systems.

2.2 GROUNDING AND BONDING COMPONENTS

A. General Requirements:
1. Provide products listed, classified, and labeled by Underwriter's Laboratories Inc. (UL) or testing firm acceptable to authority having jurisdiction as suitable for the purpose indicated.
2. Provide products listed and labeled as complying with UL 467 where applicable.

B. Conductors for Grounding and Bonding, in addition to requirements of Section 26 05 19:
1. Use insulated copper conductors unless otherwise indicated.
   a. Exceptions:
      1) Use bare copper conductors where installed underground in direct contact with earth.
      2) Use bare copper conductors where directly encased in concrete (not in raceway).
2. Factory Pre-fabricated Bonding Jumpers: Furnished with factory-installed ferrules; size braided cables to provide equivalent gauge of specified conductors.

C. Connectors for Grounding and Bonding:
1. Description: Connectors appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.
2. Unless otherwise indicated, use exothermic welded connections for underground, concealed and other inaccessible connections.
   a. Exceptions:
      1) Use mechanical connectors for connections to electrodes at ground access wells.
3. Unless otherwise indicated, use mechanical connectors or exothermic welded connections for accessible connections.
   a. Exceptions:

1) Use exothermic welded connections for connections to metal building frame.

4. Manufacturers - Mechanical and Compression Connectors:
   a. Burndy: www.burndy.com.
   b. Harger Lightning & Grounding: www.harger.com.
   c. Thomas & Betts Corporation: www.tnb.com.
   d. Substitutions: See Section 01 60 00 - Product Requirements.
5. Manufacturers - Exothermic Welded Connections:
   a. Burndy: www.burndy.com.
   b. Cadweld, a brand of Erico International Corporation: www.erico.com.
   c. ThermOweld, a brand of Continental Industries, Inc: www.thermoweld.com.
   d. Substitutions: See Section 01 60 00 - Product Requirements.

D. Ground Bars:
1. Description: Copper rectangular ground bars with mounting brackets and insulators.
2. Size: As specified herein.
3. Holes for Connections: As indicated or as required for connections to be made.
4. Manufacturers:
   a. Erico International Corporation: www.erico.com.
   b. Harger Lightning & Grounding: www.harger.com.
   c. ThermOweld, a brand of Continental Industries, Inc: www.thermoweld.com.
   d. Substitutions: See Section 01 60 00 - Product Requirements.

E. Ground Rod Electrodes:
1. Comply with NEMA GR 1.
2. Material: Copper-bonded (copper-clad) steel.
3. Size: 5/8 inch diameter by 10 feet length, unless otherwise indicated.
4. Where rod lengths of greater than 10 feet are indicated or otherwise required, sectionalized ground rods may be used.
5. Manufacturers:
   a. Erico International Corporation: www.erico.com.
   b. Galvan Industries, Inc: www.galvanelectrical.com.
   c. Harger Lightning & Grounding: www.harger.com.
   d. Substitutions: See Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.1 PREPARATION

A. Remove paint, rust, mill oils, and surface contaminants at connection points.

3.2 EXAMINATION

A. Verify that work likely to damage grounding and bonding system components has been completed.

B. Verify that field measurements are as shown on the drawings.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.3 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install grounding and bonding system components in a neat and workmanlike manner in accordance with NECA 1.

C. Ground Rod Electrodes: Unless otherwise indicated, install ground rod electrodes vertically. Where encountered rock prohibits vertical installation, install at 45 degree angle or bury horizontally in trench at least 30 inches (750 mm) deep in accordance with NFPA 70.
   1. Outdoor Installations: Unless otherwise indicated, install with top of rod 6 inches below finished grade.
   2. Indoor Installations: Unless otherwise indicated, install with 4 inches of top of rod exposed.

D. Make grounding and bonding connections using specified connectors.
   1. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors. Do not remove conductor strands to facilitate insertion into connector.
   2. Remove nonconductive paint, enamel, or similar coating at threads, contact points, and contact surfaces.
   3. Exothermic Welds: Make connections using molds and weld material suitable for the items to be connected in accordance with manufacturer's recommendations.
   4. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.

E. Identify grounding and bonding system components in accordance with Section 26 05 53.

3.4 FIELD QUALITY CONTROL

A. Perform inspection, testing, and adjusting in accordance with Section 01 40 00.

B. Inspect and test in accordance with NETA ATS except Section 4.

C. Perform inspections and tests listed in NETA ATS, Section 7.13.

D. Perform ground electrode resistance tests under normally dry conditions. Precipitation within the previous 48 hours does not constitute normally dry conditions.

E. Investigate and correct deficiencies where measured ground resistances do not comply with specified requirements.

F. Submit detailed reports indicating inspection and testing results and corrective actions taken.

END OF SECTION 26 05 26

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Conduit and equipment supports.

B. Anchors and fasteners.

C. Support and attachment components for equipment, conduit, cable, boxes, and other electrical work.

1.2 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Concrete equipment pads.

B. Section 05 50 00 - Metal Fabrications: Materials and requirements for fabricated metal supports.

C. Section 26 05 34 - Conduit: Additional support and attachment requirements for conduits.

D. Section 26 05 37 - Boxes: Additional support and attachment requirements for boxes.

E. Section 26 51 00 - Interior & Exterior Lighting: Additional support and attachment requirements for interior luminaires.

1.3 REFERENCE STANDARDS

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2015.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.

C. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2013.

D. MFMA-4 - Metal Framing Standards Publication; 2004.

E. ICC-ES AC01 - Acceptance Criteria for Expansion Anchors in Masonry Elements; 2009.

F. ICC-ES AC106 - Acceptance Criteria for Predrilled Fasteners (Screw Anchors) in Masonry Elements; 2006

G. ICC-ES AC193 - Acceptance Criteria for Mechanical Anchors in Concrete Elements; 2010

H. ICC-ES AC308 - Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements; 2009.

I. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

J. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

K. UL 5B - Strut-Type Channel Raceways and Fittings; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate sizes and arrangement of supports and bases with the actual equipment and components to be installed.
   2. Coordinate the work with other trades to provide additional framing and materials required for installation.
   3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
   4. Coordinate the arrangement of supports with ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
   5. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

B. Sequencing:
   1. Do not install products on or provide attachment to concrete surfaces until concrete has fully cured in accordance with Section 03 30 00.

1.5 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for metal channel (strut) framing systems, non-penetrating rooftop supports, and post-installed concrete and masonry anchors.

C. Shop Drawings: Include details for fabricated hangers and supports where materials or methods other than those indicated are proposed for substitution.

D. Evaluation Reports: For products specified as requiring evaluation and recognition by ICC Evaluation Service, LLC (ICC-ES), provide current ICC-ES evaluation reports upon request.

E. Product Data: Provide manufacturer’s catalog data for fastening systems.

F. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

1.6 QUALITY ASSURANCE

A. Comply with NFPA 70.

B. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

C. Comply with applicable building code.

D. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

PART 2 PRODUCTS

2.1 SUPPORT AND ATTACHMENT COMPONENTS

A. General Requirements:
1. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of electrical work.
2. Provide products listed, classified, and labeled by Underwriter's Laboratories Inc. (UL) or Intertek (ETL) as suitable for the purpose indicated, where applicable.
3. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported with a minimum safety factor of 5. Include consideration for vibration, equipment operation, and shock loads where applicable.
4. Do not use products for applications other than as permitted by NFPA 70 and product listing.
5. Do not use wire, chain, perforated pipe strap, or wood for permanent supports unless specifically indicated or permitted.
6. Steel Components: Use corrosion resistant materials suitable for the environment where installed.
   a. Indoor Dry Locations: Use zinc-plated steel unless otherwise indicated.
   b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel or stainless steel unless otherwise indicated.
   c. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
   d. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.

B. Materials for Metal Fabricated Supports: Comply with Section 05 50 00.

C. Conduit and Cable Supports: Straps, clamps, etc. suitable for the conduit or cable to be supported.

1. Conduit Straps: One-hole or two-hole type; steel or malleable iron.
2. Conduit Clamps: Bolted type unless otherwise indicated.
3. Manufacturers:
    a. Cooper Crouse-Hinds, a division of Eaton Corporation: www.cooperindustries.com.
    b. Erico International Corporation: www.erico.com.
    c. O-Z/Gedney, a brand of Emerson Industrial Automation: www.emersonindustrial.com.
    d. Thomas & Betts Corporation: www.tnb.com.
    e. Substitutions: See Section 01 60 00 - Product Requirements.

D. Outlet Box Supports: Hangers, brackets, etc. suitable for the boxes to be supported.
1. Manufacturers:
    a. Cooper Crouse-Hinds, a division of Eaton Corporation: www.cooperindustries.com.
    b. Erico International Corporation: www.erico.com.
    c. O-Z/Gedney, a brand of Emerson Industrial Automation: www.emersonindustrial.com.
    d. Thomas & Betts Corporation: www.tnb.com.
    e. Substitutions: See Section 01 60 00 - Product Requirements.

E. Metal Channel (Strut) Framing Systems: Factory-fabricated continuous-slot metal channel (strut) and associated fittings, accessories, and hardware required for field-assembly of supports.
1. Comply with MFMA-4.
2. Channel (Strut) Used as Raceway (only where specifically indicated): Listed and labeled as complying with UL 5B.
3. Channel Material:
    a. Indoor Dry Locations: Use zinc-plated steel or galvanized steel.
    b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel or stainless steel.
4. Minimum Channel Thickness: 14 gauge.
5. Minimum Channel Dimensions: 1-5/8 inch width by 13/16 inch height.
6. Manufacturers:
    a. Cooper B-Line, a division of Eaton Corporation: www.cooperindustries.com.
    b. Thomas & Betts Corporation: www.tnb.com.
    c. Unistrut, a brand of Atkore International Inc: www.unistrut.com.
    d. Substitutions: See Section 01 60 00 - Product Requirements.

F. Hanger Rods: Threaded zinc-plated steel unless otherwise indicated.
1. Minimum Size, Unless Otherwise Indicated or Required:
    a. Equipment Supports: 1/2 inch diameter.
    b. Single Conduit up to 1 inch (27mm) trade size: 1/4 inch diameter.
    c. Single Conduit larger than 1 inch (27mm) trade size: 3/8 inch diameter.
    d. Trapeze Support for Multiple Conduits: 3/8 inch diameter.
    e. Outlet Boxes: 1/4 inch diameter.
    f. Luminaires: 3/8 inch diameter.

G. Non-Penetrating Rooftop Supports for Low-Slope Roofs: Steel pedestals with thermoplastic or rubber bases that rest on top of roofing membrane, not requiring any attachment to the roof structure and not penetrating the roofing assembly, with support fixtures as specified.
   1. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
   2. Attachment/Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers and supports.
   3. Mounting Height: Provide minimum clearance of 6 inches under supported component to top of roofing.
   4. Manufacturers:
      a. Cooper B-Line, a division of Eaton Corporation: www.cooperindustries.com.
      b. Erico International Corporation: www.erico.com.
      c. PHP Systems/Design: www.phpsd.com.
      d. Unistrut, a brand of Atkore International Inc: www.unistrut.com.
      e. Substitutions: See Section 01 60 00 - Product Requirements.

H. Anchors and Fasteners:
   1. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.
   2. Concrete: Use preset concrete inserts, expansion anchors, or screw anchors.
   3. Solid or Grout-Filled Masonry: Use expansion anchors or screw anchors.
   4. Hollow Masonry: Use toggle bolts.
   5. Hollow Stud Walls: Use toggle bolts.
   6. Steel: Use beam clamps, machine bolts, or welded threaded studs.
   7. Sheet Metal: Use sheet metal screws.
   8. Wood: Use wood screws.
   9. Plastic and lead anchors are not permitted.
   10. Powder-actuated fasteners are permitted only as follows:
      a. Where approved by Architect.
      b. Use only threaded studs; do not use pins.
   11. Hammer-driven anchors and fasteners are permitted only as follows:
      a. Nails are permitted for attachment of nonmetallic boxes to wood frame construction (when specified).
      b. Staples are permitted for attachment of nonmetallic-sheathed cable to wood frame construction (when specified).
   12. Preset Concrete Inserts: Continuous metal channel (strut) and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.
      a. Comply with MFMA-4.
      b. Channel Material: Use galvanized steel.
      c. Minimum Channel Thickness: 12 gauge.
      d. Manufacturer: Same as manufacturer of metal channel (strut) framing system.
   13. Post-Installed Concrete and Masonry Anchors: Evaluated and recognized by ICC Evaluation Service, LLC (ICC-ES) for compliance with applicable building code.
   14. Manufacturers - Mechanical Anchors:
      a. Hilti, Inc: www.us.hilti.com.
      b. ITW Red Head, a division of Illinois Tool Works, Inc: www.itwredhead.com.
      c. Powers Fasteners, Inc: www.powers.com.

d. Simpson Strong-Tie Company Inc: www.strongtie.com.
e. Substitutions: See Section 01 60 00 - Product Requirements.

15. Manufacturers - Powder-Actuated Fastening Systems:
    a. Hilti, Inc: www.us.hilti.com.
    b. ITW Ramset, a division of Illinois Tool Works, Inc: www.ramset.com.
    c. Powers Fasteners, Inc: www.powers.com.
    d. Simpson Strong-Tie Company Inc: www.strongtie.com.
    e. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 MATERIALS

A. Hangers, Supports, Anchors, and Fasteners - General: Corrosion-resistant materials of size and type adequate to carry the loads of equipment and conduit, including weight of wire in conduit.

B. Supports: Fabricated of structural steel or formed steel members; galvanized.

C. Anchors and Fasteners:
1. Obtain permission from Architect before using powder-actuated anchors.
2. Concrete Structural Elements: Use precast inserts, expansion anchors, or preset inserts.
3. Steel Structural Elements: Use beam clamps, steel spring clips, steel ramset fasteners, or welded fasteners.
4. Concrete Surfaces: Use self-drilling anchors or expansion anchors.
5. Hollow Masonry, Plaster, and Gypsum Board Partitions: Use toggle bolts or hollow wall fasteners.
6. Solid Masonry Walls: Use expansion anchors or preset inserts.
7. Sheet Metal: Use sheet metal screws.
8. Wood Elements: Use wood screws.

D. Fastener Types:
1. Concrete Wedge Expansion Anchors: Complying with ICC-ES AC193.
2. Masonry Wedge Expansion Anchors: Complying with ICC-ES AC01.
3. Concrete Screw Type Anchors: Complying with ICC-ES AC193.
4. Masonry Screw Type Anchors: Complying with ICC-ES AC106.
5. Concrete Adhesive Type Anchors: Complying with ICC-ES AC308.
6. Other Types: As required.
7. Manufacturers:
    a. Powers Fasteners, Inc: www.powers.com.
    b. Substitutions: See Section 01 60 00 - Product Requirements.

E. Formed Steel Channel:
1. Manufacturer: Kindorf, Unistrut, B-Line, or approved.
2. Substitutions: See Section 01 60 00 - Product Requirements.

F. Steel Spring Clips:
1. Manufacturer: Caddy, Raco, T&B, B-Line.
2. Substitutions: See Section 01 60 00 - Product Requirements.

G. Non-Penetrating Rooftop Supports for Low-Slope Roofs: Steel pedestals with thermoplastic or rubber bases that rest on top of roofing membrane, not requiring any attachment to the roof structure and not penetrating the roofing assembly, with support fixtures as specified.
   1. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
   2. Steel Components: Stainless steel, or carbon steel hot-dip galvanized after fabrication in accordance with ASTM A123/A123M.
   3. Attachment/Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers and supports; corrosion resistant material.
   4. Mounting Height: Provide minimum clearance of 6 inches under supported component to top of roofing.
   5. Manufacturers:
      a. Cooper B-Line, a division of Cooper Industries: www.cooperindustries.com.
      b. PHP Systems/Design: www.phpsd.com.
      c. Unistrut, a brand of Atkore International Inc: www.unistrut.com.
      d. Substitutions: See Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as shown on the drawings.

B. Verify that mounting surfaces are ready to receive support and attachment components.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Install hangers and supports as required to adequately and securely support electrical system components, in a neat and workmanlike manner, as specified in NECA 1.
   1. Do not fasten supports to pipes, ducts, mechanical equipment, or conduit.
   2. Obtain permission from Architect before drilling or cutting structural members.

B. Rigidly weld support members or use hexagon-head bolts to present neat appearance with adequate strength and rigidity. Use spring lock washers under all nuts.

C. Install surface-mounted cabinets and panelboards with minimum of four anchors.

D. In wet and damp locations use steel channel supports to stand cabinets and panelboards 1 inch off wall.

E. Use sheet metal channel to bridge studs above and below cabinets and panelboards recessed in hollow partitions.

F. Install products in accordance with manufacturer's instructions.

G. Install support and attachment components in a neat and workmanlike manner in accordance with NECA 1.

H. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.

I. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.

J. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.

K. Unless specifically indicated or approved by Architect, do not provide support from roof deck.

L. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.

M. Field-Welding (where approved by Architect): Comply with Section 05 50 00.

N. Equipment Support and Attachment:
   1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
   2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
   3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
   4. Unless otherwise indicated, mount floor-mounted equipment on properly sized 3 inch high concrete pad constructed in accordance with Section 03 30 00.
   5. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.

O. Conduit Support and Attachment: Also comply with Section 26 05 34.

P. Box Support and Attachment: Also comply with Section 26 05 37.

Q. Interior Luminaire Support and Attachment: Also comply with Section 26 51 00.

R. Preset Concrete Inserts: Use manufacturer provided closure strips to inhibit concrete seepage during concrete pour.

S. Secure fasteners according to manufacturer's recommended torque settings.

T. Remove temporary supports.

U. Identify independent electrical component support wires above accessible ceilings (only where specifically indicated or permitted) in accordance with NFPA 70.

3.3 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Inspect support and attachment components for damage and defects.

C. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.

D. Correct deficiencies and replace damaged or defective support and attachment components.

END OF SECTION 26 05 29

CONDUIT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Galvanized steel rigid metal conduit (RMC).

B. Intermediate metal conduit (IMC).

C. Flexible metal conduit (FMC).

D. Liquidtight flexible metal conduit (LFMC).

E. Electrical metallic tubing (EMT).

F. Rigid polyvinyl chloride (PVC) conduit.

G. Liquidtight flexible nonmetallic conduit (LFNC).

H. Conduit fittings.

I. Accessories.

1.2 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Concrete encasement of conduits.

B. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables: Metal clad cable (Type MC), armored cable (Type AC), and manufactured wiring systems, including uses permitted.

C. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
   1. Includes additional requirements for fittings for grounding and bonding.

D. Section 26 05 29 - Hangers and Supports for Electrical Systems.

E. Section 26 05 37 - Boxes.

F. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

G. Section 26 2701 - Group Metering Equipment: Additional requirements for electrical service conduits.

1.3 REFERENCE STANDARDS

A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC); 2005.

B. ANSI C80.3 - American National Standard for Steel Electrical Metallic Tubing (EMT); 2005.

C. ANSI C80.5 - American National Standard for Electrical Rigid Aluminum Conduit (ERAC); 2005.

D. ANSI C80.6 - American National Standard for Electrical Intermediate Metal Conduit (EIMC); 2005.

E. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

F. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT); 2013.

G. NECA 111 - Standard for Installing Nonmetallic Raceways (RNC, ENT, LFNC); 2003.

H. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2012.

I. NEMA RN 1 - Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit; 2005.

J. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit; 2013.

K. NEMA TC 3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing; 2015.

L. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

M. UL 1 - Flexible Metal Conduit; Current Edition, Including All Revisions.

N. UL 6 - Electrical Rigid Metal Conduit-Steel; Current Edition, Including All Revisions.

O. UL 6A - Electrical Rigid Metal Conduit-Aluminum, Red Brass, and Stainless Steel; Current Edition, Including All Revisions.

P. UL 360 - Liquid-Tight Flexible Steel Conduit; Current Edition, Including All Revisions.

Q. UL 514B - Conduit, Tubing, and Cable Fittings; Current Edition, Including All Revisions.

R. UL 651 - Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings; Current Edition, Including All Revisions.

S. UL 797 - Electrical Metallic Tubing-Steel; Current Edition, Including All Revisions.

T. UL 1203 - Explosion-Proof and Dust-Ignition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations; Current Edition, Including All Revisions.

U. UL 1242 - Electrical Intermediate Metal Conduit-Steel; Current Edition, Including All Revisions.

V. UL 1660 - Liquid-Tight Flexible Nonmetallic Conduit; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate minimum sizes of conduits with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
   2. Coordinate the arrangement of conduits with structural members, ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
   3. Verify exact conduit termination locations required for boxes, enclosures, and equipment installed under other sections or by others.
   4. Coordinate the work with other trades to provide roof penetrations that preserve the integrity of the roofing system and do not void the roof warranty.
   5. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

B. Sequencing:
   1. Do not begin installation of conductors and cables until installation of conduit is complete between outlet, junction and splicing points.

C. For projects with Post Tension (PT) slab construction, submit dimensioned plan showing all conduit sleeves & block out locations to Architect for review.

1.5 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittals procedures.

B. Shop Drawings:
   1. Indicate proposed arrangement for conduits to be installed within structural concrete slabs, where permitted.
   2. Include proposed locations of roof penetrations and proposed methods for sealing.

C. Project Record Documents: Record actual routing for conduits installed underground, conduits embedded within concrete slabs, and conduits 2 inch (53 mm) trade size and larger.

1.6 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store conduit and fittings in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.1 CONDUIT APPLICATIONS

A. Do not use conduit and associated fittings for applications other than as permitted by NFPA 70 and product listing.

B. Unless otherwise indicated and where not otherwise restricted, use the conduit types indicated for the specified applications.

C. Underground:
   1. Under Slab on Grade: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), PVC-coated galvanized steel rigid metal conduit, or rigid PVC conduit.
   2. Exterior, Direct-Buried: Use galvanized steel rigid metal conduit, intermediate metallic conduit (IMC), or rigid PVC conduit.
   3. Where rigid polyvinyl (PVC) conduit is provided, transition to galvanized steel rigid metal conduit or intermediate metal conduit (IMC) where emerging from underground.
   4. Where rigid polyvinyl (PVC) conduit larger than 2 inch (53 mm) trade size is provided, use galvanized steel rigid metal conduit elbows or intermediate metal conduit (IMC) elbows or fiberglass for bends in runs over 100 feet. For shorter runs factory formed schedule 40 PVC elbows may be used.
   5. 1.5 Inches Diameter and Smaller: For total conduit lengths between pull points over 100 ft., use rigid steel elbows. For shorter overall lengths, rigid steel or Schedule 40 PVC may be used.
   6. Where steel conduit is installed in direct contact with earth use where soil has a resistivity of less than 2000 ohm-centimeters or is characterized as severely corrosive based on soils report or local experience to provide supplementary corrosion protection.

D. Embedded Within Concrete:
   1. Within Slab on Grade (within structural slabs only where approved by Structural Engineer): Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or rigid PVC conduit.

2. Within Slab Above Ground (within structural slabs only where approved by Structural Engineer): Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), electrical metallic tubing (EMT), or rigid PVC conduit.
3. Within Concrete Walls Above Ground: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), electrical metallic tubing (EMT), or rigid PVC conduit.
4. Where rigid polyvinyl (PVC) conduit is provided, transition to galvanized steel rigid metal conduit or intermediate metal conduit (IMC) where emerging from concrete.
5. Where electrical metallic tubing (EMT) emerges from concrete into salt air, use corrosion protection tape to provide supplementary corrosion protection for a minimum of 4 inches on either side of where conduit emerges.

E. Concealed Within Masonry Walls: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).

F. Concealed Within Hollow Stud Walls: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).

G. Concealed Above Accessible Ceilings: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).

H. Interior, Damp or Wet Locations: Use galvanized steel rigid metal conduit or intermediate metal conduit (IMC).

I. Exposed, Interior, Not Subject to Physical Damage: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).

J. Exposed, Interior, Subject to Physical Damage: Use galvanized steel rigid metal conduit or intermediate metal conduit (IMC).
   1. Locations subject to physical damage include, but are not limited to:
      a. Where exposed below 8 feet, except within electrical and communication rooms or closets.
      b. Where exposed below 20 feet in warehouse and manufacturing areas.

K. Exposed, Exterior: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or PVC-coated galvanized steel rigid metal conduit.

L. Concealed, Exterior, Not Embedded in Concrete or in Contact With Earth: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).

M. Corrosive Locations Above Ground: Use rigid PVC conduit.
   1. Corrosive locations include, but are not limited to:
      a. Cooling towers.
      b. Swimming pool equipment rooms.

N. Hazardous (Classified) Locations: Use galvanized steel rigid metal conduit or intermediate metal conduit (IMC).

O. Connections to Luminaires Above Accessible Ceilings: Use flexible metal conduit.
   1. Maximum Length: 6 feet.

P. Connections to Vibrating Equipment:
   1. Dry Locations: Use flexible metal conduit.
   2. Damp, Wet, or Corrosive Locations: Use liquidtight flexible metal conduit.
   3. Maximum Length: 6 feet unless otherwise indicated.
   4. Vibrating equipment includes, but is not limited to:
      a. Transformers.
      b. Motors.

Q. Fished in Existing Walls, Where Necessary: Use flexible metal conduit or MC cable.

2.2 CONDUIT REQUIREMENTS

A. Existing Work: Where existing conduits are indicated to be reused, they may be reused only where they comply with specified requirements, are free from corrosion, and integrity is verified by pulling a mandrel through them.

B. Electrical Service Conduits/

C. Communications Systems Conduits.

D. Fittings for Grounding and Bonding: Also comply with Section 26 05 26.

E. Provide all conduit, fittings, supports, and accessories required for a complete raceway system.

F. Provide products listed, classified, and labeled by Underwriter's Laboratories Inc. (UL) or Intertek (ETL) as suitable for the purpose indicated.

G. Minimum Conduit Size, Unless Otherwise Indicated:
   1. Branch Circuits: 1/2 inch (16 mm) trade size.
   2. Branch Circuit Homeruns: 3/4 inch (21 mm) trade size.
   3. Control Circuits: 1/2 inch (16 mm) trade size.
   4. Flexible Connections to Luminaires: 1/2 inch (16 mm) trade size.
   5. Underground, Interior: 3/4 inch (21 mm) trade size.
   6. Underground, Exterior: 3/4 inch (21 mm) trade size.

H. Where conduit size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

2.3 GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

A. Manufacturers:
   1. Allied Tube & Conduit: www.alliedeg.com.
   2. Republic Conduit: www.republic-conduit.com.

3. Wheatland Tube Company: www.wheatland.com.

B. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.

C. Fittings:
1. Manufacturers:
   a. Bridgeport Fittings Inc: www.bptfittings.com.
   b. O-Z/Gedney, a brand of Emerson Industrial Automation: www.emersonindustrial.com.
   c. Thomas & Betts Corporation: www.tnb.com.
2. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
3. Hazardous (Classified) Locations: Use fittings listed and labeled as complying with UL 1203 for the classification of the installed location.
4. Material: Use steel or malleable iron.
   a. Do not use die cast zinc fittings.
5. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.

2.4 INTERMEDIATE METAL CONDUIT (IMC)

A. Manufacturers:
1. Allied Tube & Conduit: www.alliedeg.com.
2. Republic Conduit: www.republic-conduit.com.
3. Wheatland Tube Company: www.wheatland.com.

B. Description: NFPA 70, Type IMC galvanized steel intermediate metal conduit complying with ANSI C80.6 and listed and labeled as complying with UL 1242.

C. Fittings:
1. Manufacturers:
   a. Bridgeport Fittings Inc: www.bptfittings.com.
   b. O-Z/Gedney, a brand of Emerson Industrial Automation: www.emersonindustrial.com.
   c. Thomas & Betts Corporation: www.tnb.com.
2. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
3. Hazardous (Classified) Locations: Use fittings listed and labeled as complying with UL 1203 for the classification of the installed location.
4. Material: Use steel or malleable iron.
   a. Do not use die cast zinc fittings.
5. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.

2.5 FLEXIBLE METAL CONDUIT (FMC)

A. Manufacturers:
   1. AFC Cable Systems, Inc: www.afcweb.com.
   2. Electri-Flex Company: www.electriflex.com.
   3. International Metal Hose: www.metalhose.com.

B. Description: NFPA 70, Type FMC standard wall steel or standard wall aluminum flexible metal conduit listed and labeled as complying with UL 1, and listed for use in classified firestop systems to be used.

C. Fittings:
   1. Manufacturers:
      a. Bridgeport Fittings Inc: www.bptfittings.com.
      b. O-Z/Gedney, a brand of Emerson Industrial Automation: www.emersonindustrial.com.
      c. Thomas & Betts Corporation: www.tnb.com.
   2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
   3. Material: Use steel, malleable iron, or aluminum.
      a. Do not use die cast zinc fittings.

2.6 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)

A. Manufacturers:
   1. AFC Cable Systems, Inc: www.afcweb.com.
   2. Electri-Flex Company: www.electriflex.com.
   3. International Metal Hose: www.metalhose.com.

B. Description: NFPA 70, Type LFMC polyvinyl chloride (PVC) jacketed steel or aluminum flexible metal conduit listed and labeled as complying with UL 360.

C. Fittings:
   1. Manufacturers:
      a. Bridgeport Fittings Inc: www.bptfittings.com.
      b. O-Z/Gedney, a brand of Emerson Industrial Automation: www.emersonindustrial.com.
      c. Thomas & Betts Corporation: www.tnb.com.
   2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
   3. Material: Use steel, malleable iron, or aluminum.
      a. Do not use die cast zinc fittings.

2.7 ELECTRICAL METALLIC TUBING (EMT)

A. Manufacturers:

1. Allied Tube & Conduit: www.alliedeg.com.
2. Republic Conduit: www.republic-conduit.com.
3. Wheatland Tube Company: www.wheatland.com.

B. Description: NFPA 70, Type EMT steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.

C. Fittings:
1. Manufacturers:
   a. Bridgeport Fittings Inc: www.bptfittings.com.
   b. O-Z/Gedney, a brand of Emerson Industrial Automation: www.emersonindustrial.com.
   c. Thomas & Betts Corporation: www.tnb.com.
2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
3. Material: Use steel.
   a. Do not use die cast zinc fittings.
4. Connectors and Couplings: Use set-screw type except when embedded in concrete. Use concrete tight compression (gland) type in concrete.
   a. Do not use indenter type connectors and couplings.
5. Damp or Wet Locations (where permitted): Use fittings listed for use in wet locations.
6. Embedded Within Concrete (where permitted): Use fittings listed as concrete-tight. Fittings that require taping to be concrete-tight are not acceptable.

2.8 RIGID POLYVINYL CHLORIDE (PVC) CONDUIT

A. Manufacturers:
1. Cantex Inc: www.cantexinc.com.
2. Carlon, a brand of Thomas & Betts Corporation: www.carlon.com.
3. JM Eagle: www.jmeagle.com.
4. Allied Tube and Conduit: www.alliedtube.com.

B. Description: NFPA 70, Type PVC rigid polyvinyl chloride conduit complying with NEMA TC 2 and listed and labeled as complying with UL 651; Schedule 40 unless otherwise indicated, Schedule 80 where subject to physical damage; rated for use with conductors rated 90 degrees C.

C. Fittings:
1. Manufacturer: Same as manufacturer of conduit to be connected.
2. Description: Fittings complying with NEMA TC 3 and listed and labeled as complying with UL 651; material to match conduit.

D. Elbows:
1. Use only factory formed Schedule 40 elbows. Field bends are not acceptable.
2. 1.5 Inches Diameter and Smaller: For total conduit lengths between pull points over 100 ft., use rigid steel elbows. For shorter overall lengths, rigid steel or Schedule 40 PVC may be used.

3. 2 Inches Diameter and Larger: For total conduit lengths between pull points over 100 ft., use long sweep rigid steel or fiberglass elbows. For shorter overall lengths, rigid steel, fiberglass, or Schedule 40 PVC elbows may be used.

2.9 LIQUIDTIGHT FLEXIBLE NONMETALLIC CONDUIT (LFNC)

A. Manufacturers:
1. AFC Cable Systems, Inc: www.afcweb.com.
2. Electri-Flex Company: www.electriflex.com.
3. International Metal Hose: www.metalhose.com.

B. Description: NFPA 70, Type LFNC liquidtight flexible nonmetallic conduit listed and labeled as complying with UL 1660, Type A.

C. Fittings:
1. Manufacturer: Same as manufacturer of conduit to be connected.
2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B; suitable for the type of conduit to be connected.

2.10 ACCESSORIES

A. Corrosion Protection Tape: PVC-based, minimum thickness of 10 mil.

B. Conduit Joint Compound: Corrosion-resistant, electrically conductive; suitable for use with the conduit to be installed.

C. Solvent Cement for PVC Conduit and Fittings: As recommended by manufacturer of conduit and fittings to be installed.

D. Pull Strings: Use nylon cord with average breaking strength of not less than 200 pound-force.

E. Sealing Compound for Sealing Fittings: Listed for use with the particular fittings to be installed.

F. Modular Seals for Conduit Penetrations: Rated for minimum of 40 psig; Suitable for the conduits to be installed.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as shown on drawings.

B. Verify that mounting surfaces are ready to receive conduits.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install conduit in a neat and workmanlike manner in accordance with NECA 1.

C. Install galvanized steel rigid metal conduit (RMC) in accordance with NECA 101.

D. Install intermediate metal conduit (IMC) in accordance with NECA 101.

E. Install rigid polyvinyl chloride (PVC) conduit in accordance with NECA 111.

F. Install liquidtight flexible nonmetallic conduit (LFNC) in accordance with NECA 111.

G. Conduit Routing:
   1. Unless dimensioned, conduit routing indicated is diagrammatic.
   2. When conduit destination is indicated and routing is not shown, determine exact routing required.
   3. Conceal all conduits unless specifically indicated to be exposed.
   4. Conduits in the following areas may be exposed, unless otherwise indicated:
      a. Electrical rooms.
      b. Mechanical equipment rooms.
      c. Within joists in areas with no ceiling.
   5. Unless otherwise approved, do not route conduits exposed:
      a. Across floors.
      b. Across roofs.
      c. Across top of parapet walls.
      d. Across building exterior surfaces.
   6. Conduits installed underground or embedded in concrete may be routed in the shortest possible manner unless otherwise indicated. Route all other conduits parallel or perpendicular to building structure and surfaces, following surface contours where practical.
   7. Arrange conduit to maintain adequate headroom, clearances, and access.
   8. Arrange conduit to provide no more than the equivalent of three 90 degree bends between pull points.
   9. Arrange conduit to provide no more than 150 feet between pull points.
   10. Route conduits above water and drain piping where possible.
   11. Arrange conduit to prevent moisture traps. Provide drain fittings at low points and at sealing fittings where moisture may collect.
   12. Maintain minimum clearance of 6 inches between conduits and piping for other systems.
   13. Maintain minimum clearance of 12 inches between conduits and hot surfaces.
   14. Group parallel conduits in the same area together on a common rack.

H. Conduit Support:
   1. Secure and support conduits in accordance with NFPA 70 and Section 26 05 29 using suitable supports and methods approved by the authority having jurisdiction.

2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
3. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conduits to lay on ceiling tiles.
4. Use conduit strap to support single surface-mounted conduit.
    a. Use clamp back spacer with conduit strap for damp and wet locations to provide space between conduit and mounting surface.
5. Use metal channel (strut) with accessory conduit clamps to support multiple parallel surface-mounted conduits.
6. Use conduit clamp to support single conduit from beam clamp or threaded rod.
7. Use trapeze hangers assembled from threaded rods and metal channel (strut) with accessory conduit clamps to support multiple parallel suspended conduits.
8. Use non-penetrating rooftop supports to support conduits routed across rooftops (only where specifically approved).
9. Use of spring steel conduit clips for support of conduits is permitted only as follows:
    a. Support of electrical metallic tubing (EMT) up to 1 inch (27 mm) trade size concealed above accessible ceilings and within hollow stud walls.
10. Use of wire for support of conduits is not permitted.
11. Where conduit support intervals specified in NFPA 70 and NECA standards differ, comply with the most stringent requirements.

I. Connections and Terminations:
1. Use approved zinc-rich paint or conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.
2. Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.
3. Use suitable adapters where required to transition from one type of conduit to another.
4. Provide drip loops for liquidtight flexible conduit connections to prevent drainage of liquid into connectors.
5. Terminate threaded conduits in boxes and enclosures using threaded hubs or double lock nuts for dry locations and raintight hubs for wet locations.
6. Where spare conduits stub up through concrete floors and are not terminated in a box or enclosure, provide threaded couplings equipped with threaded plugs set flush with finished floor.
7. Provide insulating bushings or insulated throats at all conduit terminations to protect conductors.
8. Secure joints and connections to provide maximum mechanical strength and electrical continuity.

J. Penetrations:
1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.
2. Make penetrations perpendicular to surfaces unless otherwise indicated.
3. Provide sleeves for penetrations as indicated or as required to facilitate installation. Set sleeves flush with exposed surfaces unless otherwise indicated or required.
4. Conceal bends for conduit risers emerging above ground.
5. Seal interior of conduits entering the building from underground at first accessible point to prevent entry of moisture and gases.

6. Provide suitable modular seal where conduits penetrate exterior wall below grade.
7. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.
8. Make penetrations for roof-mounted equipment within associated equipment openings and curbs where possible to minimize roofing system penetrations. Where penetrations are necessary, seal as indicated or as required to preserve integrity of roofing system and maintain roof warranty.
9. Provide metal escutcheon plates for conduit penetrations exposed to public view.
10. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 84 00.

K. Underground Installation:
1. Provide trenching and backfilling .
2. Minimum Cover, Unless Otherwise Indicated or Required:
   a. Underground, Exterior: 24 inches.
   b. Under Slab on Grade: 12 inches to bottom of slab.
3. Provide underground warning tape in accordance with Section 26 05 53 along entire conduit length for service entrance where not concrete-encased.

L. Embedment Within Structural Concrete Slabs (only where approved by Structural Engineer):
1. Include proposed conduit arrangement with submittals.
2. Maximum Conduit Size: 1 inch (27 mm) unless otherwise approved.
3. Minimum Conduit Spacing: Shall be as directed by Structural Engineer.
4. Install conduits within middle one third of slab thickness.
5. Secure conduits to prevent floating or movement during pouring of concrete.

M. Concrete Encasement: Where conduits not otherwise embedded within concrete are indicated to be concrete-encased, provide concrete in accordance with Section 03 30 00 with minimum concrete cover of 3 inches on all sides unless otherwise indicated.

N. Hazardous (Classified) Locations: Where conduits cross boundaries of hazardous (classified) locations, provide sealing fittings located as indicated or in accordance with NFPA 70.

O. Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings or approved flexible connections to prevent damage to enclosed conductors or connected equipment. This includes, but is not limited to:
1. Where conduits cross structural joints intended for expansion, contraction, or deflection.
2. Where calculated in accordance with NFPA 70 for rigid polyvinyl chloride (PVC) conduit installed above ground to compensate for thermal expansion and contraction.
3. Where conduits are subject to earth movement by settlement or frost.

P. Condensation Prevention: Where conduits cross barriers between areas of potential substantial temperature differential, provide sealing fitting or approved sealing compound at an accessible point near the penetration to prevent condensation. This includes, but is not limited to:
1. Where conduits pass from outdoors into conditioned interior spaces.
2. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.
3. Where conduits penetrate coolers or freezers.

Q. Provide pull string in all empty conduits and in conduits where conductors and cables are to be installed by others. Leave minimum slack of 12 inches at each end.

R. Provide grounding and bonding in accordance with Section 26 05 26.

S. Identify conduits in accordance with Section 26 05 53.

T. Do not cross conduits in slab.

U. Cut conduit square using saw or pipecutter; de-burr cut ends.

V. Bring conduit to shoulder of fittings; fasten securely.

W. 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 20 minutes minimum.

X. Use suitable caps to protect installed conduit against entrance of dirt and moisture.

Y. All elbows installed in primary and secondary power conduit runs shall be minimum 36-inch radius.

Z. Where conduit is shown stubbed into a telephone, computer or communication terminal area, conduit shall be stubbed up 6 inches below ceiling and terminated with insulating bushings.

AA. Where the contractor elects to utilize PVC in lieu of GRC, the contractor shall provide supplemental ground bus in terminating switch and panelboards, and green ground wire as per code rules.

AB. Conduit runs shall not exceed 100 feet without an accessible pull box installed in line.

AC. Communications system conduit run above the ceiling shall not be installed within 12 inches of a parallel run of current carrying conductors, transformers, feeder cables, motors, or lighting ballasts.

AD. Conduit connections between outlet boxes less than 24 inches apart on opposite sides of a wall shall be made with a loop of flexible conduit to limit sound transmission.

AE. Penetrations of Masonry and Concrete Constructions:
1. Ensure that the sound control performance of structures be maintained in accordance with the drawings and specifications. All penetrations shall be installed in a manner that results in complete air tightness through structure. If a condition occurs where penetration of the structure by a conduit is not shown clearly on the drawings (or described in the specifications), the Contractor shall ask immediately for clarification of the method necessary to install the particular item.

AF. Penetrations of Drywall Constructions:
1. Ensure that the sound control performance of structures be maintained in accordance with the drawings and specifications. All penetrations shall be installed in a manner that results in complete air tightness through structure. If a condition occurs where penetration of the structure by a conduit is not shown clearly on the drawings (or described in the specifications), the Contractor shall ask immediately for clarification of the method necessary to install the particular item.

AG. Install conduit to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 8400.

3.3 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.

C. Correct deficiencies and replace damaged or defective conduits.

3.4 CLEANING

A. Clean interior of conduits to remove moisture and foreign matter.

3.5 PROTECTION

A. Immediately after installation of conduit, use suitable manufactured plugs to provide protection from entry of moisture and foreign material and do not remove until ready for installation of conductors.

END OF SECTION 26 05 34

BOXES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Outlet and device boxes up to 100 cubic inches, including those used as junction and pull boxes.

B. Cabinets and enclosures, including junction and pull boxes larger than 100 cubic inches.

C. Boxes for hazardous (classified) locations.

D. Floor boxes.

E. Underground boxes/enclosures.

1.2 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete.

B. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

C. Section 26 05 29 - Hangers and Supports for Electrical Systems.

D. Section 26 05 34 - Conduit:
   1. Conduit bodies and other fittings.
   2. Additional requirements for locating boxes to limit conduit length and/or number of bends between pulling points.

E. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

F. Section 26 2701 - Wall Mounted Group Metering Equipment: Metering transformer cabinets.

G. Section 26 27 26 - Wiring Devices:
   1. Wall plates.

1.3 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

B. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2010.

C. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2012.

D. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports; 2013.

E. NEMA OS 2 - Nonmetallic Outlet Boxes, Device Boxes, Covers and Box Supports; 2013.

F. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.

G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

H. SCTE 77 - Specification for Underground Enclosure Integrity; 2013.

I. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

J. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

K. UL 508A - Industrial Control Panels; Current Edition, Including All Revisions.

L. UL 514A - Metallic Outlet Boxes; Current Edition, Including All Revisions.

M. UL 514C - Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
   2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
   3. Coordinate minimum sizes of boxes with the actual installed arrangement of conductors, clamps, support fittings, and devices, calculated according to NFPA 70.
   4. Coordinate minimum sizes of pull boxes with the actual installed arrangement of connected conduits, calculated according to NFPA 70.
   5. Coordinate the placement of boxes with millwork, furniture, devices, equipment, etc. installed under other sections or by others.
   6. Coordinate the work with other trades to preserve insulation integrity.
   7. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted boxes where indicated.
   8. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

1.5 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency.

C. Project Record Documents: Record actual locations for outlet and device boxes, pull boxes, cabinets and enclosures, floor boxes, and underground boxes/enclosures.

D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.
   2. Keys for Lockable Enclosures: Two of each different key.

1.6 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Products: Provide products listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

C. Electrical boxes shall be sized according to NEC requirements unless otherwise noted in the contract documents.

D. Maintain integrity of insulation materials where flush boxes are installed in insulated spaces.

E. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.1 BOXES

A. General Requirements:
   1. Do not use boxes and associated accessories for applications other than as permitted by NFPA 70 and product listing.
   2. Provide all boxes, fittings, supports, and accessories required for a complete raceway system and to accommodate devices and equipment to be installed.
   3. Provide products listed, classified, and labeled by Underwriter's Laboratories Inc. (UL) or Intertek (ETL) as suitable for the purpose indicated.
   4. Where box size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

5. Provide grounding terminals within boxes where equipment grounding conductors terminate.

B. Outlet and Device Boxes Up to 100 cubic inches, Including those used as Junction and Pull Boxes:
1. Use sheet-steel boxes for dry locations unless otherwise indicated or required.
2. Use cast iron boxes or cast aluminum boxes for damp or wet locations unless otherwise indicated or required; furnish with compatible weatherproof gasketed covers.
3. Use cast iron boxes or cast aluminum boxes where exposed galvanized steel rigid metal conduit or exposed intermediate metal conduit (IMC) is used.
4. Use cast aluminum boxes where aluminum rigid metal conduit is used.
5. Use nonmetallic boxes where exposed rigid PVC conduit is used.
6. Use suitable concrete type boxes where flush-mounted in concrete.
7. Use suitable masonry type boxes where flush-mounted in masonry walls.
8. Use raised covers suitable for the type of wall construction and device configuration where required.
9. Use shallow boxes where required by the type of wall construction.
10. Do not use "through-wall" boxes designed for access from both sides of wall.
11. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.
12. Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.
13. Nonmetallic Boxes: Comply with NEMA OS 2, and list and label as complying with UL 514C, permitted in residential units only.
14. Boxes for Supporting Luminaires and Ceiling Fans: Listed as suitable for the type and weight of load to be supported; furnished with fixture stud to accommodate mounting of luminaire where required.
15. Boxes for Ganged Devices: Use multigang boxes of single-piece construction. Do not use field-connected gangable boxes.
16. Minimum Box Size, Unless Otherwise Indicated:
    a. Wiring Devices (Other Than Communications Systems Outlets): 4 inch square by 1-1/2 inch deep (100 by 38 mm) trade size.
    b. Communications Systems Outlets: Comply with Section 27 10 05.
    c. Ceiling Outlets: 4 inch octagonal or square by 1-1/2 inch deep (100 by 38 mm) trade size.
17. Wall Plates: Comply with Section 26 27 26.
18. Manufacturers:
    a. Cooper Crouse-Hinds, a division of Eaton Corporation: www.cooperindustries.com.
    b. Hubbell Incorporated; Bell Products: www.hubbell-bell.com.
    c. Hubbell Incorporated; RACO Products: www.hubbell-raco.com.
    d. O-Z/Gedney, a brand of Emerson Industrial Automation: www.emersonindustrial.com.
    e. Thomas & Betts Corporation: www.tnb.com.
    f. Appleton Electric.
    g. Substitutions: See Section 01 60 00 - Product Requirements.

C. Cabinets and Enclosures, Including Junction and Pull Boxes Larger Than 100 cubic inches:

1. Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E, or UL 508A.
2. NEMA 250 Environment Type, Unless Otherwise Indicated:
   a. Indoor Clean, Dry Locations: Type 1, painted steel.
   b. Outdoor Locations: Type 3R, painted steel.
3. Junction and Pull Boxes Larger Than 100 cubic inches:
   a. Provide screw-cover or hinged-cover enclosures unless otherwise indicated.
   b. Boxes 6 square feet and Larger: Provide hinged-cover enclosures.
4. Cabinets and Hinged-Cover Enclosures, Other Than Junction and Pull Boxes:
   a. Provide lockable hinged covers, all locks keyed alike unless otherwise indicated.
   b. Back Panels: Painted steel, removable (where applicable).
5. Finish for Painted Steel Enclosures: Manufacturer's standard grey unless otherwise indicated.
6. Manufacturers:
   a. Cooper B-Line, a division of Eaton Corporation: www.cooperindustries.com.
   b. Hoffman, a brand of Pentair Technical Products: www.hoffmanonline.com.
   c. Hubbell Incorporated; Wiegmann Products: www.hubbell-wiegmann.com.
   d. Substitutions: See Section 01 60 00 - Product Requirements.

D. Electrical Outlet Box Pad:
1. Electrical outlet box pads shall be applied where called out on the drawings or specifications. Its function is to seal box openings, increase mass, and provide damping to reduce air-transmitted sound through party walls. It shall consist of polybutene-butyl and inert fillers. Material shall provide good adhesion to metal and plastic. Pads shall be applied to the backs of installed electrical boxes, molded to box, and folded around conduit cable entering the box. Pads shall not be used in areas subject to temperatures above 200 degrees F.
2. The following are acceptable, subject to the above:
   a. Lowry's outlet box pads from Harry A. Lowry & Associates, Inc., Sun Valley, California, (800) 225-8231.
   b. SpecSeal firestop putty pads (fire-rated) from Specified Technologies, Incorporated, Somerville, New Jersey, (800) 992-1180.
   c. Or approved equal.

E. In-Ground Cast Metal Box: NEMA 250, Type 6, flanged, recessed cover box for flush mounting:

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify exact location of floor boxes with Architect.

B. Verify that mounting surfaces are ready to receive boxes.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Perform work in a neat and workmanlike manner in accordance with NECA 1 and, where applicable, NECA 130, including mounting heights specified in those standards where mounting heights are not indicated.

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Provide separate boxes for emergency power and normal power systems.

E. Unless otherwise indicated, provide separate boxes for line voltage and low voltage systems.

F. Flush-mount boxes in finished areas unless specifically indicated to be surface-mounted.

G. Unless otherwise indicated, boxes may be surface-mounted where exposed conduits are indicated or permitted.

H. Box Locations:
   1. Locate boxes to be accessible. Provide access panels as required where approved by the Architect.
      a. Coordinate exact location of infloor boxes with Architect.
      b. Adjust box locations up to 10 feet if required to accommodate intended purpose, at no additional cost to the owner.
   2. Unless dimensioned, box locations indicated are approximate.
   3. Locate boxes as required for devices installed under other sections or by others.
      a. Switches, Receptacles, and Other Wiring Devices: Comply as indicated on drawings.
      b. Communications Systems Outlets: Comply as indicated on drawings.
   4. Locate boxes so that wall plates do not span different building finishes.
   5. Locate boxes so that wall plates do not cross masonry joints.
   6. Unless otherwise indicated, where multiple outlet boxes are installed at the same location at different mounting heights, install along a common vertical center line.
   7. Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide minimum 24 inches horizontal separation.
   8. Fire-Resistance-Rated Walls: Install flush-mounted boxes such that the required fire-resistance will not be reduced.
      a. Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide minimum 24 inches separation where wall is constructed with individual noncommunicating stud cavities protect both boxes with listed putty pads.
      b. Do not install flush-mounted boxes with area larger than 16 square inches or such that the total aggregate area of openings exceeds 100 square inches for any 100 square feet of wall area.

9. Locate junction and pull boxes as indicated, as required to facilitate installation of conductors, and to limit conduit length and/or number of bends between pulling points in accordance with Section 26 05 34.
10. Locate junction and pull boxes in the following areas, unless otherwise indicated or approved by the Architect:
    a. Concealed above accessible suspended ceilings.
    b. Within joists in areas with no ceiling.
    c. Electrical rooms.
    d. Mechanical equipment rooms.

I. Box Supports:
1. Secure and support boxes in accordance with NFPA 70 and Section 26 05 29 using suitable supports and methods approved by the authority having jurisdiction.
2. Provide independent support from building structure except for cast metal boxes (other than boxes used for fixture support) supported by threaded conduit connections in accordance with NFPA 70. Do not provide support from piping, ductwork, or other systems.
3. Installation Above Suspended Ceilings: Do not provide support from ceiling grid or ceiling support system.
4. Use far-side support to secure flush-mounted boxes supported from single stud in hollow stud walls. Repair or replace supports for boxes that permit excessive movement.

J. Install boxes plumb and level.

K. Flush-Mounted Boxes:
1. Install boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that front edge of box or associated raised cover is not set back from finished surface more than 1/4 inch or does not project beyond finished surface.
2. Install boxes in combustible materials such as wood so that front edge of box or associated raised cover is flush with finished surface.
3. Repair rough openings around boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that there are no gaps or open spaces greater than 1/8 inch at the edge of the box.

L. Floor-Mounted Cabinets: Mount on properly sized 3 inch high concrete pad constructed in accordance with Section 03 30 00.

M. Install boxes as required to preserve insulation integrity.

N. Metallic Floor Boxes: Install box level at the proper elevation to be flush with finished floor.

O. Nonmetallic Floor Boxes: Cut box flush with finished floor after concrete pour.

P. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.

Q. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified.

R. Close unused box openings.

S. Install blank wall plates on junction boxes and on outlet boxes with no devices or equipment installed or designated for future use.

T. Provide grounding and bonding in accordance with Section 26 05 26.

U. Identify boxes in accordance with Section 26 05 53.
   1. Adjust box locations up to 10 feet if required to accommodate intended purpose, at no additional cost to Owner.

V. Orient boxes to accommodate wiring device orientation as specified in Section 26 27 26.

W. Maintain headroom and present neat mechanical appearance.

X. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only.

Y. Inaccessible Ceiling Areas: Install outlet and junction boxes no more than 6 inches from ceiling access panel or from removable recessed luminaire.

Z. Coordinate mounting heights and locations of outlets mounted above counters, benches, and backsplashes.

AA. Locate outlet boxes to allow luminaires positioned as shown on reflected ceiling plan.

AB. Align adjacent wall mounted outlet boxes for switches, thermostats, and similar devices.
   1. Acoustic rated walls.
      a. In a single stud wall, there shall be a separation of 24 inches between centerlines of outlet boxes or receptacles set into opposite sides of the wall. When these boxes are of dimensions exceeding 4 inches wide, this dimension (24 inches) shall be clear between the side walls, providing a full 24-inch separation regardless of the box size. Conduit connecting such boxes shall be flexible and shall provide 6 inches slack per 24 inches of run.
      b. In a double stud wall, boxes in opposite sides of the wall shall be located 24 inches on center, minimum. Effectively, this means that boxes on the same side of the wall will be 48 inches apart if there is a box between them on the other side of the wall. Conduit, in the case of a double wall, shall home run to a point outside of the partition before connecting to cable and conduit connecting boxes on the other side. Conduit, which shall be flexible, may thread through the studs on its own side but shall under no circumstances interface with the stud on the other side of the wall.
      c. The boxes shall be treated to reduce sound transmission. All unused knock-out holes shall be plugged with knock-out caps. The openings or cutouts in the walls to receive the boxes/receptacles shall be made no more than 1-1/4 inches oversize to

allow a gap all around of 1-1/8 inches. The flanges shall be perimeter sealed with acoustical caulking, prior to the boxes/receptacles being inserted.

d. An outlet box pad, which acts to increase mass and provides damping, shall be applied to the backs of back-to-back electrical boxes separated by less than 24 inches, or where the box is installed in acoustical barrier walls. Refer to architectural wall types.

AC. Use stamped steel bridges to fasten flush mounting outlet box between studs.

AD. Use adjustable steel channel fasteners for hung ceiling outlet box.

AE. Support boxes independently of conduit, except cast box that is connected to two rigid metal conduits both supported within 12 inches of box.

AF. Locate outlet boxes so that the wall plates do not cross masonry joints or span different building finishes.

3.3 CLEANING

A. Clean interior of boxes to remove dirt, debris, plaster and other foreign material.

B. Clean exposed surfaces and restore finish.

3.4 PROTECTION

A. Immediately after installation, protect boxes from entry of moisture and foreign material until ready for installation of conductors.

3.5 INTERFACE WITH OTHER PRODUCTS

A. Coordinate installation of outlet box with products furnished under other sections of these specifications.

B. Coordinate locations and sizes of required access doors.

C. Locate flush mounting box in masonry wall to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat opening.

D. Coordinate mounting heights and locations of outlets mounted above counters, benches, and backsplashes with architectural drawings.

END OF SECTION 26 05 37

IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Electrical identification requirements.

B. Identification nameplates and labels.

C. Wire and cable markers.

D. Underground warning tape.

1.2 RELATED REQUIREMENTS

A. Section 09 90 00 - Painting and Coating.

B. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables: Color coding for power conductors and cables 600 V and less; vinyl color coding electrical tape.

1.3 REFERENCE STANDARDS

A. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

B. NFPA 70E - Standard for Electrical Safety in the Workplace; 2015.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Verify final designations for equipment, systems, and components to be identified prior to fabrication of identification products.

B. Sequencing:
   1. Do not conceal items to be identified, in locations such as above suspended ceilings, until identification products have been installed.
   2. Do not install identification products until final surface finishes and painting are complete.

1.5 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

1.6 FIELD CONDITIONS

A. Do not install adhesive products when ambient temperature is lower than recommended by manufacturer.

PART 2 PRODUCTS

2.1 IDENTIFICATION REQUIREMENTS

A. Existing Work: Unless specifically excluded, identify existing elements to remain whose designations are changed as part of the new work.

B. Identification for Equipment:
1. Use identification nameplate to identify each piece of electrical distribution and control equipment and associated sections, compartments, and components.
a. Switchboards:

1) Identify ampere rating.

2) Identify voltage and phase.

3) Identify power source.

4) Use identification nameplate to identify main overcurrent protective device.

5) Use identification nameplate to identify load(s) served for each branch device. Identify spares.

b. Panelboards:

1) Identify ampere rating.

2) Identify voltage and phase.

3) Identify power source.

4) Identify main overcurrent protective device. Use identification label for panelboards with a door. For power distribution panelboards without a door, use identification nameplate.

5) Use typewritten circuit directory to identify load(s) served for panelboards with a door. Identify spares and spaces. Identify load type, circuit number, breaker size and number of poles, and circuit load in volt-amps.

6) For power panelboards without a door, use identification nameplate to identify load(s) served for each branch device. Identify spares.

c. Transformers:

1) Identify kVA rating.

2) Identify voltage and phase for primary and secondary.

3) Identify power source.

4) Identify load(s) served.

d. Enclosed switches, circuit breakers, and motor controllers:

1) Identify voltage and phase.

2) Identify power source.

3) Identify load(s) served.

e. Busway:

1) Identify ampere rating.

2) Identify voltage and phase.

3) Identify power source.

4) Provide identification at maximum intervals of 40 feet, minimum of one label per floor.

5) Use identification nameplate to identify load(s) served for each plug-in unit.

f. Time Switches:

1) Identify load(s) served and associated circuits controlled. Include location.

g. Enclosed Contactors:

1) Identify voltage and phase.

2) Identify configuration, e.g., E.O.E.H. (electrically operated, electrically held) or E.O.M.H. (electrically operated, mechanically held).

3) Identify coil voltage.

4) Identify load(s) and associated circuits controlled. Include location.

2. Service Equipment:
   a. Use identification nameplate to identify each service disconnecting means.
   b. For buildings or structures supplied by more than one service, or any combination of branch circuits, feeders, and services, use identification nameplate acceptable to

authority having jurisdiction at each service disconnecting means to identify all other services, feeders, and branch circuits supplying that building or structure. Verify format and descriptions with authority having jurisdiction.

c. Use identification nameplate or identification label at each piece of service equipment to identify the available fault current and the date calculations were performed.

3. Emergency System Equipment:
   a. Use identification nameplate to identify emergency system equipment in accordance with NFPA 70.
   b. Use identification nameplate or identification label at each piece of service equipment to identify type and location of on-site emergency power sources.
   c. Use identification nameplate or identification label to identify emergency operating instructions for emergency system equipment.
4. Use voltage marker or identification label to identify highest voltage present for each piece of electrical equipment with voltage 480 V or higher.
5. Use identification nameplate or identification label to identify equipment utilizing series ratings, where permitted, in accordance with NFPA 70.
6. Use identification nameplate to identify disconnect location for equipment with remote disconnecting means.
7. Use identification label, identification nameplate, or handwritten text using indelible marker on inside of door at each motor controller to identify nameplate horsepower, full load amperes, code letter, service factor, voltage, and phase of motor(s) controlled.
8. Arc Flash Hazard Warning Labels: Use warning labels to identify arc flash hazards for electrical equipment, such as switchboards, panelboards, industrial control panels, meter socket enclosures, and motor control centers that are likely to require examination, adjustment, servicing, or maintenance while energized.
   a. Minimum Size: 5 by 7 inches.
   b. Legend: Include orange header that reads "WARNING", followed by the word message "Arc Flash and Shock Hazard; Appropriate PPE Required; Do not operate controls or open covers without appropriate personal protection equipment; Failure to comply may result in injury or death; Refer to NFPA 70E for minimum PPE requirements" or approved equivalent.
   c. Legend: Provide custom legend in accordance with NFPA 70E based on equipment-specific data as indicated on the drawings:

      1) Include orange header that reads "WARNING" where calculated incident energy is less than 40 calories per square cm.

      2) Include red header that reads "DANGER" where calculated incident energy is 40 calories per square cm or greater.

      3) Include the text "Arc Flash and Shock Hazard; Appropriate PPE Required" or approved equivalent.

      4) Include the following information:

         (a) Arc flash protection boundary.

(b) Incident energy.

(c) Hazard/risk category.

(d) PPE (personnel protective equipment) requirements.

(e) Nominal voltage.

(f) Shock hazard condition.

(g) Limited approach boundary.

(h) Restricted approach boundary.

(i) Prohibited approach boundary.

(j) Equipment identification.

(k) Date calculations were performed.

C. Identification for Conductors and Cables:
1. Color Coding for Power Conductors 600 V and Less: Comply with Section 26 05 19.

<u>Less than 250 Volts Between Phases</u>:
Phase A - Black
Phase B - Red
Phase C - Blue
Neutral - White
Ground - Green

2. Identification for Communications Conductors and Cables: Comply with Section 27 10 05.
3. Use wire and cable markers to identify circuit number or other designation indicated for power, control, and instrumentation conductors and cables at the following locations:
   a. At each source and load connection.
   b. Within boxes when more than one circuit is present.
   c. Within equipment enclosures when conductors and cables enter or leave the enclosure.
4. Use wire and cable markers to identify connected grounding electrode system components for grounding electrode conductors.
5. Use underground warning tape to identify direct buried cables.

D. Identification for Raceways:
1. Use underground warning tape to identify underground raceways.

E. Identification for Boxes:
1. Fire Alarm System: Red.

2. For exposed boxes in public areas, do not color code.
3. Use handwritten text using indelible marker to identify circuits enclosed.
    a. For exposed boxes in public areas, provide identification on inside face of cover.

F. Identification for Devices:
1. Identification for Communications Devices: Comply with Section 27 10 05.
2. Use identification label to identify serving branch circuit for all receptacles.
3. Use identification label to identify receptacles protected by upstream GFI protection, where permitted.

2.2 IDENTIFICATION NAMEPLATES AND LABELS

A. Identification Nameplates:
1. Manufacturers:
    a. Brimar Industries, Inc: www.brimar.com.
    b. Kolbi Pipe Marker Co: www.kolbipipemarkers.com.
    c. Seton Identification Products: www.seton.com.
    d. Substitutions: See Section 01 60 00 - Product Requirements.
2. Materials:
    a. Indoor Clean, Dry Locations: Use plastic nameplates.
    b. Outdoor Locations: Use plastic, stainless steel, or aluminum nameplates suitable for exterior use.
3. Plastic Nameplates: Two-layer or three-layer laminated electrically non-conductive phenolic with beveled edges; minimum thickness of 1/16 inch; engraved text.
    a. Exception: Provide minimum thickness of 1/8 inch when any dimension is greater than 4 inches.
4. Stainless Steel Nameplates: Minimum thickness of 1/32 inch; engraved or laser-etched text.
5. Aluminum Nameplates: Anodized; minimum thickness of 1/32 inch; engraved or laser-etched text.
6. Mounting Holes for Mechanical Fasteners: Two, centered on sides for sizes up to 1 inch high; Four, located at corners for larger sizes.

B. Identification Labels:
1. Manufacturers:
    a. Brady Corporation: www.bradyid.com.
    b. Brother International Corporation: www.brother-usa.com.
    c. Panduit Corp: www.panduit.com.
    d. Substitutions: See Section 01 60 00 - Product Requirements.
2. Materials: Use self-adhesive laminated plastic labels; UV, chemical, water, heat, and abrasion resistant.
    a. Use only for indoor locations.
3. Text: Use factory pre-printed or machine-printed text. Do not use handwritten text unless otherwise indicated.

2.3 WIRE AND CABLE MARKERS

A. Manufacturers:
1. Brady Corporation: www.bradyid.com.

2. HellermannTyton: www.hellermanntyton.com.
3. Panduit Corp: www.panduit.com.
4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Markers for Conductors and Cables: Use wrap-around self-adhesive vinyl cloth, wrap-around self-adhesive vinyl self-laminating, heat-shrink sleeve, plastic sleeve, or vinyl split sleeve type markers suitable for the conductor or cable to be identified.
1. Do not use self-adhesive type markers.

C. Markers for Conductor and Cable Bundles: Use plastic marker tags secured by nylon cable ties.

D. Legend: Power source and circuit number or other designation indicated.

E. Text: Use factory pre-printed or machine-printed text, all capitalized unless otherwise indicated.
1. Do not use handwritten text.

F. Minimum Text Height: 1/8 inch.

G. Color: Black text on white background unless otherwise indicated.

2.4 UNDERGROUND WARNING TAPE

A. Manufacturers:
1. Brady Corporation: www.bradyid.com.
2. Brimar Industries, Inc: www.brimar.com.
3. Seton Identification Products: www.seton.com.
4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Materials: Use non-detectable type OR foil-backed detectable type polyethylene tape suitable for direct burial, unless otherwise indicated.
1. Exception: Use foil-backed detectable type tape where required by serving utility or as noted.

C. Non-detectable Type Tape: 3 inches wide, with minimum thickness of 4 mil.

D. Foil-backed Detectable Type Tape: 3 inches wide, with minimum thickness of 5 mil, unless otherwise required for proper detection.

E. Legend: Type of service, continuously repeated over full length of tape.

F. Color:
1. Tape for Buried Power Lines: Black text on red background.
2. Tape for Buried Communication, Alarm, and Signal Lines: Black text on orange background.

PART 3 EXECUTION

3.1 PREPARATION

A. Clean surfaces to receive adhesive products according to manufacturer's instructions.

3.2 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install identification products to be plainly visible for examination, adjustment, servicing, and maintenance. Unless otherwise indicated, locate products as follows:
   1. Surface-Mounted Equipment: Enclosure front.
   2. Flush-Mounted Equipment: Inside of equipment door or enclosure front.
   3. Free-Standing Equipment: Enclosure front; also enclosure rear for equipment with rear access.
   4. Elevated Equipment: Legible from the floor or working platform.
   5. Branch Devices: Adjacent to device.
   6. Interior Components: Legible from the point of access.
   7. Conduits: Legible from the floor.
   8. Boxes: Outside face of cover unless otherwise noted.
   9. Conductors and Cables: Legible from the point of access.
   10. Devices: Outside face of cover.

C. Install identification products centered, level, and parallel with lines of item being identified.

D. Secure nameplates to exterior surfaces of enclosures using stainless steel screws, rivets, self-adhesive backing, or epoxy cement and to interior surfaces using self-adhesive backing or epoxy cement.
   1. Do not use adhesives on exterior surfaces except where substrate can not be penetrated.

E. Install self-adhesive labels and markers to achieve maximum adhesion, with no bubbles or wrinkles and edges properly sealed.

F. Install underground warning tape above buried lines with one tape per trench at 6 inches below finished grade. For trenches over 18 inches wide, install additional marker tape such that they are not over 10 inches apart (edge to edge) over the entire width of the trench.

G. Secure rigid signs using stainless steel screws.

H. Mark all handwritten text, where permitted, to be neat and legible.

3.3 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Replace self-adhesive labels and markers that exhibit bubbles, wrinkles, curling or other signs of improper adhesion.

END OF SECTION 26 05 53

SWITCHBOARDS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Switchboards.

B. Metering transformer cabinets.

C. Meter bases.

1.2 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Concrete for supporting foundations and pads.

B. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

C. Section 26 05 29 - Hangers and Supports for Electrical Systems.

1.3 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

B. NEMA KS 1 - Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum); 2013.

C. NEMA PB 2 - Deadfront Distribution Switchboards; 2011.

D. NEMA PB 2.1 - General Instructions for Proper Handling, Installation, Operation, and Maintenance of Deadfront Distribution Switchboards Rated 600 Volts or Less; 2013.

E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. UL 891 - Standard for Safety Switchboards; Underwriters Laboratories, Inc.; 2005.

1.4 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide electrical characteristics including voltage, frame size and trip ratings, fault current withstand ratings, and time-current curves of all equipment and components.

C. 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 per phase, neutral, and ground; and switchboard instrument details.

D. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

E. Project Record Documents: Record actual locations of switchboards.

F. Maintenance Data: Recommended maintenance procedures and intervals.

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.
   2. Enclosure Keys: Two of each different key.

1.5 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section.

C. Perform work in accordance with utility company written requirements and NFPA 70.
   1. Maintain one copy of each document on site.

D. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver in 48 inch maximum width shipping splits, individually wrapped for protection and mounted on shipping skids.

B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

C. Handle in accordance with NEMA PB 2.1 and manufacturer's written instructions. Lift only with lugs provided for the purpose. Handle carefully to avoid damage to switchboard internal components, enclosure, and finish.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Eaton Electrical: www.eatonelectrical.com.

B. General Electric Company: www.geindustrial.com.

C. Schneider Electric; Square D Products: www.schneider-electric.us.

D. Siemens: www.sea.siemens.com.

2.2 SWITCHBOARDS

A. Description: NEMA PB 2 switchboard with electrical ratings and configurations as indicated and specified.

B. Ratings:
   1. Voltage and bus ampacity rating: As indicated on drawings.
   2. Integrated Equipment Rating: Rating shall exceed available utility fault current.
   3. Main service board shall be service entrance rated.

C. Bus Material: Copper or aluminum with tin plating, standard size.

D. Bus Connections: Bolted, accessible from front for maintenance.

E. Ground Bus: Extend length of switchboard.

F. Insulated Ground Bus: Extend length of switchboard.

G. Fusible Switch Assemblies: NEMA KS 1, load interrupter enclosed knife switch with externally operable handle. Provide interlock to prevent opening front cover with switch in ON position. Handle lock in OFF position. Fuse clips: Designed to accommodate Class R or Class J fuses, type as specified.

H. Fusible Switch Assemblies, 800 Amperes and Larger: Bolted pressure contact switches. Fuse clips: Designed to accommodate Class L fuses.

I. Molded Case Circuit Breakers: Integral thermal and instantaneous magnetic trip in each pole.
   1. Provide circuit breakers UL listed as Type HACR for air conditioning equipment branch circuits.
   2. Include shunt trip where indicated.

J. Line and Load Terminations: Accessible from the front only of the switchboard, suitable for the conductor materials and sizes indicated.

K. Metering Transformer Compartment: For utility company's use; compartment size, bus spacing and drilling, door, and locking and sealing requirements in accordance with utility company's requirements.

L. Future Provisions: Fully equip spaces for future devices with bussing and bus connections, suitably insulated and braced for short circuit currents. Provide continuous current rating as indicated.

M. Pull Box: Removable top and sides, same construction as switchboard.
   1. Size as shown on Drawings.

2. Set front back sufficient distance to accommodate circuit breaker lifting devices.
3. Provide insulating, fire-resistive bottom with separate openings for each circuit to pass into switchboard.

N. Enclosure: Type 1 - General Purpose.
1. Align sections at rear only.
2. Switchboard Height: 90 inches, excluding floor sills, lifting members and pull boxes.
3. 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.

2.3 COMPONENTS

A. Metering Transformer Cabinets: Sheet metal cabinet with hinged door, conforming to utility company requirements, with provisions for locking and sealing.
1. Size: As required by utility.

B. Meter Base: As required by utility company.

C. Other Components: As required by utility company.

2.4 SOURCE QUALITY CONTROL

A. Shop inspect and test switchboard according to NEMA PB 2.

PART 3 EXECUTION

3.1 PREPARATION

A. Provide concrete housekeeping pad under the provisions of Section 03 30 00.

B. Arrange with utility company to obtain permanent electric service to the Project.

C. Verify that field measurements are as instructed by manufacturer and as indicated on utility company drawings.

3.2 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install switchboards in accordance with NECA 1 (general workmanship), NECA 400, and NEMA PB 2.1.

C. Arrange equipment to provide required clearances and maintenance access, including accommodations for any drawout devices.

D. Where switchboard is indicated to be mounted with inaccessible side against wall, provide minimum clearance of 1/2 inch between switchboard and wall.

E. Provide required support and attachment components in accordance with Section 26 05 29.

F. Install switchboards plumb and level.

G. Unless otherwise indicated, mount switchboards on properly sized 4 inch high concrete pad constructed in accordance with Section 03 30 00.

H. Provide grounding and bonding in accordance with Section 26 05 26.

I. Install all field-installed devices, components, and accessories.

J. Where accessories are not self-powered, provide control power source as indicated or as required to complete installation.

K. Provide filler plates to cover unused spaces in switchboards.

L. Install switchboard in locations shown on drawings, according to NEMA PB 2.1.

M. Install transformer pad and/or vault, metering transformer cabinets, and meter base as required by utility company.

N. Install in a neat and workmanlike manner, as specified in NECA 400.

O. Tighten accessible bus connections and mechanical fasteners after placing switchboard.

P. Install fuses in each switch.

3.3 FIELD QUALITY CONTROL

A. Perform field testing in accordance with Section 01 40 00.

3.4 ADJUSTING

A. Adjust all operating mechanisms for free mechanical movement.

B. Tighten bolted bus connections in accordance with manufacturer's instructions.

C. For systems with adjustable trip circuit breakers, provide coordination study for review. Adjust circuit breaker trip and time delay settings to values indicated on coordination study. Submit to Architect for review.

3.5 CLEANING

A. Touch up scratched or marred surfaces to match original finish.

END OF SECTION 26 24 13

PANELBOARDS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Power distribution panelboards.

B. Overcurrent protective devices for panelboards.

1.2 RELATED REQUIREMENTS

A. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

B. Section 26 05 29 - Hangers and Supports for Electrical Systems.

C. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

1.3 REFERENCE STANDARDS

A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service; Federal Specification; Revision E, 2013.

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

C. NECA 407 - Standard for Installing and Maintaining Panelboards; 2009.

D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.

E. NEMA PB 1 - Panelboards; 2011.

F. NEMA PB 1.1 - General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less; 2013.

G. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2013.

H. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

I. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

J. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

K. UL 67 - Panelboards; Current Edition, Including All Revisions.

L. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.

M. UL 869A - Reference Standard for Service Equipment; Current Edition, Including All Revisions.

N. UL 943 - Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.

O. UL 1053 - Ground-Fault Sensing and Relaying Equipment; Current Edition, Including All Revisions.

P. UL 1699 - Arc-Fault Circuit-Interrupters; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
3. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted panelboards where indicated.
4. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
5. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

1.5 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for panelboards, enclosures, overcurrent protective devices, and other installed components and accessories.

C. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, overcurrent protective device arrangement and sizes, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.

D. Field Quality Control Test Reports.

E. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

F. Project Record Documents: Record actual installed locations of panelboards and actual installed circuiting arrangements.

G. Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.

H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.
   2. Panelboard Keys: One for each panelboard installed.

1.6 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store panelboards in accordance with manufacturer's instructions and NECA 407.

B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

C. Handle carefully in accordance with manufacturer's written instructions to avoid damage to panelboard internal components, enclosure, and finish.

1.8 FIELD CONDITIONS

A. Maintain ambient temperature within the following limits during and after installation of panelboards:
   1. Panelboards Containing Circuit Breakers: Between 23 degrees F and 104 degrees F.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Eaton Corporation; Cutler-Hammer Products: www.eaton.com.

B. General Electric Company: www.geindustrial.com.

C. Schneider Electric; Square D Products: www.schneider-electric.us.

D. Siemens.

E. Substitutions: See Section 01 60 00 - Product Requirements.

F. Source Limitations: Furnish panelboards and associated components produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

2.2 ALL PANELBOARDS

A. Provide products listed and labeled by Underwriters Laboratories Inc. as suitable for the purpose indicated.

B. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
   1. Altitude: Less than 6,600 feet.
   2. Ambient Temperature:
      a. Panelboards Containing Circuit Breakers: Between 23 degrees F and 104 degrees F.

C. Short Circuit Current Rating:
   1. Provide panelboards with listed short circuit current rating not less than the available fault current at the installed location.
   2. Listed series ratings are acceptable, except where not permitted by motor contribution according to NFPA 70, acceptable only where specifically indicated, or not acceptable.
   3. Label equipment utilizing series ratings as required by NFPA 70.

D. Panelboards Used for Service Entrance: Listed and labeled as suitable for use as service equipment according to UL 869A.

E. Mains: Configure for top or bottom incoming feed as indicated or as required for the installation.

F. Branch Overcurrent Protective Devices: Replaceable without disturbing adjacent devices.

G. Bussing: Sized in accordance with UL 67 temperature rise requirements.
   1. Provide fully rated neutral bus, with a suitable lug for each feeder or branch circuit requiring a neutral connection.
   2. Provide 200 percent rated neutral bus and lugs where oversized neutral conductors are provided.
   3. Provide solidly bonded equipment ground bus in each panelboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.
   4. Provide separate isolated/insulated ground bus where indicated.

H. Conductor Terminations: Suitable for use with the conductors to be installed.

I. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.

1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
    a. Indoor Clean, Dry Locations: Type 1.
    b. Outdoor Locations: Type 3R.
2. Boxes: Galvanized steel unless otherwise indicated.
    a. Provide wiring gutters sized to accommodate the conductors to be installed.
    b. Increase gutter space as required where sub-feed lugs, feed-through lugs, gutter taps, or oversized lugs are provided.
    c. Provide removable end walls for NEMA Type 1 enclosures.
    d. Provide painted steel boxes for surface-mounted panelboards, finish to match fronts.
3. Fronts:
    a. Fronts for Surface-Mounted Enclosures: Same dimensions as boxes.
    b. Finish for Painted Steel Fronts: Manufacturer's standard grey unless otherwise indicated.
4. Lockable Doors: All locks keyed alike unless otherwise indicated.

J. Future Provisions: Prepare all unused spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.

K. Ground Fault Protection: Where ground-fault protection is indicated, provide system listed and labeled as complying with UL 1053.
1. Where electronic circuit breakers equipped with integral ground fault protection are used, provide separate neutral current sensor where applicable.
2. Where accessory ground fault sensing and relaying equipment is used, equip companion overcurrent protective devices with ground-fault shunt trips.
    a. Use zero sequence ground fault detection method unless otherwise indicated.
    b. Provide test panel and field-adjustable ground fault pick-up and delay settings.

L. Selectivity: Where the requirement for selectivity is indicated, furnish products as required to achieve selective coordination.

M. Provide the following features and accessories where indicated or where required to complete installation:
1. Feed-through lugs.
2. Main breaker.
3. Double lugs.

2.3 POWER DISTRIBUTION PANELBOARDS

A. Description: Panelboards complying with NEMA PB 1, power and feeder distribution type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.

B. Conductor Terminations:
1. Main and Neutral Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
2. Main and Neutral Lug Type: Compression.

C. Bussing:
   1. Phase and Neutral Bus Material: Aluminum or copper.
   2. Ground Bus Material: Copper.

D. Circuit Breakers:
   1. Provide bolt on type.
   2. Provide thermal magnetic circuit breakers unless otherwise indicated.

E. Enclosures:
   1. Provide surface-mounted enclosures as indicated.
   2. Fronts: Provide trims to cover access to load terminals, wiring gutters, and other live parts, with exposed access to overcurrent protective device handles.

2.4 OVERCURRENT PROTECTIVE DEVICES

A. Molded Case Circuit Breakers:
   1. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.
   2. Interrupting Capacity:
      a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than:

         1) 10,000 rms symmetrical amperes at 240 VAC or 208 VAC.

         2) 14,000 rms symmetrical amperes at 480 VAC.
      b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.
      c. Series Rated Systems: Provide circuit breakers listed in combination with upstream devices to provide interrupting rating not less than the short circuit current rating indicated.
   3. Conductor Terminations:
      a. Provide mechanical lugs for circuit breaker frame sizes less than 400 amperes.
      b. Provide compression lugs for circuit breaker frame sizes 400 amperes and above.
      c. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors of full breaker ampacity rating.
   4. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.
      a. Provide field-adjustable magnetic instantaneous trip setting for circuit breaker frame sizes 225 amperes and larger.
      b. Provide interchangeable trip units for circuit breaker frame sizes 400 amperes and larger.
   5. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.
   6. Provide the following circuit breaker types where indicated:

a. Ground Fault Circuit Interrupter (GFCI) Circuit Breakers: Listed as complying with UL 943, class A for protection of personnel.
b. Ground Fault Equipment Protection Circuit Breakers: Designed to trip at 30 mA for protection of equipment.
c. Arc-Fault Circuit Interrupter (AFCI) Circuit Breakers: Combination type listed as complying with UL 1699. Provide where required by applicable cable.

7. Provide listed switching duty rated circuit breakers with SWD marking for all branch circuits serving lighting.
8. Provide listed high intensity discharge lighting rated circuit breakers with HID marking for all branch circuits serving HID lighting.
9. Do not use tandem circuit breakers.
10. Do not use handle ties in lieu of multi-pole circuit breakers.

2.5 SOURCE QUALITY CONTROL

A. Factory test panelboards according to NEMA PB 1.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as shown on the drawings.

B. Verify that the ratings and configurations of the panelboards and associated components are consistent with the indicated requirements.

C. Verify that mounting surfaces are ready to receive panelboards.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install panelboards securely, in a neat and workmanlike manner in accordance with NECA 1 (general workmanship), NECA 407 (panelboards), and NEMA PB 1.1.

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Provide required supports in accordance with Section 26 05 29.

E. Install panelboards plumb.

F. Install flush-mounted panelboards so that trims fit completely flush to wall with no gaps and rough opening completely covered.

G. Mount panelboards such that the top of panelboard is 6 feet 6 inches above the floor or working platform. Install panelboards taller than 6 feet with bottom no more than 4 inches above the floor.
   1. Dwelling Units: Mount load center to meet ADA accessible side reach location and height per OSSC 1110.3.4.

H. Mount floor-mounted power distribution panelboards on properly sized 3 inch or 4 inch high concrete pad constructed in accordance with Section 03 30 00.

I. Provide spare 1 inch trade size conduits out of each flush-mounted panelboard stubbed into accessible space above ceiling.
   1. 1 empty 1 inch for every 6 spare breaker pole spaces and spare breakers.

J. Provide grounding and bonding in accordance with Section 26 05 26.
   1. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on isolated/insulated ground bus.
   2. Terminate branch circuit isolated grounding conductors on isolated/insulated ground bus only. Do not terminate on solidly bonded equipment ground bus.

K. Install all field-installed branch devices, components, and accessories.

L. Multi-Wire Branch Circuits: Group grounded and ungrounded conductors together in the panelboard as required by NFPA 70.

M. Set field-adjustable circuit breaker tripping function settings as required.

N. Set field-adjustable ground fault protection pickup and time delay settings as required.

O. Provide filler plates to cover unused spaces in panelboards.

P. Provide circuit breaker lock-on devices to prevent unauthorized personnel from de-energizing essential loads where indicated. Also provide for the following:
   1. Emergency and night lighting circuits.
   2. Fire detection and alarm circuits.
   3. Communications equipment circuits.
   4. Intrusion detection and access control system circuits.
   5. Video surveillance system circuits.

Q. Identify panelboards in accordance with Section 26 05 53.

R. Provide computer-generated circuit directory for each lighting and appliance panelboard and each power distribution panelboard provided with a door, clearly and specifically indicating the loads served. Identify spares and spaces.

3.3 FIELD QUALITY CONTROL

A. Perform inspection, testing, and adjusting in accordance with Section 01 40 00.

B. Inspect and test in accordance with NETA ATS, except Section 4.

C. Molded Case Circuit Breakers: Perform inspections and tests listed in NETA ATS, Section 7.6.1.1 for all main circuit breakers and circuit breakers larger than 800 amperes. Tests listed as optional are not required.
   1. Perform insulation-resistance tests on all control wiring with respect to ground.
   2. Test functions of the trip unit by means of secondary injection.

D. Ground Fault Protection Systems: Test in accordance with manufacturer's instructions as required by NFPA 70.
   1. Perform inspections and tests listed in NETA ATS, Section 7.14. The insulation-resistance test on control wiring listed as optional is not required.

E. Test GFCI circuit breakers to verify proper operation.

F. Test AFCI circuit breakers to verify proper operation.

G. Test shunt trips to verify proper operation.

H. Procure services of a qualified manufacturer's representative to observe installation and assist in inspection, testing, and adjusting. Include manufacturer's reports with field quality control submittals.

I. Correct deficiencies and replace damaged or defective panelboards or associated components.

3.4 ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

B. Adjust alignment of panelboard fronts.

C. Load Balancing: For each panelboard, rearrange circuits such that the difference between each measured steady state phase load does not exceed 20 percent and adjust circuit directories accordingly. Maintain proper phasing for multi-wire branch circuits.

3.5 CLEANING

A. Clean dirt and debris from panelboard enclosures and components according to manufacturer's instructions.

B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION 26 24 16

WIRING DEVICES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Wall switches.

B. Receptacles.

C. Wall plates.

1.2 RELATED REQUIREMENTS

A. Section 26 05 37 - Boxes.

B. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

1.3 REFERENCE STANDARDS

A. FS W-C-596 - Connector, Electrical, Power, General Specification for; Federal Specification; Revision G, 2001.

B. FS W-S-896 - Switches, Toggle (Toggle and Lock), Flush-mounted (General Specification); Federal Specification; Revision F, 1999.

C. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

D. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2010.

E. NEMA WD 1 - General Color Requirements for Wiring Devices; 1999 (R2015).

F. NEMA WD 6 - Wiring Devices - Dimensional Specifications; 2016.

G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

H. UL 20 - General-Use Snap Switches; Current Edition, Including All Revisions.

I. UL 498 - Attachment Plugs and Receptacles; Current Edition, Including All Revisions.

J. UL 514D - Cover Plates for Flush-Mounted Wiring Devices; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the placement of outlet boxes with millwork, furniture, equipment, etc. installed under other sections or by others.
   2. Coordinate wiring device ratings and configurations with the electrical requirements of actual equipment to be installed.
   3. Coordinate the placement of outlet boxes for wall switches with actual installed door swings.
   4. Coordinate the installation and preparation of uneven surfaces, such as split face block, to provide suitable surface for installation of wiring devices.
   5. Coordinate the core drilling of holes for poke-through assemblies with the work covered under other sections.
   6. Notify Architect of any conflicts or deviations from the contract documents to obtain direction prior to proceeding with work.

B. Sequencing:
   1. Do not install wiring devices until final surface finishes and painting are complete.

1.5 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.
   1. Wall Dimmers: Include derating information for ganged multiple devices.

C. Samples: One for each type and color of device and wall plate specified.

D. Field Quality Control Test Reports.

E. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

F. Operation and Maintenance Data:
   1. Wall Dimmers: Include information on operation and setting of presets.
   2. GFI Receptacles: Include information on status indicators and testing procedures and intervals.

G. Project Record Documents: Record actual installed locations of wiring devices.

H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.
   2. Screwdrivers for Tamper-Resistant Screws: Two for each type of screw.
   3. Extra Keys for Locking Switches: Five of each type.

1.6 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

D. Products: Listed, classified, and labeled as suitable for the purpose intended.

1.7 DELIVERY, STORAGE, AND PROTECTION

A. Store in a clean, dry space in original manufacturer's packaging until ready for installation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Hubbell Incorporated: www.hubbell-wiring.com.

B. Leviton Manufacturing Company, Inc: www.leviton.com.

C. Lutron Electronics Company, Inc: www.lutron.com.

D. Pass & Seymour, a brand of Legrand North America, Inc: www.legrand.us

E. Cooper Wiring Devices: www.cooperwiringdevices.com.

F. Substitutions: See Section 01 60 00 - Product Requirements.

G. Source Limitations: Where possible, for each type of wiring device furnish products produced by a single manufacturer and obtained from a single supplier.

2.2 ALL WIRING DEVICES

A. Provide products listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

B. Finishes:
   1. All Wiring Devices: Color as selected by Architect with wall plate as specified in wall plates section, unless otherwise indicated.
   2. Wiring Devices Installed in Finished Spaces: Color as selected by Architect with wall plate as specified in wall plates section, unless otherwise indicated.

3. Wiring Devices Installed in Unfinished Spaces: Color as selected by Architect with wall plate as specified in wall plates section, unless otherwise indicated.
4. Wiring Devices Installed in Wet or Damp Locations: Color as selected by Architect, with specified weatherproof cover unless otherwise indicated.
5. Isolated Ground Convenience Receptacles: Orange with isolated ground triangle mark on device face.
6. Wiring Devices Connected to Emergency Power: Red with wall plate as specified for wiring devices connected to normal power, but engraved "Emergency".
7. Clock Hanger Receptacles: Brown with wall plate as specified in wall plates section, unless otherwise indicated.

2.3 WALL SWITCHES

A. Manufacturers:
1. Hubbell Incorporated: www.hubbell-wiring.com.
2. Leviton Manufacturing Company, Inc: www.leviton.com.
3. Pass & Seymour, a brand of Legrand North America, Inc: www.legrand.us
4. Cooper Wiring Devices: www.cooperwiringdevices.com.
5. Substitutions: See Section 01 60 00 - Product Requirements.

B. All Wall Switches: AC only, quiet operating, general-use snap switches with silver alloy contacts, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 20 and where applicable, FS W-S-896; types as indicated on the drawings.
1. Wiring Provisions: Terminal screws for side wiring with separate ground terminal screw.

C. Standard Wall Switches: Industrial specification grade, 20 A, 120/277 V with standard toggle type switch actuator and maintained contacts; switch type as indicated on the drawings.
1. Products:
a. Hubbell 1221 Series.
b. Substitutions: See Section 01 60 00 - Product Requirements.

2.4 RECEPTACLES

A. Manufacturers:
1. Hubbell Incorporated: www.hubbell-wiring.com.
2. Leviton Manufacturing Company, Inc: www.leviton.com.
3. Pass & Seymour, a brand of Legrand North America, Inc: www.legrand.us
4. Cooper Wiring Devices: www.cooperwiringdevices.com.
5. Substitutions: See Section 01 60 00 - Product Requirements.

B. All Receptacles: Self-grounding, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 498, and where applicable, FS W-C-596; types as indicated on the drawings.
1. Wiring Provisions: Terminal screws for side wiring and screw actuated binding clamp for back wiring with separate ground terminal screw.
2. NEMA configurations specified are according to NEMA WD 6.
3. Hospital Grade Receptacles: Listed as complying with UL 498 Supplement SD, with green dot hospital grade mark on device face.

C. Convenience Receptacles:
   1. Standard Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R and/or 15A, 125V, NEMA 5-15R; single or duplex as indicated on the drawings.
      a. Products:
         1) Hubbell 5362 (20A).
         2) Hubbell 5262 (15A).
         3) Substitutions: See Section 01 60 00 - Product Requirements.
   2. Standard Convenience Receptacles in Commercial Areas: Industrial specification grade, 20A, 125V, NEMA 5-20R and/or 15A, 125V, NEMA 5-15R; type as indicated on the drawings.
      a. Products:
         1) Hubbell 5362 (20A).
         2) Hubbell 5262 (15A).
         3) Substitutions: See Section 01 60 00 - Product Requirements.

2.5 WALL PLATES

A. Manufacturers:
   1. Hubbell Incorporated: www.hubbell-wiring.com.
   2. Leviton Manufacturing Company, Inc: www.leviton.com.
   3. Pass & Seymour, a brand of Legrand North America, Inc: www.legrand.us
   4. Substitutions: See Section 01 60 00 - Product Requirements.

B. All Wall Plates: Comply with UL 514D.
   1. Configuration: One piece cover as required for quantity and types of corresponding wiring devices.
   2. Size: Standard.
   3. Screws: Metal with slotted heads finished to match wall plate finish.
   4. Provide screwless wallplates with concealed mounting hardware where indicated.

C. Stainless Steel: Faceplates in kitchen area shall be #302 stainless.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as shown on the drawings.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.

C. Verify that wall openings are neatly cut and will be completely covered by wall plates.

D. Verify that final surface finishes are complete, including painting.

E. Verify that floor boxes are adjusted properly.

F. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.

G. Verify that core drilled holes for poke-through assemblies are in proper locations.

H. Verify that openings in access floor are in proper locations.

I. Verify that conditions are satisfactory for installation prior to starting work.

3.2 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.3 INSTALLATION

A. Perform work in a neat and workmanlike manner in accordance with NECA 1 and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.

B. Coordinate locations of outlet boxes provided under Section 26 05 37 as required for installation of wiring devices provided under this section.
   1. Mounting Heights: As indicated on the drawings.
   2. Orient outlet boxes for vertical installation of wiring devices unless otherwise indicated.
   3. Where multiple receptacles, wall switches, or wall dimmers are installed at the same location and at the same mounting height, gang devices together under a common wall plate.
   4. Locate wall switches on strike side of door with edge of wall plate 3 inches from edge of door frame. Where locations are indicated otherwise, notify Architect to obtain direction prior to proceeding with work.
   5. Locate receptacles for electric drinking fountains concealed behind drinking fountain according to manufacturer's instructions.

C. Install wiring devices in accordance with manufacturer's instructions.

D. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.

E. Where required, connect wiring devices using pigtails not less than 6 inches long. Do not connect more than one conductor to wiring device terminals.

F. Connect wiring devices by wrapping conductor clockwise 3/4 turn around screw terminal and tightening to proper torque specified by the manufacturer. Where present, do not use push-in pressure terminals that do not rely on screw-actuated binding.

G. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.

H. Provide GFI receptacles with integral GFI protection at each location indicated. Do not use feed-through wiring to protect downstream devices.

I. Unless otherwise indicated, GFI receptacles may be connected to provide feed-through protection to downstream devices. Label such devices to indicate they are protected by upstream GFI protection.

J. Where split-wired duplex receptacles are indicated, remove tabs connecting top and bottom receptacles.

K. Install wiring devices plumb and level with mounting yoke held rigidly in place.

L. Install wall switches with OFF position down.

M. Install vertically mounted receptacles with grounding pole on bottom and horizontally mounted receptacles with grounding pole on right.

N. Install wall plates to fit completely flush to wall with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.

O. Install blank wall plates on junction boxes and on outlet boxes with no wiring devices installed or designated for future use.

P. Identify wiring devices in accordance with Section 26 05 53.

Q. Install poke-through closure plugs in all unused core holes to maintain fire rating of floor.

3.4 FIELD QUALITY CONTROL

A. Perform field inspection, testing, and adjusting in accordance with Section 01 40 00.

B. Inspect each wiring device for damage and defects.

C. Operate each wall switch, wall dimmer, and fan speed controller with circuit energized to verify proper operation.

D. Test each receptacle to verify operation and proper polarity.

E. Correct wiring deficiencies and replace damaged or defective wiring devices.

3.5 ADJUSTING

A. Adjust devices and wall plates to be flush and level.

B. Adjust presets for wall dimmers according to manufacturer's instructions as directed by Architect.

3.6 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

END OF SECTION 26 27 26

LIGHTING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Interior luminaires.

B. LED drivers.

C. Poles.

1.2 RELATED REQUIREMENTS

A. Section 26 0526 - Grounding and Bonding for Electrical Systems.

B. Section 26 05 37 - Boxes.

C. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

1.3 REFERENCE STANDARDS

A. IESNA LM-63 - ANSI Approved Standard File Format for Electronic Transfer of Photometric Data and Related Information; 2002 (Reaffirmed 2008).

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

C. NECA/IESNA 500 - Standard for Installing Indoor Commercial Lighting Systems; 2006.

D. NECA/IESNA 501 - Recommended Practice for Installing Exterior Lighting Systems; 2006.

E. NECA/IESNA 502 - Standard for Installing Industrial Lighting Systems; 2006.

F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

G. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the installation of luminaires with mounting surfaces installed under other sections or by others. Coordinate the work with placement of supports, anchors, etc. required for mounting. Coordinate compatibility of luminaires and associated trims with mounting surfaces at installed locations.

2. Coordinate the placement of luminaires with structural members, ductwork, piping, equipment, diffusers, fire suppression system components, and other potential conflicts installed under other sections or by others.
3. Notify Architect of any conflicts or deviations from the contract documents to obtain direction prior to proceeding with work.

1.5 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings:
1. Indicate dimensions and components for each luminaire that is not a standard product of the manufacturer.
2. Provide photometric calculations where luminaires are proposed for substitution upon request.

C. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, installed accessories, and ceiling compatibility; include model number nomenclature clearly marked with all proposed features.
1. Provide electronic files of photometric data certified by a National Voluntary Laboratory Accreditation Program (NVLAP) lab or independent testing agency in IESNA LM-63 standard format upon request.
2. Ballasts: Include wiring diagrams and list of compatible lamp configurations.
3. Lamps: Include rated life, color temperature, color rendering index (CRI), and initial and mean lumen output.
4. Fluorescent Emergency Power Supply Unit: Include list of compatible lamp configurations and associated lumen output.
5. Air Handling Luminaires: Include air handling performance data.

D. Coefficients of Utilization by an approved testing laboratory.

E. Project Record Documents: Record actual connections and locations of luminaires and any associated remote components.

1.6 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years experience.

1.7 DELIVERY, STORAGE, AND PROTECTION

A. Receive, handle, and store products according to NECA/IESNA 500 (commercial lighting), NECA/IESNA 502 (industrial lighting), and manufacturer's written instructions.

B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

1.8 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.9 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Provide five year manufacturer warranty for all linear fluorescent ballasts.

PART 2 PRODUCTS

2.1 LUMINAIRES

A. Provide products that comply with requirements of NFPA 70.

B. Provide products that are listed and labeled as complying with UL 1598, where applicable.

C. Provide products listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

D. Provide accessories and fittings as recommended by manufacturer to properly and completely install and wire fixtures.

E. Furnish products as indicated in Schedule included on the Drawings.

F. Provide the complete system of lighting fixtures and lamps as shown on the drawings and specified herein. The requirements of all other sections of the specification are equally applicable to the work to be performed under this section.

G. The fixture catalog numbers listed on the drawing indicate manufacturer, fixture design, appearance, etc., desired. These fixtures shall be modified if necessary to comply with the specification herein. Lighting fixtures specified will be the basis for comparison in the consideration of fixtures of other manufacturers.

H. All fixture component parts shall be manufactured and/or assembled at the manufacturing plant for shipment in one or more packages. The shipment from the fixture manufacturer shall include integrally-mounted drivers.

I. Fixtures - General:
   1. All surface mounted LED fixtures shall have low density label.
   2. All fixtures mounted outdoors or in unheated spaces shall have 0 degree F ballasts.

J. If fixtures specified herein are discontinued at the time the work is executed, provide suitable substitute fixtures, without additional cost, as directed by the engineer.

K. LED Luminaire Components: UL 8750 recognized or listed as applicable.

L. Electrical Characteristics: 277 volts, 60 Hz, unless otherwise specified.

M. Substitutions, Unless Otherwise Indicated: See Section 01 6000 - Product Requirements.

2.2 EXIT SIGNS

A. Description: Exit signs and similar signs for special purpose applications such as area of refuge/rescue assistance.

2.3 BALLASTS AND DRIVERS

A. Manufacturers:
   1. General Electric Company/GE Lighting: www.gelighting.com.
   2. Osram Sylvania: www.sylvania.com.
   3. Philips Lighting Electronics/Advance: www.advance.philips.com.
   4. Substitutions: See Section 01 60 00 - Product Requirements.
   5. Manufacturer Limitations: Where possible, for each type of luminaire provide ballasts produced by a single manufacturer.
   6. Where a specific manufacturer or model is indicated elsewhere in the luminaire schedule or on the drawings, substitutions are not permitted unless explicitly indicated.

2.4 POLES

A. Install lighting poles at locations indicated. Bond luminaires, metal accessories and pole to branch circuit equipment grounding conductor.

B. Mount poles plumb. Provide shims to adjust plumb. Grout around pole bases. Provide steel or aluminum bolt covers.

C. Furnish bolt templates and pole mounting accessories to installer of pole foundations.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as shown on the drawings.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with NFPA 70.

C. Verify that suitable support frames are installed where required.

D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.2 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.3 INSTALLATION

A. Coordinate locations of outlet boxes provided under Section 26 05 37 as required for installation of luminaires provided under this section.

B. Install products according to manufacturer's instructions.

C. Install luminaires securely, in a neat and workmanlike manner, as specified in NECA 1 (general workmanship), NECA 500 (commercial lighting), and NECA 502 (industrial lighting).

D. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.

E. Square and rectangular fixtures shall be mounted with sides parallel to building lines and parallel with ceiling lines.

F. Properly support and align fixtures and provide all necessary steel shapes for support of the fixtures. Recessed fluorescent fixtures shall be supported at opposite corners by steel wire connected to building structure per IBC requirements. Coordinate complete fixture installation with the facility construction.

G. Surface Mounted Fluorescent Fixtures: Where fixtures are indicated for installation on low density ceiling material, mount on ceiling spacers as recommended by manufacturer unless UL approved for mounting directly to ceiling material.

H. Install accessories furnished with each luminaire.

I. Bond products and metal accessories to branch circuit equipment grounding conductor.

J. Identify luminaires connected to emergency power system in accordance with Section 26 05 53.

K. Install lamps in each luminaire.

L. Lamp Burn-In: Operate lamps at full output for prescribed period per manufacturer's recommendations prior to use with any dimming controls. Replace lamps that fail prematurely due to improper lamp burn-in.

M. Verify all ceiling systems and coordinate fixture type and accessories prior to ordering fixtures.

N. Install fluorescent fixtures as recommended by the manufacturer or as necessary to provide exact horizontal alignment, preventing horizontal or vertical deflection, or angular jointing of fixtures installed in continuous rows.

O. All lighting fixtures shall be furnished complete with lamps, ballast and all accessories necessary to provide a complete operable fixture.

3.4 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Inspect each product for damage and defects.

C. Operate each luminaire after installation and connection to verify proper operation.

D. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Architect.

3.5 ADJUSTING

A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Architect. Secure locking fittings in place.

3.6 CLEANING

A. Clean surfaces according to NECA 500 (commercial lighting), NECA 502 (industrial lighting), and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

3.7 CLOSEOUT ACTIVITIES

A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.

B. Demonstration: Demonstrate proper operation of luminaires to Architect, and correct deficiencies or make adjustments as directed.

C. Just prior to Substantial Completion, replace all lamps that have failed.

3.8 PROTECTION

A. Protect installed luminaires from subsequent construction operations.

END OF SECTION 26 51 00