PROJECT MANUAL

Eugene School District 4J

KELLY MIDDLE SCHOOL IMPROVEMENTS

And

NORTH EUGENE HIGH SCHOOL IMPROVEMENTS

Eugene, Oregon

CIP #461.524.003

Issue Date: 03 March 2020

GMA Architects
860 West Park Street, Suite 300
Eugene, OR 97401

DOCUMENT 00 01 01
TITLE PAGE

PROJECT MANUAL:
KELLY MIDDLE SCHOOL IMPROVEMENTS and NORTH EUGENE HIGH SCHOOL IMPROVEMENTS
Eugene Public School District 4J
Eugene, Oregon
C.I.P. Project No. 461.524.003

OWNER:
Eugene School District 4J
715 West 4th Ave.
Eugene, Oregon 97402
Project Manager: Patrick Mucker
(541) 790-7418 Office
mucker_p@4j.lane.edu

ARCHITECT:
GMA Architects
860 W. Park Suite 300, Eugene, OR 97401
Project Architect: Joseph E. Moore, AIA
Project Manager: Leah M. Pettus-Czar, AIA
(541) 344-9157 Office
lmpc@gma-arch.com

MECHANICAL & ELECTRICAL ENGINEERS:
PAE Engineers
44 West Broadway, Suite 430
Eugene, OR 97401
Mechanical POC: Devin Coulter, PE
Electrical POC: Elise Keller
(541) 735-6222
devin.coulter@pae-engineers.com
elise.keller@pae-engineers.com

CIVIL ENGINEER:
KPFF Consulting Engineers
800 Willamette St, Suite 400
Eugene, OR 97401
Project Manager: Anna Backus, PE
Project Engineer: Matt Keenan, PE
(541) 484-0241 Office
anna.backus@kpff.com

STRUCTURAL ENGINEER:
Mortier Ang Engineers
1355 Oak St, Suite 200
Eugene, OR 97401
Project Engineer: Jok Ang, PE, SE
(541) 484-9080 Office
joka@mortierang.com

DATE: 03 March 2020

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CIP #461.524.003
03 MARCH 2020

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END OF SECTION 00 01 00

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INVITATION TO BID

Sealed bids will be received by Diana McElhinney, Facilities Management Assistant, for the Kelly Middle School Improvements and North Eugene High School Improvements project on Thursday March 26, 2020 until the Deadline for Bid Submission at 2:00pm at the Eugene School District 4J Facilities Management Office, 715 West Fourth Avenue, Eugene, Oregon 97402. The Bids will be opened publicly and read aloud immediately after the deadline for submission of bids. Late Bids will not be considered.

Briefly, the work is described as interior improvements to existing classrooms, new striping at existing parking and drive areas, and new playground addition at two schools. Work includes selective demolition, site work, concrete, rough carpentry, finish carpentry, insulation, openings, finishes, equipment, plumbing, mechanical, and electrical. Beginning March 03, 2020 Prime Bidders, Sub-bidders and Suppliers may obtain bidding documents at the following hyperlink: **http://www.4j.lane.edu./bids/.** Hard copies are not provided by the School District. It is the responsibility of all Prime Bidders, Sub-bidders, and Suppliers to obtain Bidding Documents and all Addenda from the hyperlink.

A mandatory pre-bid conference and walk-through has been scheduled for March 13th, at 3:00pm, to begin at Kelly Middle School. The location of the conference will be the Kelly Middle School Main Office 850 Howard Ave Eugene, Oregon 97404. The meeting will move, at 4:00pm, to the North Eugene High School Main Office 200 Silver Lane Eugene, Oregon 97404. All Prime Bidders wishing to submit a bid are required to attend this conference at both sites. Statements made by the District's representatives at the conference are not binding upon the District unless confirmed by Written Addendum. Pre-qualification of bidders is not required.

Each Bid must be submitted on the prescribed form and accompanied by a Surety Bond, Cashiers Check, or Certified Check, executed in favor of Eugene School District 4J, in the amount not less than ten percent (10%) of the total bid, based upon the total bid amount for those items bid upon.
Either with the Bid or within two working hours of the Deadline for Submission of Bids, bidders shall submit, on the form provided, information regarding first-tier subcontractors furnishing labor or labor and materials, as provided in ORS 279C.370. Bids for which disclosure forms are required, but not submitted, will be rejected.

No bid for a construction contract will be received or considered unless the Bidder is registered with the Construction Contractors Board or licensed by the State Landscape Contractors Board at the time the Bid is made, as required by OAR 137-049-0230. [A license to work with asbestos-containing materials under ORS 468A.720 is not required for this project.]

For every bid $100,000 or greater, all Contractors and Subcontractors shall have a public works bond, in the amount of $30,000, filed with the Construction Contractors' Board (CCB), before starting work on the project, unless exempt. A copy of the Contractors' BOLI Public Works Bond shall be provided with the executed contract documents.

Each Bid shall contain a statement indicating whether the Bidder is a "resident bidder", as defined in ORS 279A.120.

Each Bid shall contain a statement that the "Contractor agrees to be bound by and will comply with the provisions of ORS 279C.800 through 279C.870 regarding payment of Prevailing Wages".
Contractor shall certify nondiscrimination in obtaining required subcontractors, in accordance with ORS 279A.110(4).

School District 4J reserves the right to (1) reject any or all Bids not in compliance with all public bidding procedures and requirements, (2) postpone award of the Contract for a period not to exceed sixty (60) days from the date of bid opening, (3) waive informalities in the Bids, (4) select the Bid which appears to be in the best interest of the District, or (5) reject any or all bids.

Date:	03 March 2020
By:	Diana McElhinney, Facilities Management Assistant
Published:	Register Guard, Daily Journal of Commerce, ORPIN (Oregon Procurement Information Network)
Posted:	School District 4J Administration Office School District 4J Hyperlink: http://www.4j.lane.edu/bids/ 200 North Monroe Eugene, OR 97403

DOCUMENT 00 41 13
BID FORM

BID FOR: Kelly Middle School Improvements and North Eugene High School Improvements
CIP Number 461.524.003

Submitted to: Facilities Management
Eugene School District 4J
715 West Fourth Avenue
Eugene, Oregon 97402

Bid Deadline: 2:00pm
March 26th, 2020

Submitted by: _____
(Company Name)

BASE BID
The undersigned proposes to furnish all material, equipment, and labor required for the complete project, and to perform all work in strict accordance with the Contract Documents for the lump sum prices indicated below with completion occurring on or prior to the dates indicated:

BASE BID:

Bid: _____ $ _____
(Words) (Figures)

The undersigned agrees, if awarded the Contract, to substantially complete all Base Bid work on or before the dates specified in Section 01 11 00.

BID SECURITY
Accompanying herewith is Bid Security, which is not less than ten percent (10%) of the total amount of the Base Bid plus additive alternates.

STIPULATIONS
The undersigned acknowledges the liquidated damages provision included in the A101 Agreement.

The undersigned agrees, if awarded the contract, to comply with the provisions of Oregon Revised Statutes 279C.800 through 279C.870 pertaining to the payment of prevailing rates of wage.

The undersigned agrees if awarded the contract to comply with Oregon Revised Statutes 326.603 giving the Owner authority to obtain fingerprints and criminal records check of Contractors, their employees, and subcontractors providing labor for the Project.

The undersigned agrees, if awarded the Contract, to execute and deliver to the Owner within ten (10) working days after receiving contract forms, a signed Agreement and a satisfactory Performance Bond and Payment Bond each in an amount equal to 100 percent (100%) of the Contract Sum.

The undersigned agrees, if awarded the Contract, to provide a Schedule of Values for the contract amount within seven (7) days of the Notice to Award. The Schedule of Values shall include separate values for each school for billing and accounting purposes. Payment Applications and Progress Payments will need to include the Schedule of Values as separate work for each school.

For every Agreement of $100,000 or greater in value, all Contractors and Subcontractors shall have a public works bond in the amount of $30,000, filed with the Construction Contractors' Board (CCB), in compliance with ORS 279C.836, before starting work on the project unless exempt. Contractor agrees to provide a copy of the Contractor's BOLI Public Works bond with the signed Agreement as Specified in the Supplementary Conditions.

DOCUMENT 00 41 13
BID FORM

The undersigned agrees that the Bid Security accompanying this proposal is the measure of liquidated damages which the Owner will sustain by the failure of the undersigned to execute and deliver the above named agreement and bonds; and that if the undersigned defaults in executing that agreement within ten (10) days after forms are provided or providing the bonds, then the Bid Security shall become the property of the Owner; but if this proposal is not accepted within sixty (60) days of the time set for the opening of bids, or if the undersigned executes and delivers said agreement and bonds, the Bid Security shall be returned.

By submitting this Bid, the Bidder certifies that the Bidder:
a) has available the appropriate financial, material, equipment, facility and personnel resources and expertise, or the ability to obtain the resources and expertise, necessary to meet all contractual responsibilities;
b) has a satisfactory record of past performance;
c) has a satisfactory record of integrity, and is not disqualified under ORS 279C.440;
d) is qualified legally to contract with the Owner; and
e) will promptly supply all necessary information in connection with any inquiry the Owner may make concerning the responsibility of the Bidder.
Prior to award of a Contract, the Bidder shall submit appropriate documentation to allow the Owner to determine whether or not the Bidder is "responsible" according to the above criteria.

The contractor agrees with the provisions of Oregon Revised Statutes 279C.505, which requires that the contractor shall demonstrate it has established a drug-testing program for employees and will require each subcontractor providing labor for the Project to do the same.

The undersigned has received addenda numbers _____ to _____ inclusive and has included their provisions in the above Bid amounts.

The undersigned has visited the site to become familiar with conditions under which the Work is to be performed and has correlated the Bidder's personal observations with the requirements of the proposed Contract Documents.

The undersigned certifies that the Bidder is a _____ Bidder under ORS. ("Resident" or "Non-resident", to be filled in by Bidder)

Names of Firm: _____

Street Address: _____
(City) (State) (Zip)

Telephone Number: _____ FAX Number: _____

Email Address: _____

Signed By: _____ Printed Name:_____
(Signature of Authorized Official. If bid is from a partnership, one of the partners must sign bid).

Date Signed: _____

Official Capacity: _____

If corporation, attest: _____ Date: _____
(Secretary of Corporation)

SEAL (If Corporate)

_____ Corporation
_____ Partnership
_____ Individual

Enclosed: Bid Security

DOCUMENT 00 41 13
BID FORM

NON-DISCRIMINATION REQUIREMENT

Contractor certifies that the Contractor has not discriminated against minorities, women or emerging small business enterprises in obtaining any required subcontracts.

The Contractor agrees not to discriminate against any client, employee, or applicant for employment or for services, because of race, color, religion, sex, national origin, physical or mental handicap, sexual orientation or age, unless based upon bona fide occupational qualifications, and that they are otherwise in compliance with all federal, state and local laws prohibiting discrimination, with regard to, but not limited to, the following: Employment upgrading, demotion or transfer; Recruitment or recruitment advertising; Layoffs or termination; Rates of pay or other forms of compensation; Selection for training; Rendition of services. It is further understood that any vendor who is in violation of this clause shall be barred forthwith from receiving awards of any purchase order from the School District, unless a satisfactory showing is made that discriminatory practices have terminated and that a recurrence of such acts is unlikely.

FIRM NAME: _____

ADDRESS: _____

TELEPHONE: _____

BY: _____
(Company or Firm Officer)

BY: _____
(Type or Print Name)

DOCUMENT 00 41 13
BID FORM

NON-COLLUSION AFFIDAVIT

STATE OF _____)

County of _____)

I state that I am _____ of _____
(Title) (Name of Firm)
and that I am authorized to make this affidavit on behalf of my firm, and its owners, directors, and officers. I am the person responsible in my firm for the price(s) and the amount of this bid.

I state that:

(1) The price(s) and amount of this bid have been arrived at independently and without consultation, communication or agreement with any other contractor, bidder or potential bidder, except as disclosed on the attached appendix.

(2) That neither the price(s) nor the amount of this bid, and neither the approximate price(s) nor approximate amount of this bid, have been disclosed to any other firm or person who is a bidder or potential bidder, and they will not be disclosed before bid opening.

(3) No attempt has been made or will be made to induce any firm or person to refrain from bidding on this contract, or to submit a bid higher than this bid, or to submit any intentionally high or noncompetitive bid or other form of complementary bid.

(4) The bid of my firm is made in good faith and not pursuant to any agreement or discussion with, or inducement from, any firm or person to submit a complementary or noncompetitive bid.

(5) _____, its affiliates, subsidiaries, officers, directors and
(Name of my Firm)
employees are not currently under investigation by any governmental agency and have not in the last four years been convicted of or found liable for any act prohibited by State or Federal law in any jurisdiction, involving conspiracy or collusion with respect to bidding on any public contract, except as described on the attached appendix.

I state that _____ understands and acknowledges that the above representations
(Name of my Firm)
are material and important, and will be relied on by School District 4J in awarding the contract(s) for which this bid is submitted. I understand and my firm understands that any misstatement in this affidavit is and shall be treated as fraudulent concealment from School District 4J of the true facts relating to the submission of bids for this contract.

_____
(Authorized Signature)

Sworn to and subscribed before me this _____ day of _____, 20

_____
(Notary Public for Oregon)

My Commission Expires: _____

END OF BID FORM

Updated 1/4/18

DOCUMENT 00 45 22
FIRST-TIER SUBCONTRACTOR DISCLOSURE FORM

PROJECT: Kelly Middle School Improvements and North Eugene High School Improvements
CIP NUMBER: 461.524.003

TO: Facilities Management
Eugene School District 4J
715 West Fourth Avenue
Eugene, Oregon 97402

BID SUBMISSION DEADLINE: **Date:** _____ **Time:** _____

SUBMITTAL REQUIREMENTS
Subcontractor disclosure is required on all public improvement contracts greater than $100,000.

This form must be submitted at the location specified in the Invitation to Bid on the advertised bid closing date and within two working hours after the advertised bid closing time.

List below the name of each subcontractor that will be furnishing labor or labor and materials, and that is required to be disclosed, the category of work that the subcontractor will be performing, and the dollar value of the subcontract. Enter "NONE" if there are no subcontractors that need to be disclosed. (ATTACH ADDITIONAL SHEETS IF NEEDED.)

SUBCONTRACTOR	**DOLLAR VALUE**	**CATEGORY OF WORK**
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

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

a) 5% of the total Contract Price, but at least $15,000. [If the Dollar Value is less than $15,000 do not list the subcontractor above.]
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 non-responsive bid. A non-responsive bid will not be considered for award.

Form submitted by (Bidder Name): _____

Contact Name: _____ **Phone:** _____

Signature: _____

END OF DOCUMENT 00 45 22

DOCUMENT 00 52 13
FORM OF AGREEMENT

PART 1 – GENERAL

1.1 STANDARD FORM

A. The form of Agreement will be executed on AIA Form A101, Standard Form of Agreement Between Owner and Contractor, 2017 edition, which is included by reference. The document, as edited by Owner, is available for review at http://www.4j.lane.edu/bids/.

PART 2 – PRODUCTS

Not Used.

PART 3 – EXECUTION

Not Used.

END OF DOCUMENT 00 52 13

DRAFT

AIA® Document A101™ – 2017

Standard Form of Agreement Between Owner and Contractor

where the basis of payment is a Stipulated Sum

AGREEMENT made as of the « » day of « » in the year « »
(In words, indicate day, month and year.)

BETWEEN the Owner:
(Name, legal status, address and other information)

Lane County School District 4J
715 West 4th Avenue
Eugene, OR 97402
541-790-7409
Project Manager email: mucker_p@4j.lane.edu
and the Contractor:
(Name, legal status, address and other information)

« »
« »
« »

for the following Project:
(Name, location and detailed description)

« »
« »
« »

The Architect:
(Name, legal status, address and other information)

« »
« »
« »

The Owner and Contractor agree as follows.

ADDITIONS AND DELETIONS: The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

The parties should complete A101™–2017, Exhibit A, Insurance and Bonds, contemporaneously with this Agreement. AIA Document A201™–2017, General Conditions of the Contract for Construction, is adopted in this document by reference. Do not use with other general conditions unless this document is modified.

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TABLE OF ARTICLES

ARTICLE 1 THE CONTRACT DOCUMENTS

The Contract Documents consist of this Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, Addenda issued prior to execution of this Agreement, other documents listed in this Agreement, and Modifications issued after execution of this Agreement, all of which form the Contract, and are as fully a part of the Contract as if attached to this Agreement or repeated herein. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. An enumeration of the Contract Documents, other than a Modification, appears in Article 9.

ARTICLE 2 THE WORK OF THIS CONTRACT

The Contractor shall fully execute the Work described in the Contract Documents, except as specifically indicated in the Contract Documents to be the responsibility of others.

ARTICLE 3 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

§ 3.1 The date of commencement of the Work shall be:
(Check one of the following boxes.)

[« »] The date of this Agreement.

[« »] A date set forth in a notice to proceed issued by the Owner.

[« »] Established as follows:
(Insert a date or a means to determine the date of commencement of the Work.)

« »

If a date of commencement of the Work is not selected, then the date of commencement shall be the date of this Agreement.

§ 3.2 The Contract Time shall be measured from the date of commencement of the Work.

§ 3.3 Substantial Completion

§ 3.3.1 Subject to adjustments of the Contract Time as provided in the Contract Documents, the Contractor shall achieve Substantial Completion of the entire Work:
(Check one of the following boxes and complete the necessary information.)

[« »] Not later than « » (« ») calendar days from the date of commencement of the Work.

[« »] By the following date: « »

§ 3.3.2 Subject to adjustments of the Contract Time as provided in the Contract Documents, if portions of the Work are to be completed prior to Substantial Completion of the entire Work, the Contractor shall achieve Substantial Completion of such portions by the following dates:

Portion of Work	Substantial Completion Date

§ 3.3.3 If the Contractor fails to achieve Substantial Completion as provided in this Section 3.3, liquidated damages, if any, shall be assessed as set forth in Section 4.5.

ARTICLE 4 CONTRACT SUM

§ 4.1 The Owner shall pay the Contractor the Contract Sum in current funds for the Contractor's performance of the Contract. The Contract Sum shall be s ($), subject to additions and deductions as provided in the Contract Documents.

§ 4.2 Alternates

§ 4.2.1 Alternates, if any, included in the Contract Sum:

Item	Price

§ 4.2.2 Subject to the conditions noted below, the following alternates may be accepted by the Owner following execution of this Agreement. Upon acceptance, the Owner shall issue a Modification to this Agreement.
(Insert below each alternate and the conditions that must be met for the Owner to accept the alternate.)

Item	Price	Conditions for Acceptance

§ 4.3 Allowances, if any, included in the Contract Sum:
(Identify each allowance.)

Item	Price

§ 4.4 Unit prices, if any:
(Identify the item and state the unit price and quantity limitations, if any, to which the unit price will be applicable.)

Item	Units and Limitations	Price per Unit ($0.00)

§ 4.5 Liquidated Damages

The Contractor shall pay to the Owner Liquidated Damages of $1,000 per day for each day of delay in achieving Substantial Completion.

« »

§ 4.6 Other:
(Insert provisions for bonus or other incentives, if any, that might result in a change to the Contract Sum.)

« »

ARTICLE 5 PAYMENTS

§ 5.1 Progress Payments

§ 5.1.1 Based upon Applications for Payment submitted to the Architect by the Contractor and Certificates for Payment issued by the Architect, the Owner shall make progress payments on account of the Contract Sum to the Contractor as provided below and elsewhere in the Contract Documents.

§ 5.1.2 The period covered by each Application for Payment shall be one calendar month ending on the last day of the month, or as follows:

« »

§ 5.1.3 Provided that an Application for Payment is received by the Architect not later than the « First » day of a month, the Owner shall make payment of the amount certified to the Contractor not later than the « Thirtieth » day of the « same » month. If an Application for Payment is received by the Architect after the application date fixed above, payment of the amount certified shall be made by the Owner not later than « thirty » (« 30 ») days after the Architect receives the Application for Payment.
(Federal, state or local laws may require payment within a certain period of time.)

§ 5.1.4 Each Application for Payment shall be based on the most recent schedule of values submitted by the Contractor in accordance with the Contract Documents. The schedule of values shall allocate the entire Contract Sum among the various portions of the Work. The schedule of values shall be prepared in such form, and supported by such data to substantiate its accuracy, as the Architect may require. This schedule of values shall be used as a basis for reviewing the Contractor's Applications for Payment.

§ 5.1.5 Applications for Payment shall show the percentage of completion of each portion of the Work as of the end of the period covered by the Application for Payment.

§ 5.1.6 In accordance with AIA Document A201™–2017, General Conditions of the Contract for Construction, and subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

§ 5.1.6.1 The amount of each progress payment shall first include:

.1 That portion of the Contract Sum properly allocable to completed Work;

.2 That portion of the Contract Sum properly allocable to materials and equipment delivered and suitably stored at the site for subsequent incorporation in the completed construction, or, if approved in advance by the Owner, suitably stored off the site at a location agreed upon in writing; and

.3 That portion of Construction Change Directives that the Architect determines, in the Architect's professional judgment, to be reasonably justified.

§ 5.1.6.2 The amount of each progress payment shall then be reduced by:

.1 The aggregate of any amounts previously paid by the Owner;

.2 The amount, if any, for Work that remains uncorrected and for which the Architect has previously withheld a Certificate for Payment as provided in Article 9 of AIA Document A201–2017;

.3 Any amount for which the Contractor does not intend to pay a Subcontractor or material supplier, unless the Work has been performed by others the Contractor intends to pay;

.4 For Work performed or defects discovered since the last payment application, any amount for which the Architect may withhold payment, or nullify a Certificate of Payment in whole or in part, as provided in Article 9 of AIA Document A201–2017; and

.5 Retainage withheld pursuant to Section 5.1.7.

§ 5.1.7 Retainage

§ 5.1.7.1 For each progress payment made prior to Substantial Completion of the Work, the Owner may withhold the following amount, as retainage, from the payment otherwise due:
(Insert a percentage or amount to be withheld as retainage from each Application for Payment. The amount of retainage may be limited by governing law.)

« 5% »

§ 5.1.7.1.1 The following items are not subject to retainage:
(Insert any items not subject to the withholding of retainage, such as general conditions, insurance, etc.)

« »

§ 5.1.7.2 Reduction or limitation of retainage, if any, shall be as follows:
(If the retainage established in Section 5.1.7.1 is to be modified prior to Substantial Completion of the entire Work, including modifications for Substantial Completion of portions of the Work as provided in Section 3.3.2, insert provisions for such modifications.)

« »

§ 5.1.7.3 Except as set forth in this Section 5.1.7.3, upon Substantial Completion of the Work, the Contractor may submit an Application for Payment that includes the retainage withheld from prior Applications for Payment pursuant to this Section 5.1.7. The Application for Payment submitted at Substantial Completion shall not include retainage as follows:
(Insert any other conditions for release of retainage upon Substantial Completion.)

« »

§ 5.1.8 If final completion of the Work is materially delayed through no fault of the Contractor, the Owner shall pay the Contractor any additional amounts in accordance with Article 9 of AIA Document A201–2017.

§ 5.1.9 Except with the Owner's prior approval, the Contractor shall not make advance payments to suppliers for materials or equipment which have not been delivered and stored at the site.

§ 5.2 Final Payment

§ 5.2.1 Final payment, constituting the entire unpaid balance of the Contract Sum, shall be made by the Owner to the Contractor when

.1 the Contractor has fully performed the Contract except for the Contractor's responsibility to correct Work as provided in Article 12 of AIA Document A201–2017, and to satisfy other requirements, if any, which extend beyond final payment; and

.2 a final Certificate for Payment has been issued by the Architect.

§ 5.2.2 The Owner's final payment to the Contractor shall be made no later than 30 days after the issuance of the Architect's final Certificate for Payment, or as follows:

« »

§ 5.3 Interest

Payments due and unpaid under the Contract shall bear interest from the date payment is due at the rate stated below, or in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.
(Insert rate of interest agreed upon, if any.)

« » % « »

ARTICLE 6 DISPUTE RESOLUTION

§ 6.1 Initial Decision Maker

The Architect will serve as the Initial Decision Maker pursuant to Article 15 of AIA Document A201–2017, unless the parties appoint below another individual, not a party to this Agreement, to serve as the Initial Decision Maker.
(If the parties mutually agree, insert the name, address and other contact information of the Initial Decision Maker, if other than the Architect.)

« »
« »
« »
« »

§ 6.2 Binding Dispute Resolution

For any Claim subject to, but not resolved by, mediation pursuant to Article 15 of AIA Document A201–2017, the method of binding dispute resolution shall be as follows:
(Check the appropriate box.)

[« »] Arbitration pursuant to Section 15.4 of AIA Document A201–2017

[« »] Litigation in a court of competent jurisdiction

[« »] Other *(Specify)*

« »

If the Owner and Contractor do not select a method of binding dispute resolution, or do not subsequently agree in writing to a binding dispute resolution method other than litigation, Claims will be resolved by litigation in a court of competent jurisdiction.

ARTICLE 7 TERMINATION OR SUSPENSION

§ 7.1 The Contract may be terminated by the Owner or the Contractor as provided in Article 14 of AIA Document A201–2017.

§ 7.1.1 If the Contract is terminated for the Owner's convenience in accordance with Article 14 of AIA Document A201–2017, then the Owner shall pay the Contractor a termination fee as follows:
(Insert the amount of, or method for determining, the fee, if any, payable to the Contractor following a termination for the Owner's convenience.)

« »

§ 7.2 The Work may be suspended by the Owner as provided in Article 14 of AIA Document A201–2017.

ARTICLE 8 MISCELLANEOUS PROVISIONS

§ 8.1 Where reference is made in this Agreement to a provision of AIA Document A201–2017 or another Contract Document, the reference refers to that provision as amended or supplemented by other provisions of the Contract Documents.

§ 8.2 The Owner's representative:
(Name, address, email address, and other information)

« »

polston_j@4j.lane.edu

§ 8.3 The Contractor's representative:
(Name, address, email address, and other information)

« »

§ 8.4 Neither the Owner's nor the Contractor's representative shall be changed without ten days' prior notice to the other party.

§ 8.5 Insurance and Bonds

§ 8.5.1 The Owner and the Contractor shall purchase and maintain insurance as set forth in AIA Document A101™–2017, Standard Form of Agreement Between Owner and Contractor where the basis of payment is a Stipulated Sum, Exhibit A, Insurance and Bonds, and elsewhere in the Contract Documents.

§ 8.5.2 The Contractor shall provide bonds as set forth in AIA Document A101™–2017 Exhibit A, and elsewhere in the Contract Documents.

§ 8.6 Notice in electronic format, pursuant to Article 1 of AIA Document A201–2017, may be given in accordance with AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, if completed, or as otherwise set forth below:
(If other than in accordance with AIA Document E203–2013, insert requirements for delivering notice in electronic format such as name, title, and email address of the recipient and whether and how the system will be required to generate a read receipt for the transmission.)

« »

§ 8.7 Other provisions:

« For all phases of the Project, the Contractor and the Owner shall purchase and maintain insurance, and the Contractor shall provide bonds as set forth in Article 11 of AIA Document A201–2007.
(State bonding requirements, if any, and limits of liability for insurance required in Article 11 of AIA Document A201–2007.)

General Insurance: The CONTRACTOR shall maintain in force for the duration of this agreement a Umbrella Insurance Policy with the limits not less than $5,000,000, a Commercial General Liability, Automobile Liability (owned, non-owned and hired) Insurance policy(s) written on an occurrence basis with limits not less than $1,000,000 per occurrence and $2,000,000 in the aggregated naming the DISTRICT, its employees, officials and agents as an additional insured as respects to work or services performed under this agreement. This insurance will be primary to any insurance the DISTRICT may carry on its own. If the DISTRICT requires Professional Liability coverage, the terms, conditions, and limits must be approved by the DISTRICT's Risk Manager.

Workers' Compensation: The CONTRACTOR shall provide and maintain workers' compensation coverage for its employees, officers, agents, or partners as required by applicable workers' compensation laws.
Equipment and Material: The CONTRACTOR shall be responsible for any loss, damage, or destruction of its own property, equipment, and materials used in connection with the work.

Course of Construction: The CONTRACTOR shall maintain an all-risk policy covering the replacement cost of the Work during the course of construction. The policy shall include the interests of the DISTRICT and the Architect. The amount of insurance shall equal the completed value of the contract.

Property Insurance: The CONTRACTOR shall purchase from and maintain in a company or companies authorized to do business in the jurisdiction in which the Project is located, property insurance on an "all risk" policy form, including builder's risk/installation floater, whichever is appropriate, in the amount of the initial Contract Sum, plus the value of subsequent modifications and the cost of materials supplied by others, comprising the total value of the entire Project at the site on a replacement cost basis without optional deductibles. Such property insurance shall be maintained, unless otherwise provided in the Contract Documents or otherwise agreed in writing by all persons and entities who are beneficiaries of such insurance, until final payment has been made as provided in The Contract Documents or until no person or entity other than the DISTRICT has an insurable interest in the property required by this paragraph to be covered, whichever is later. The insurance shall include interests of the DISTRICT, Architect and CONTRACTOR, Subcontractors, and sub-Subcontractors in the Project.

Evidence of Coverage: Evidence of the above coverages issued by a company satisfactory to the DISTRICT shall be provided to the DISTRICT by way of a certificate of insurance before any work or services commence. A 30-day notice of cancellation or material change in coverage clause shall be included. It is the CONTRACTOR's obligation to provide the 30 days' notice if not done so by the CONTRACTOR's insurance company(s). Failure to maintain the proper insurance shall be grounds for immediate termination of this Agreement.

Subcontractors: The CONTRACTOR shall require all Subcontractors to provide and maintain general liability, auto liability, professional liability (as applicable), and workers' compensation insurance with coverage equivalent to those required of the general CONTRACTOR in this contract. The CONTRACTOR shall require certificates of insurance from all Subcontractors as evidence of coverage.

Exception or Waivers: Any exception or waiver of these requirements shall be subject to review and approval from the DISTRICT's Risk Manager.

PERFORMANCE BOND AND PAYMENT BOND: The CONTRACTOR shall furnish a Performance bond and a Labor and Materials Payment bond covering faithful performance of the Contract and payment of obligations arising there under. Bonds are to be obtained through a company that is on the US Government Treasury list for approved sureties and/or approved by School DISTRICT 4J's Risk Manager. The cost of the Bond shall be included in the Contract Sum. The amount of each bond shall be equal to 100 percent of the Contract Sum. Submit on AIA Document A312, latest edition. The CONTRACTOR shall deliver the required bonds to the DISTRICT with the executed Agreement. The CONTRACTOR shall require the Attorney-in-fact who executes the required bonds on behalf of the surety to affix thereto a certified and current copy of their power of attorney.

»

ARTICLE 9 ENUMERATION OF CONTRACT DOCUMENTS

§ 9.1 This Agreement is comprised of the following documents:

.1 AIA Document A101™–2017, Standard Form of Agreement Between Owner and Contractor

.2 AIA Document A101™–2017, Exhibit A, Insurance and Bonds

.3 AIA Document A201™–2007, General Conditions of the Contract for Construction
(Insert the date of the E203-2013 incorporated into this Agreement.)

« »

.5 Drawings

Number	Title	Date

.6 Specifications

Section	Title	Date	Pages

.7 Addenda, if any:

Number	Date	Pages

Portions of Addenda relating to bidding or proposal requirements are not part of the Contract Documents unless the bidding or proposal requirements are also enumerated in this Article 9.

.8 Other Exhibits:
(Check all boxes that apply and include appropriate information identifying the exhibit where required.)

[« »] AIA Document E204™–2017, Sustainable Projects Exhibit, dated as indicated below:
(Insert the date of the E204-2017 incorporated into this Agreement.)

« »

[« »] The Sustainability Plan:

Title	Date	Pages

[« »] Supplementary and other Conditions of the Contract:

Document	Title	Date	Pages

.9 Other documents, if any, listed below:
(List here any additional documents that are intended to form part of the Contract Documents. AIA Document A201™–2017 provides that the advertisement or invitation to bid, Instructions to Bidders, sample forms, the Contractor's bid or proposal, portions of Addenda relating to bidding or proposal requirements, and other information furnished by the Owner in anticipation of receiving bids or proposals, are not part of the Contract Documents unless enumerated in this Agreement. Any such documents should be listed here only if intended to be part of the Contract Documents.)

« »

This Agreement entered into as of the day and year first written above.

OWNER *(Signature)*	**CONTRACTOR** *(Signature)*
«Ryan Spain, Facilities Director »« »	« »« »
(Printed name and title)	*(Printed name and title)*

DOCUMENT 00 72 13
GENERAL CONDITIONS

PART 1 – GENERAL

1.1 STANDARD FORM

A. General Conditions of the Contract for Construction AIA Document A201, 2017 edition, immediately following, are part of these specifications.

B. The Contractor and all Subcontractors shall read and be governed by them.

1.2 CONFLICTS

A. In the case of conflicts between the General Conditions and these Specifications, the Specifications govern.

PART 2 – PRODUCTS

Not Used.

PART 3 – EXECUTION

Not Used.

END OF DOCUMENT 00 72 13

DRAFT

AIA® Document A201™ – 2007

General Conditions of the Contract for Construction

for the following PROJECT:
(Name and location or address)
« »
« »

THE OWNER:
(Name, legal status and address)
« »« »
« »

THE ARCHITECT:
(Name, legal status and address)
« »« »
« »

TABLE OF ARTICLES

ADDITIONS AND DELETIONS: The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

DRAFT

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ARTICLE 1 GENERAL PROVISIONS

§ 1.1 BASIC DEFINITIONS

§ 1.1.1 THE CONTRACT DOCUMENTS

The Contract Documents are enumerated in the Agreement between the Owner and Contractor (hereinafter the Agreement) and consist of the Agreement, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, Addenda issued prior to execution of the Contract, other documents listed in the Agreement and Modifications issued after execution of the Contract. A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a Construction Change Directive or (4) a written order for a minor change in the Work issued by the Architect. Unless specifically enumerated in the Agreement, the Contract Documents do not include the advertisement or invitation to bid, Instructions to Bidders, sample forms, other information furnished by the Owner in anticipation of receiving bids or proposals, the Contractor's bid or proposal, or portions of Addenda relating to bidding requirements.

§ 1.1.2 THE CONTRACT

The Contract Documents form the Contract for Construction. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations or agreements, either written or oral. The Contract may be amended or modified only by a Modification including a GMP Amendment. The Contract Documents shall not be construed to create a contractual relationship of any kind (1) between the Contractor and the Architect or the Architect's consultants, (2) between the Owner and a Subcontractor or a Sub-subcontractor except as set forth in Section 5.3 and Section 5.4, (3) between the Owner and the Architect or the Architect's consultants or (4) between any persons or entities other than the Owner and the Contractor. The Architect shall, however, be entitled to performance and enforcement of obligations under the Contract intended to facilitate performance of the Architect's duties.

§ 1.1.3 THE WORK

The term "Work" means the construction and services required by the Contract Documents, whether completed or partially completed, and includes all other labor, materials, equipment and services provided or to be provided by the Contractor to fulfill the Contractor's obligations. The Work may constitute the whole or a part of the Project.

§ 1.1.4 THE PROJECT

The Project is the total construction of which the Work performed under the Contract Documents may be the whole or a part and which may include construction by the Owner and by separate contractors.

§ 1.1.5 THE DRAWINGS

The Drawings are the graphic and pictorial portions of the Contract Documents showing the design, location and dimensions of the Work, generally including plans, elevations, sections, details, schedules and diagrams.

§ 1.1.6 THE SPECIFICATIONS

The Specifications are that portion of the Contract Documents consisting of the written requirements for materials, equipment, systems, standards and workmanship for the Work, and performance of related services.

§ 1.1.7 INSTRUMENTS OF SERVICE

Instruments of Service are representations, in any medium of expression now known or later developed, of the tangible and intangible creative work performed by the Architect and the Architect's consultants under their respective professional services agreements. Instruments of Service may include, without limitation, studies, surveys, models, sketches, drawings, specifications, and other similar materials.

§ 1.1.8 INITIAL DECISION MAKER

The Initial Decision Maker is the person identified in the Agreement to render initial decisions on Claims in accordance with Section 15.2 and certify termination of the Agreement under Section 14.2.2.

§ 1.1.9 KNOWLEDGE

The terms "knowledge," "recognize," and "discover," their respective derivatives, and similar terms in the Contract Documents, as used in reference to the Contractor, shall be interpreted to mean that which the Contractor knows (or should know), recognizes (or should recognize), and discovers (or should discover) in exercising the care, skill, and diligence required of a general commercial contractor. Analogously, the expression "reasonably inferable" and

similar terms in the Contract Documents shall be interpreted to mean reasonably inferable by a contractor familiar with the Project and exercising the care, skill, and diligence required of a general commercial contractor.

§ 1.2 CORRELATION AND INTENT OF THE CONTRACT DOCUMENTS

§ 1.2.1 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all; performance by the Contractor shall be required only to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results. In the event of inconsistencies within or between parts of the Contract Documents, or between the Contract Documents and applicable standards, codes, and ordinances, the Contractor shall (i) provide the better quality or greater quantity of Work or (ii) comply with the more stringent requirement; either or both in accordance with the Architect's interpretation. The terms and conditions of this Section 1.2.1, however, shall not relieve the Contractor of any of the obligations set forth in Sections 3.2 and 3.7.

§ 1.2.2 Organization of the Specifications into divisions, sections and articles, and arrangement of Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade.

§ 1.2.3 Unless otherwise stated in the Contract Documents, words that have well-known technical or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings. Dimensions not expressly provided in the Contract Documents are to be computed, rather than determined by scale or rule.

§ 1.3 CAPITALIZATION

Terms capitalized in these General Conditions include those that are (1) specifically defined, (2) the titles of numbered articles or (3) the titles of other documents published by the American Institute of Architects.

§ 1.4 INTERPRETATION

In the interest of brevity the Contract Documents frequently omit modifying words such as "all" and "any" and articles such as "the" and "an," but the fact that a modifier or an article is absent from one statement and appears in another is not intended to affect the interpretation of either statement.

§ 1.5 OWNERSHIP AND USE OF DRAWINGS, SPECIFICATIONS AND OTHER INSTRUMENTS OF SERVICE

§ 1.5.1 The Architect and the Architect's consultants shall be deemed the authors and owners of their respective Instruments of Service, including the Drawings and Specifications, and will retain all common law, statutory and other reserved rights, including copyrights. The Contractor, Subcontractors, Sub-subcontractors, and material or equipment suppliers shall not own or claim a copyright in the Instruments of Service. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with this Project is not to be construed as publication in derogation of the Architect's or Architect's consultants' reserved rights.

§ 1.5.2 The Contractor, Subcontractors, Sub-subcontractors and material or equipment suppliers are authorized to use and reproduce the Instruments of Service provided to them solely and exclusively for execution of the Work. All copies made under this authorization shall bear the copyright notice, if any, shown on the Instruments of Service. The Contractor, Subcontractors, Sub-subcontractors, and material or equipment suppliers may not use the Instruments of Service on other projects or for additions to this Project outside the scope of the Work without the specific written consent of the Owner, Architect and the Architect's consultants.

§ 1.6 TRANSMISSION OF DATA IN DIGITAL FORM

If the parties intend to transmit Instruments of Service or any other information or documentation in digital form, they shall endeavor to establish necessary protocols governing such transmissions, unless otherwise already provided in the Agreement or the Contract Documents.

ARTICLE 2 OWNER

§ 2.1 GENERAL

§ 2.1.1 The Owner is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Owner shall designate in writing a representative who shall have express authority to bind the Owner with respect to all matters requiring the Owner's approval or authorization. Except as otherwise provided in Section 4.2.1, the Architect does not have such authority. The term "Owner" means

the Owner or the Owner's authorized representative. Jim Polston is designated by the Owner as its representative and is authorized to act on behalf of the Owner, unless a new representative is subsequently designated in writing by the Owner.

§ 2.1.2 The Owner shall furnish to the Contractor within fifteen days after receipt of a written request, information necessary and relevant for the Contractor to evaluate, give notice of or enforce mechanic's lien rights. Such information shall include a correct statement of the record legal title to the property on which the Project is located, usually referred to as the site, and the Owner's interest therein.

§ 2.2 INFORMATION AND SERVICES REQUIRED OF THE OWNER

§ 2.2.1 Prior to commencement of the Work, the Contractor may request in writing that the Owner provide reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract. Thereafter, the Contractor may only request such evidence if (1) the Owner fails to make payments to the Contractor as the Contract Documents require; (2) a change in the Work materially changes the Contract Sum; or (3) the Contractor identifies in writing a reasonable concern regarding the Owner's ability to make payment when due. The Owner shall furnish such evidence as a condition precedent to commencement or continuation of the Work or the portion of the Work affected by a material change.

§ 2.2.2 Except for permits and fees that are the responsibility of the Contractor under the Contract Documents, including those required under Section 3.7.1, the Owner shall secure the building permits and pay for necessary approvals, easements, assessments and charges required for use or occupancy of permanent structures or for permanent changes in existing facilities.

§ 2.2.3 Except to the extent required for execution of the Work and requested by the Contractor in writing, the Owner shall not furnish any surveys describing physical characteristics, legal limitations and utility locations for the site of the Project, but shall provide a legal description of the site. The Contractor shall be entitled to rely on the accuracy of information furnished by the Owner but shall exercise proper precautions relating to the safe performance of the Work.

§ 2.2.4 The Owner shall furnish information or services required of the Owner by the Contract Documents with reasonable promptness.

§ 2.2.5 Unless otherwise provided in the Contract Documents, the Owner shall furnish to the Contractor one copy of the Contract Documents for purposes of making reproductions pursuant to Section 1.5.2.

§ 2.3 OWNER'S RIGHT TO STOP THE WORK

If the Contractor fails to correct Work that is not in accordance with the requirements of the Contract Documents as required by Section 12.2 or repeatedly fails to carry out Work in accordance with the Contract Documents, the Owner may issue a written order to the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, the right of the Owner to stop the Work shall not give rise to a duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity, except to the extent required by Section 6.1.3.

§ 2.4 OWNER'S RIGHT TO CARRY OUT THE WORK

If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a seven-day period after receipt of written notice from the Owner (except no notice shall be required in the event of an emergency) to commence and continue correction of such default or neglect with diligence and promptness, the Owner may (but shall not be obligated to), without prejudice to other remedies the Owner may have, commence and continue to carry out the Work, including, without limitation, to correct such deficiencies. In such case an appropriate Change Order shall be issued deducting from payments then or thereafter due the Contractor the reasonable cost of correcting such deficiencies, including Owner's expenses and compensation for the Architect's additional services made necessary by such default, neglect or failure. If payments then or thereafter due the Contractor are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner.

§ 2.5 EXTENT OF OWNER RIGHTS

The rights stated in this Article 2 and elsewhere in the Contract Documents are cumulative and not in limitation of any rights of the Owner (i) granted in the Contract Documents, (ii) at law, or (iii) in equity.

In no event shall the Owner have control over, charge of, or any responsibility for construction means, methods, techniques, sequences, or procedures or for safety precautions and programs in connection with the Work, notwithstanding any of the rights and authority granted the Owner in the Contract Documents.

ARTICLE 3 CONTRACTOR

§ 3.1 GENERAL

§ 3.1.1 The Contractor is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Contractor shall be lawfully licensed, if required in the jurisdiction where the Project is located. The Contractor shall designate in writing a representative who shall have express authority to bind the Contractor with respect to all matters under this Contract. The term "Contractor" means the Contractor or the Contractor's authorized representative.

§ 3.1.2 The Contractor shall perform the Work in accordance with the Contract Documents.

§ 3.1.3 The Contractor shall not be relieved of obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Owner or the Architect in the administration of the Contract, or by tests, inspections or approvals required or performed by persons or entities other than the Contractor.

§ 3.1.4 Unless otherwise directed by the Architect, the Contractor shall perform all Work in accordance with product manufacturers' recommendations or directions for best results. No preparatory step or installation procedure may be omitted unless specifically authorized by the Contract Documents or at the direction of the Architect. Conflicts among manufacturers' directions or the Contract Documents shall be resolved by the Architect.

§ 3.2 REVIEW OF CONTRACT DOCUMENTS AND FIELD CONDITIONS BY CONTRACTOR

§ 3.2.1 Execution of the Contract by the Contractor is a representation that the Contractor has visited the site, become generally familiar with local conditions under which the Work is to be performed and correlated personal observations with requirements of the Contract Documents. Prior to execution of the Agreement, the Contractor and each Subcontractor have evaluated and satisfied themselves as to the conditions and limitations under which the Work is to be performed, including, without limitation, (i) the location, condition, layout, and nature of the Project site and surrounding areas, (ii) generally prevailing climatic conditions, (iii) anticipated labor supply and costs, (iv) availability and cost of materials, tools, and equipment, and (v) other similar issues. The Owner assumes no responsibility or liability for the physical condition or safety of the Project site or any improvements located on the Project site. Except as set forth in Section 10.3, the Contractor shall be solely responsible for providing a safe place for the performance of the Work. The Owner shall not be required to make any adjustment in either the Contract Sum or the Contract Time in connection with any failure by the Contractor or any Subcontractor to have complied with the requirements of this Section 3.2.1.

§ 3.2.2 Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Section 2.2.3, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the site affecting it. These obligations are for the purpose of facilitating coordination and construction by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the design information contained in the Contract Documents; however, the Contractor shall promptly report to the Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information in such form as the Owner or the Architect may require. It is recognized that the Contractor's review is made in the Contractor's capacity as a contractor and not as a licensed design professional, unless otherwise specifically provided in the Contract Documents.

The exactness of grades, elevations, dimensions, or locations given on any Drawings issued by the Architect, or the work installed by other contractors, is not guaranteed by the Architect or the Owner.

The Contractor shall, therefore, satisfy itself as to the accuracy of all grades, elevations, dimensions, and locations. In all cases of interconnection of its Work with existing or other work, it shall verify at the site all dimensions relating to such existing or other work. Any errors due to the Contractor's failure to so verify all such grades,

elevations, dimensions, or locations shall be promptly rectified by the Contractor without any additional cost to the Owner.

§ 3.2.3 The Contractor is not required to ascertain that the Contract Documents are in accordance with applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, but the Contractor shall promptly report to the Architect any nonconformity discovered by or made known to the Contractor as a request for information in such form as the Architect may require.

§ 3.2.4 If the Contractor believes that additional cost or time is involved because of clarifications or instructions the Architect issues in response to the Contractor's notices or requests for information pursuant to Sections 3.2.2 or 3.2.3, the Contractor shall make Claims as provided in Article 15. If the Contractor fails to perform the obligations of Sections 3.2.2 or 3.2.3, the Contractor shall pay such costs and damages to the Owner as would have been avoided if the Contractor had performed such obligations. If the Contractor performs those obligations, the Contractor shall not be liable to the Owner or Architect for damages resulting from errors, inconsistencies or omissions in the Contract Documents, for differences between field measurements or conditions and the Contract Documents, or for nonconformities of the Contract Documents to applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities.

§ 3.3 SUPERVISION AND CONSTRUCTION PROCEDURES

§ 3.3.1 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for, and have control over, construction means, methods, techniques, sequences and procedures and for coordinating all portions of the Work under the Contract. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences or procedures, the Contractor shall evaluate the jobsite safety thereof and, except as stated below, shall be fully and solely responsible for the jobsite safety of such means, methods, techniques, sequences or procedures. If the Contractor determines that such means, methods, techniques, sequences or procedures may not be safe, the Contractor shall give timely written notice to the Owner and Architect and shall not proceed with that portion of the Work without further written instructions from the Architect.

§ 3.3.2 The Contractor shall be responsible to the Owner for acts and omissions of the Contractor's employees, Subcontractors and their agents and employees, and other persons or entities performing portions of the Work for, or on behalf of, the Contractor or any of its Subcontractors.

§ 3.3.3 The Contractor shall be responsible for inspection of portions of Work already performed to determine that such portions are in proper condition to receive subsequent Work.

§ 3.3.4 The Contractor must notify the District Facilities Director and Owner's Representative prior to the interruption of any utility or operating system, regardless of the area it services. The specific schedule for all interruptions in services must be coordinated through the Owner's Representative.

§ 3.3.5 The Contractor and its Subcontractors may not use the Owner's tools, equipment, or materials unless authorized in advance by the Owner's Representative.

§ 3.3.6 If the Contractor reasonably believes that suspension of the Work is warranted by reason of unforeseen circumstances that could adversely affect the quality of the Work if the Work were continued, the Contractor shall immediately notify the Owner and the Architect and describe with particularity the reasons therefor. Except as stated elsewhere in the Contract Documents or in an emergency, the Contractor shall not suspend the Work until it receives approval from the Owner.

§ 3.3.7 It is understood and agreed that the relationship of Contractor to Owner shall be that of an independent contractor under ORS 670.600. Nothing contained in this Agreement or inferable from this Agreement shall be deemed or construed to (a) make Contractor the agent, servant, or employee of the Owner; or (b) create any partnership, joint venture, or other association between Owner and Contractor. Any direction or instruction by Owner or any of its authorized representatives in respect to the Work shall relate to the results the Owner desires to obtain from the Work, and shall in no way affect Contractor's independent contractor status.

§ 3.4 LABOR AND MATERIALS

§ 3.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.

§ 3.4.2 Except in the case of minor changes in the Work authorized by the Architect in accordance with Sections 3.12.8 or 7.4, the Contractor may make substitutions only with the prior written consent of the Owner, after evaluation by the Architect and in accordance with a Change Order or Construction Change Directive.

§ 3.4.3 The Contractor shall enforce strict discipline and good order among the Contractor's employees and other persons carrying out the Work. The Contractor shall not permit employment of unfit persons or persons not properly skilled in tasks assigned to them.

§ 3.4.4 The Contractor shall only employ or use labor in connection with the Work capable of working harmoniously with all trades, crafts, and any other individuals associated with the Project. The Contractor shall also use best efforts to minimize the likelihood of any strike, work stoppage, or other labor disturbance and shall not be entitled to any increase in the Contract Sum in the event of a labor dispute.

.1 If the Work is to be performed by trade unions, the Contractor shall make all necessary arrangements to reconcile, without delay, damage, or cost to the Owner and without recourse to the Architect or the Owner, any conflict between the Contract Documents and any agreements or regulations of any kind at any time in force among members or councils that regulate or distinguish the activities that shall not be included in the work of any particular trade.

.2 In case the progress of the Work is affected by any undue delay in furnishing or installing any items or materials or equipment required under the Contract Documents because of such conflict involving any such labor agreement or regulation, the Owner may require that other material or equipment of equal kind and quality be provided pursuant to a Change Order or Construction Change Directive.

§ 3.5 WARRANTY

The Contractor warrants to the Owner and Architect that materials and equipment furnished under the Contract will be of good quality and new unless the Contract Documents require or permit otherwise. The Contractor further warrants that the Work will conform to the requirements of the Contract Documents and will be free from defects, except for those inherent in the quality of the Work the Contract Documents require or permit. Work, materials, or equipment not conforming to these requirements may be considered defective. The Contractor's warranty excludes remedy for damage or defect caused by abuse, alterations to the Work not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear and normal usage. If required by the Architect or the Owner, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment. The Contractor agrees to assign to the Owner at the time of final completion of the Work any and all manufacturers' warranties relating to materials and labor used in the Work and further agrees to perform the Work in such manner so as to preserve any and all such manufacturers' warranties. The Contractor further warrants the building envelope and penetration components against defects in materials and workmanship for a period of two-years following the date of Substantial Completion in accordance with ORS 701.340 and shall annually inspect the same. If, after 15 days' written notice, the Contractor fails to proceed to cure any breach of this warranty, the Owner may have the defects corrected and the Contractor and its surety, if any, shall be liable for all expense incurred. In case of an emergency where, in the opinion of the Owner or the Architect, delay would cause serious loss or damage, if any, corrective work may be undertaken without advance notice to the Contractor, but the Contractor and its surety shall remain liable for all expenses incurred.

§ 3.6 TAXES

The Contractor shall pay sales, consumer, use and similar taxes for the Work provided by the Contractor and all Social Security and withholding payments that are legally enacted when bids are received or negotiations concluded, whether or not yet effective or merely scheduled to go into effect.

§ 3.7 PERMITS, FEES, NOTICES AND COMPLIANCE WITH LAWS

§ 3.7.1 Except for the building permit which will be paid for by the Owner, the Contractor shall secure and pay for all permits, fees, licenses, and inspections by government agencies necessary for proper execution and completion of the Work.

§ 3.7.2 The Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities applicable to performance of the Work.

§ 3.7.3 If the Contractor performs Work knowing it to be contrary to applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, the Contractor shall assume appropriate responsibility for such Work and shall bear the costs attributable to correction.

§ 3.7.4 Concealed or Unknown Conditions. If the Contractor encounters conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature, that differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor shall promptly provide notice to the Owner and the Architect before conditions are disturbed and in no event later than 21 days after first observance of the conditions. The Architect will promptly investigate such conditions and, if the Architect determines that they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend an equitable adjustment in the Contract Sum or Contract Time, or both. If the Architect determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall promptly notify the Owner and Contractor in writing, stating the reasons. If either party disputes the Architect's determination or recommendation, that party may proceed as provided in Article 15.

§ 3.7.5 If, in the course of the Work, the Contractor encounters human remains or recognizes the existence of burial markers, archaeological sites or wetlands not indicated in the Contract Documents, the Contractor shall immediately suspend any operations that would affect them and shall notify the Owner and Architect. Upon receipt of such notice, the Owner shall promptly take any action necessary to obtain governmental authorization required to resume the operations. The Contractor shall continue to suspend such operations until otherwise instructed by the Owner but shall continue with all other operations that do not affect those remains or features. Requests for adjustments in the Contract Sum and Contract Time arising from the existence of such remains or features may be made as provided in Article 15.

§ 3.8 ALLOWANCES

§ 3.8.1 The Contractor shall include in the Contract Sum all allowances stated in the Contract Documents. Items covered by allowances shall be supplied for such amounts and by such persons or entities as the Owner may direct, but the Contractor shall not be required to employ persons or entities to whom the Contractor has reasonable objection.

§ 3.8.2 Unless otherwise provided in the Contract Documents,

- **.1** Allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts;
- **.2** Contractor's costs for unloading and handling at the site, labor, installation costs, overhead, profit and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum but not in the allowances; and
- **.3** Whenever costs are more than or less than allowances, the Contract Sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect (1) the difference between actual costs and the allowances under Section 3.8.2.1 and (2) changes in Contractor's costs under Section 3.8.2.2.

§ 3.8.3 Materials and equipment under an allowance shall be selected by the Owner with reasonable promptness.

§ 3.9 SUPERINTENDENT

§ 3.9.1 The Contractor shall employ a competent Project Manager, superintendent and necessary assistants who shall be in attendance at the Project site during performance of the Work. The Project Manager shall represent the Contractor, and communications given to the Project Manager shall be as binding as if given to the Contractor.

§ 3.9.2 The Contractor, as soon as practicable after award of the Contract, shall furnish in writing to the Owner through the Architect the name and qualifications of a proposed Project Manager and superintendent. The Architect

may reply within 14 days to the Contractor in writing stating (1) whether the Owner or the Architect has reasonable objection to the proposed Project Manager and superintendent or (2) that the Architect requires additional time to review. Failure of the Architect to reply within the 14 day period shall constitute notice of no reasonable objection.

§ 3.9.3 The Contractor shall not employ a proposed Project Manager or superintendent to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not change the Project Manager or superintendent without the Owner's consent, which shall not unreasonably be withheld or delayed.

§ 3.10 CONTRACTOR'S CONSTRUCTION SCHEDULES

§ 3.10.1 The Contractor, promptly after being awarded the Contract, shall prepare and submit for the Owner's and Architect's information a Contractor's construction schedule for the Work. The schedule shall not exceed time limits current under the Contract Documents, shall be revised at appropriate intervals as required by the conditions of the Work and Project, shall be related to the entire Project to the extent required by the Contract Documents, and shall provide for expeditious and practicable execution of the Work.

§ 3.10.2 The Contractor shall prepare a submittal schedule, promptly after being awarded the Contract and thereafter as necessary to maintain a current submittal schedule, and shall submit the schedule(s) for the Architect's approval. The Architect's approval shall not unreasonably be delayed or withheld. The submittal schedule shall (1) be coordinated with the Contractor's construction schedule, and (2) allow the Architect reasonable time to review submittals. If the Contractor fails to submit a submittal schedule, the Contractor shall not be entitled to any increase in Contract Sum or extension of Contract Time based on the time required for review of submittals.

§ 3.10.3 The Contractor shall perform the Work in general accordance with the most recent schedules submitted to the Owner and Architect.

§ 3.10.4 The construction schedule shall be submitted together with the GMP and shall be in a detailed precedence-style critical path management ("CPM") or primavera-type format satisfactory to the Owner and the Architect that shall also (i) provide a graphic representation of all activities and events that will occur during performance of the Work; (ii) identify each phase of construction and occupancy; and (iii) set forth dates that are critical in ensuring the timely and orderly completion of the Work in accordance with the requirements of the Contract Documents (hereinafter referred to as "Milestone Dates"). Upon review and acceptance by the Owner and the Architect of the Milestone Dates, the construction schedule shall be deemed part of the Contract Documents and attached to the Agreement as Exhibit 3,10.4. If not accepted, the construction schedule shall be promptly revised by the Contractor in accordance with the recommendations of the Owner and the Architect and resubmitted for acceptance. The Contractor shall monitor the progress of the Work for conformance with the requirements of the construction schedule and shall promptly advise the Owner of any delays or potential delays. The accepted construction schedule shall be updated to reflect actual conditions (sometimes referred to in these Supplementary Conditions as "progress reports") as set forth in Section 3.10.1 or if requested by either the Owner or the Architect. In the event any progress report indicates any delays, the Contractor shall propose an affirmative plan to correct the delay, including overtime and/or additional labor, if necessary. In no event shall any progress report constitute an adjustment in the Contract Time, any Milestone Date, or the Contract Sum unless any such adjustment is agreed to by the Owner and authorized pursuant to Change Order.

§ 3.10.5 In the event the Owner determines that the performance of the Work, as of a Milestone Date, has not progressed or reached the level of completion required by the Contract Documents, the Owner shall have the right to order the Contractor to take corrective measures reasonably necessary to expedite the progress of construction, including, without limitation, (i) working additional shifts or overtime, (ii) supplying additional manpower, equipment, and facilities, and (iii) other similar measures (hereinafter referred to collectively as "Extraordinary Measures"). Such Extraordinary Measures shall continue until the progress of the Work complies with the stage of completion required by the Contract Documents. The Owner's right to require Extraordinary Measures is solely for the purpose of ensuring the Contractor's compliance with the construction schedule.

.1 Unless such Extraordinary Measure are necessitated by acts or omission reasonably out of the Contractor's control, the Contractor shall not be entitled to an adjustment in the Contract Sum in connection with Extraordinary Measures required by the Owner under or pursuant to this Section 3.10.5.

.2 The Owner may exercise the rights furnished the Owner under or pursuant to this Section 3.10.5 as frequently as the Owner deems necessary to ensure that the Contractor's performance of the Work will comply with any Milestone Date or completion date set forth in the Contract Documents.

§ 3.10.6 The Owner shall have the right to direct a postponement or rescheduling of any date or time for the performance of any part of the Work that may interfere with the operation of the Owner's premises or any tenants or invitees thereof. The Contractor shall, upon the Owner's request, reschedule any portion of the Work affecting operation of the premises during hours when the premises are not in operation. Any postponement, rescheduling, or performance of the Work under this Section 3.10.6 may be grounds for an extension of the Contract Time, if permitted under Section 8.3.1, and an equitable adjustment in the Contract Sum if (i) the performance of the Work was properly scheduled by the Contractor in compliance with the requirements of the Contract Documents, and (ii) such rescheduling or postponement is required for the convenience of the Owner.

§ 3.11 DOCUMENTS AND SAMPLES AT THE SITE

The Contractor shall maintain at the site for the Owner one copy of the Drawings, Specifications, Addenda, Change Orders and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, and one copy of approved Shop Drawings, Product Data, Samples and similar required submittals. These shall be available to the Architect and shall be delivered to the Architect for submittal to the Owner upon completion of the Work as a record of the Work as constructed.

§ 3.11.1 The Contractor shall maintain for the Owner one record as-built copy of the Drawings, Specifications, Addenda, Change Orders and other Modifications, in good order and marked currently to record field changes and selections made during construction, and one record copy of approved Shop Drawings, Product Data, Samples and similar required submittals. These as-built documents shall incorporate all changes and substitutions to the Work, including without limitation changes or substitutions arising from Change Orders, Construction Change Directives, and details clarified by Requests for Information, Supplemental Instructions or approved Shop Drawings. The Contractor's as-built documentation shall be available to the Architect and the Owner during the course of the Project.

§ 3.11.2 The Contractor shall maintain all approved permit drawings in a manner that will make them accessible at the Project site to governmental inspectors and other authorized agencies. All approved permit drawings shall be wrapped, marked, and delivered to the Owner within sixty (60) days of Substantial Completion.

§ 3.11.3 The Contractor must continuously maintain at the Project site all material safety data sheets, safety records, daily logs, and other Contract documentation necessary to immediately ascertain the safety of the Work and to establish compliance with life safety policies, Hazardous Materials requirements, and the Contract Documents.

§ 3.11.4 The Contractor, with its Subcontractors, will prepare draft record Contract Documents, showing all as-built conditions as required under Section 3.11.1 and the Owner's close-out policies and procedures, and submit them to the Architect for review. Based on the Architect's review and comments, if any, and pursuant to the Owner's close-out policies and procedures, the Contractor will prepare and deliver to the Owner within sixty (60) days of Substantial Completion, final, accurate, and complete record Contract Documents, including without limitation record Drawings and Specifications, showing the exact "as-built" conditions of the Work.

§ 3.12 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

§ 3.12.1 Shop Drawings are drawings, diagrams, schedules and other data specially prepared for the Work by the Contractor or a Subcontractor, Sub-subcontractor, manufacturer, supplier or distributor to illustrate some portion of the Work.

§ 3.12.2 Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams and other information furnished by the Contractor to illustrate materials or equipment for some portion of the Work.

§ 3.12.3 Samples are physical examples that illustrate materials, equipment or workmanship and establish standards by which the Work will be judged.

§ 3.12.4 Shop Drawings, Product Data, Samples and similar submittals are not Contract Documents. Their purpose is to demonstrate the way by which the Contractor proposes to conform to the information given and the design

concept expressed in the Contract Documents for those portions of the Work for which the Contract Documents require submittals. Review by the Architect is subject to the limitations of Section 4.2.7. Informational submittals upon which the Architect is not expected to take responsive action may be so identified in the Contract Documents. Submittals that are not required by the Contract Documents may be returned by the Architect without action.

§ 3.12.5 The Contractor shall review for compliance with the Contract Documents, approve and submit to the Architect Shop Drawings, Product Data, Samples and similar submittals required by the Contract Documents in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of the Owner or of separate contractors.

§ 3.12.6 By submitting Shop Drawings, Product Data, Samples and similar submittals, the Contractor represents to the Owner and Architect that the Contractor has (1) reviewed and approved them, (2) determined and verified materials, field measurements and field construction criteria related thereto, or will do so and (3) checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

§ 3.12.7 The Contractor shall perform no portion of the Work for which the Contract Documents require submittal and review of Shop Drawings, Product Data, Samples or similar submittals until the respective submittal has been approved by the Architect.

§ 3.12.8 The Work shall be in accordance with approved submittals except that the Contractor shall not be relieved of responsibility for deviations from requirements of the Contract Documents by the Architect's approval of Shop Drawings, Product Data, Samples or similar submittals unless the Contractor has specifically informed the Architect in writing of such deviation at the time of submittal and (1) the Architect has given written approval to the specific deviation as a minor change in the Work, or (2) a Change Order or Construction Change Directive has been issued authorizing the deviation. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples or similar submittals by the Architect's approval thereof.

§ 3.12.9 The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data, Samples or similar submittals, to revisions other than those requested by the Architect on previous submittals. In the absence of such written notice, the Architect's approval of a resubmission shall not apply to such revisions.

§ 3.12.10 The Contractor shall not be required to provide professional services that constitute the practice of architecture or engineering unless such services are specifically required by the Contract Documents for a portion of the Work or unless the Contractor needs to provide such services in order to carry out the Contractor's responsibilities for construction means, methods, techniques, sequences and procedures. The Contractor shall not be required to provide professional services in violation of applicable law. If professional design services or certifications by a design professional related to systems, materials or equipment are specifically required of the Contractor by the Contract Documents, the Owner and the Architect will specify all performance and design criteria that such services must satisfy. The Contractor shall cause such services or certifications to be provided by a properly licensed design professional who shall comply with the reasonable requirements of the Owner regarding qualifications and insurance, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings and other submittals prepared by such professional. Shop Drawings and other submittals related to the Work designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to the Architect. The Owner, Contractor and the Architect shall be entitled to rely upon the adequacy, accuracy and completeness of the services, certifications and approvals performed or provided by such design professionals. Pursuant to this Section 3.12.10, the Architect will review, approve or take other appropriate action on submittals only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Contractor shall not be responsible for the adequacy of the performance and design criteria specified in the Contract Documents.

§ 3.13 USE OF SITE

§ 3.13.1 The Contractor shall confine operations at the site to areas permitted by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities and the Contract Documents and shall not unreasonably encumber the site with materials or equipment.

§ 3.13.2 Only materials and equipment that are to be used directly in the Work shall be brought to and stored on the Project site by the Contractor. After equipment is no longer required for the Work, it shall be promptly removed from the Project site. Protection of construction materials and equipment stored at the Project site from weather, theft, damage, and all other adversity is solely the responsibility of the Contractor. The Contractor shall ensure that the Work, at all times, is performed in a manner that affords reasonable access, both vehicular and pedestrian, to the site of the Work and all adjacent areas. The Work shall be performed, to the fullest extent reasonably possible, in such a manner that public areas adjacent to the site of the Work shall be free from all debris, building materials, and equipment likely to cause hazardous conditions.

§ 3.13.3 The Contractor and any entity for whom the Contractor is responsible shall not erect any sign on the Project site without the prior written consent of the Owner, which may be withheld in the sole discretion of the Owner.

§ 3.13.4 Without limitation of any other provision of the Contract Documents, the Contractor shall use best efforts to minimize any interference with the occupancy or beneficial use of (i) any areas and buildings adjacent to the site of the Work and (ii) the Building in the event of partial occupancy, as more specifically described in Section 9.9. Without prior approval of the Owner, the Contractor shall not permit any workers to use any existing facilities at the Project site, including, without limitation, lavatories, toilets, entrances, and parking areas other than those designated by the Owner.

.1 Without limitation of any other provision of the Contract Documents, the Contractor shall use its best efforts to comply with all rules and regulations promulgated by the Owner in connection with the use and occupancy of the Project site and the Building, as amended from time to time. The Contractor shall immediately notify the Owner in writing if during the performance of the Work, the Contractor finds compliance of any portion of such rules and regulations to be impracticable, setting forth the problems of such compliance and suggesting alternatives through which the same results intended by such portions of the rules and regulations can be achieved. The Owner may, in the Owner's sole discretion, adopt such suggestions, develop new alternatives, or require compliance with the existing requirements of the rules and regulations.

.2 The Contractor shall also comply with all insurance requirements and collective bargaining agreements applicable to use and occupancy of the Project site and the Building.

§ 3.14 CUTTING AND PATCHING

§ 3.14.1 The Contractor shall be responsible for cutting, fitting or patching required to complete the Work or to make its parts fit together properly. All areas requiring cutting, fitting and patching shall be restored to the condition existing prior to the cutting, fitting and patching, unless otherwise required by the Contract Documents.

§ 3.14.2 The Contractor shall not damage or endanger a portion of the Work or fully or partially completed construction of the Owner or separate contractors by cutting, patching or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter such construction by the Owner or a separate contractor except with written consent of the Owner and of such separate contractor; such consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold from the Owner or a separate contractor the Contractor's consent to cutting or otherwise altering the Work.

§ 3.15 CLEANING UP

§ 3.15.1 The Contractor shall keep the premises and surrounding area free from accumulation of waste materials or rubbish caused by operations under the Contract. At completion of the Work, the Contractor shall remove waste materials, rubbish, the Contractor's tools, construction equipment, machinery and surplus materials from and about the Project.

§ 3.15.2 If the Contractor fails to clean up as provided in the Contract Documents, the Owner may do so and Owner shall be entitled to reimbursement from the Contractor.

§ 3.16 ACCESS TO WORK

The Contractor shall provide the Owner and Architect access to the Work in preparation and progress wherever located.

§ 3.17 ROYALTIES, PATENTS AND COPYRIGHTS

The Contractor shall pay all royalties and license fees. The Contractor shall defend suits or claims for infringement of copyrights and patent rights and shall hold the Owner and Architect harmless from loss on account thereof, but shall not be responsible for such defense or loss when a particular design, process or product of a particular manufacturer or manufacturers is required by the Contract Documents, or where the copyright violations are contained in Drawings, Specifications or other documents prepared by the Owner or Architect. However, if the Contractor has reason to believe that the required design, process or product is an infringement of a copyright or a patent, the Contractor shall be responsible for such loss unless such information is promptly furnished to the Architect.

§ 3.18 INDEMNIFICATION

§ 3.18.1 To the fullest extent permitted by law the Contractor shall indemnify and hold harmless the Owner, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work, provided that such claim, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), including loss of use resulting therefrom, but only to the extent caused by the negligent acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity that would otherwise exist as to a party or person described in this Section 3.18.

§ 3.18.2 In claims against any person or entity indemnified under this Section 3.18 by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, the indemnification obligation under Section 3.18.1 shall not be limited by a limitation on amount or type of damages, compensation or benefits payable by or for the Contractor or a Subcontractor under workers' compensation acts, disability benefit acts or other employee benefit acts.

§ 3.18.3 The Contractor's indemnity obligations under this Section 3.18 shall also specifically include, without limitation, all fines, penalties, damages, liability, costs, expenses (including, without limitation, reasonable attorneys' fees), and punitive damages (if any) arising out of, or in connection with, any (i) violation of or failure to comply with any law, statute, ordinance, rule, regulation, code, or requirement of a public authority that bears upon the performance of the Work by the Contractor, a Subcontractor, or any person or entity for whom either is responsible, (ii) means, methods, procedures, techniques, or sequences of execution or performance of the Work, and (iii) failure to secure any pay for permits, fees, approvals, licenses, and inspections as required under the Contract Documents, or any violation of any permit or other approval of a public authority applicable to the Work, by the Contractor, a Subcontractor, or any person or entity for whom either is responsible.

§ 3.18.4 The Contractor shall indemnify and hold harmless the Owner, its members, managers, directors, officers, employees and agents (collectively, the "Indemnitees") from and against any costs and expenses (including reasonable attorneys' fees) incurred by any of the Indemnitees in enforcing any of the Contractor's defense, indemnity, and hold-harmless obligations under this Contract, and no member, ,manager, director, officer, employee or agent of the Owner shall be personally liable for any obligation or liability arising under the Contract Documents.

ARTICLE 4 ARCHITECT

§ 4.1 GENERAL

§ 4.1.1 The Owner shall retain an architect lawfully licensed to practice architecture or an entity lawfully practicing architecture in the jurisdiction where the Project is located. That person or entity is identified as the Architect in the Agreement and is referred to throughout the Contract Documents as if singular in number.

§ 4.1.2 Duties, responsibilities and limitations of authority of the Architect as set forth in the Contract Documents shall not be restricted, modified or extended without written consent of the Owner, Contractor and Architect.

§ 4.1.3 If the employment of the Architect is terminated, the Owner shall employ a successor architect as to whom the Contractor has no reasonable objection and whose status under the Contract Documents shall be that of the Architect.

§ 4.2 ADMINISTRATION OF THE CONTRACT

§ 4.2.1 The Architect will provide administration of the Contract as described in the Contract Documents and will be an Owner's representative during construction until the date the Architect issues the final Certificate for Payment. The Architect will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents.

§ 4.2.2 The Architect will visit the site to become substantially familiar with the progress and quality of the portion of the Work completed, and to determine in general if the Work observed is being performed in a manner indicating that the Work will be in accordance with the Contract Documents. However, the Architect will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. The Architect will not have control over, charge of, or responsibility for, the construction means, methods, techniques, sequences or procedures, or for the safety precautions and programs in connection with the Work, since these are solely the Contractor's rights and responsibilities under the Contract Documents, except as provided in Section 3.3.1.

§ 4.2.3 The Contractor will facilitate and the Architect will participate in weekly meetings with the Contractor and any appropriate consultants at the site to review and discuss progress and any issues. The Contractor will maintain record meeting notes of weekly meetings and will provide these notes to Architect and Owner for their review and comment. On the basis of the site visits, the Architect will keep the Owner reasonably informed about the progress and quality of the portion of the Work completed, and report to the Owner (1) deviations from the Contract Documents and from the most recent construction schedule submitted by the Contractor, and (2) defects and deficiencies in the Work. The Architect will not be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. The Architect will not have control over or charge of and will not be responsible for acts or omissions of the Contractor, Subcontractors, or their agents or employees, or any other persons or entities performing portions of the Work.

§ 4.2.4 COMMUNICATIONS FACILITATING CONTRACT ADMINISTRATION

Except as otherwise provided in the Contract Documents or when direct communications have been specially authorized, the Owner and Contractor shall endeavor to communicate with each other through the Architect about matters arising out of or relating to the Contract. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and material suppliers shall be through the Contractor. Communications by and with separate contractors shall be through the Owner.

§ 4.2.5 Based on the Architect's evaluations of the Contractor's Applications for Payment, the Architect will review and certify the amounts due the Contractor and will issue Certificates for Payment in such amounts.

§ 4.2.6 The Architect has authority to reject Work that does not conform to the Contract Documents. If the Architect knows of any Work that does not conform with the Contract Documents, the Architect will promptly notify the Contractor and the Owner in writing of such non-conforming work. Whenever the Architect considers it necessary or advisable, the Architect will have authority to require inspection or testing of the Work in accordance with Sections 13.5.2 and 13.5.3, whether or not such Work is fabricated, installed or completed. However, neither this authority of the Architect nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect to the Contractor, Subcontractors, material and equipment suppliers, their agents or employees, or other persons or entities performing portions of the Work.

§ 4.2.7 The Architect will review and approve, or take other appropriate action upon, the Contractor's submittals such as Shop Drawings, Product Data and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Architect's action will be taken in accordance with the approved submittal schedule or, in the absence of an approved submittal schedule, with reasonable promptness while allowing sufficient time in the Architect's professional judgment to permit adequate review. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Architect's review of the Contractor's submittals shall not relieve the Contractor of the obligations under Sections 3.3, 3.5 and 3.12. The Architect's review shall not constitute approval of safety precautions or, unless otherwise specifically stated by the Architect, of any construction means, methods, techniques, sequences or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

§ 4.2.8 The Architect will prepare Change Orders and Construction Change Directives, and may authorize minor changes in the Work as provided in Section 7.4. The Architect will investigate and make determinations and recommendations regarding concealed and unknown conditions as provided in Section 3.7.4.

§ 4.2.9 The Architect will conduct inspections to determine the date or dates of Substantial Completion and the date of final completion; issue Certificates of Substantial Completion pursuant to Section 9.8; receive and forward to the Owner, for the Owner's review and records, written warranties and related documents required by the Contract and assembled by the Contractor pursuant to Section 9.10; and issue a final Certificate for Payment pursuant to Section 9.10.

§ 4.2.10 If the Owner and Architect agree, the Architect will provide one or more project representatives to assist in carrying out the Architect's responsibilities at the site. The duties, responsibilities and limitations of authority of such project representatives shall be as set forth in an exhibit to be incorporated in the Contract Documents.

§ 4.2.11 The Architect will interpret and decide matters concerning performance under, and requirements of, the Contract Documents on written request of either the Owner or Contractor. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness.

§ 4.2.12 Interpretations and decisions of the Architect will be consistent with the requirements indicated in, and reasonably inferable from, the Contract Documents and will be in writing or in the form of drawings.

§ 4.2.13 The Architect's decisions on matters relating to aesthetic effect in connection with the administration of the Contract will be final if consistent with the intent expressed in the Contract Documents.

§ 4.2.14 The Architect will review and respond to requests for information about the Contract Documents. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness. If appropriate, the Architect will prepare and issue supplemental Drawings and Specifications in response to the requests for information.

ARTICLE 5 SUBCONTRACTORS

§ 5.1 DEFINITIONS

§ 5.1.1 A Subcontractor is a person or entity who has a direct contract with the Contractor to perform a portion of the Work at the site. The term "Subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Subcontractor or an authorized representative of the Subcontractor. The term "Subcontractor" does not include a separate contractor or subcontractors of a separate contractor.

§ 5.1.2 A Sub-subcontractor is a person or entity who has a direct or indirect contract with a Subcontractor to perform a portion of the Work at the site. The term "Sub-subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Sub-subcontractor or an authorized representative of the Sub-subcontractor.

§ 5.2 AWARD OF SUBCONTRACTS AND OTHER CONTRACTS FOR PORTIONS OF THE WORK

§ 5.2.1 Within 10 days after the date of the submittal of the GMP, the Contractor shall furnish in writing to the Owner through the Architect the names of persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for each principal portion of the Work. The Architect may reply within 5 days to the Contractor in writing stating (1) whether the Owner or the Architect has reasonable objection to any such proposed person or entity or (2) that the Architect requires additional time for review. Failure of the Owner or Architect to reply within the 5-day period shall constitute notice of no reasonable objection.

§ 5.2.2 The Contractor shall not contract with a proposed person or entity to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not be required to contract with anyone to whom the Contractor has made reasonable objection.

§ 5.2.3 If the Owner or Architect has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner or Architect has no reasonable objection. If the proposed but rejected Subcontractor was reasonably capable of performing the Work, the Contract Sum and Contract Time shall

be increased or decreased by the difference, if any, occasioned by such change, and an appropriate Change Order shall be issued before commencement of the substitute Subcontractor's Work. However, no increase in the Contract Sum or Contract Time shall be allowed for such change unless the Contractor has acted promptly and responsively in submitting names as required.

§ 5.2.4 The Contractor shall not substitute a Subcontractor, person or entity previously selected if the Owner or Architect makes reasonable objection to such substitution.

§ 5.3 SUBCONTRACTUAL RELATIONS

By appropriate agreement, written where legally required for validity, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities, including the responsibility for safety of the Subcontractor's Work, which the Contractor, by these Documents, assumes toward the Owner and Architect. Each subcontract agreement shall preserve and protect the rights of the Owner and Architect under the Contract Documents with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the subcontract agreement, the benefit of all rights, remedies and redress against the Contractor that the Contractor, by the Contract Documents, has against the Owner. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the subcontract agreement, copies of the Contract Documents to which the Subcontractor will be bound, and, upon written request of the Subcontractor, identify to the Subcontractor terms and conditions of the proposed subcontract agreement that may be at variance with the Contract Documents. Subcontractors will similarly make copies of applicable portions of such documents available to their respective proposed Sub-subcontractors. Also, the subcontract shall be in writing and shall specifically provide that the Owner is an intended third-party beneficiary of such subcontract.

§ 5.4 CONTINGENT ASSIGNMENT OF SUBCONTRACTS

§ 5.4.1 Each subcontract agreement for a portion of the Work is assigned by the Contractor to the Owner, provided that

.1 assignment is effective only after termination of the Contract by the Owner for cause pursuant to Section 14.2 and only for those subcontract agreements that the Owner accepts by notifying the Subcontractor and Contractor in writing; and

.2 assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Contract.

When the Owner accepts the assignment of a subcontract agreement, the Owner assumes the Contractor's rights and obligations under the subcontract.

§ 5.4.2 If the Work in connection with a subcontract has been suspended for more than thirty (30) days after termination of the Contract by the Owner pursuant to Section 14.2 and the Owner accepts assignment of such subcontract, the Subcontractor's compensation shall be equitably adjusted for any increase in direct costs incurred by such Subcontractor as a result of the suspension.

§ 5.4.3 Upon such assignment to the Owner under this Section 5.4, the Owner may further assign the subcontract to a successor contractor or other entity. If the Owner assigns the subcontract to a successor contractor or other entity, the Owner shall nevertheless remain legally responsible for all of the successor contractor's obligations under the subcontract.

§ 5.4.4 Each subcontract shall specifically provide that the Owner shall only be responsible to the Subcontractor for those obligations that accrue subsequent to the Owner's exercise of any rights under this conditional assignment.

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

§ 6.1 OWNER'S RIGHT TO PERFORM CONSTRUCTION AND TO AWARD SEPARATE CONTRACTS

§ 6.1.1 The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and to award separate contracts in connection with other portions of the Project or other construction or operations on the site under Conditions of the Contract identical or substantially similar to these including those

portions related to insurance and waiver of subrogation. If the Contractor claims that delay or additional cost is involved because of such action by the Owner, the Contractor shall make such Claim as provided in Article 15.

§ 6.1.2 When separate contracts are awarded for different portions of the Project or other construction or operations on the site, the term "Contractor" in the Contract Documents in each case shall mean the Contractor who executes each separate Owner-Contractor Agreement.

§ 6.1.3 The Owner shall provide for coordination of the activities of the Owner's own forces and of each separate contractor with the Work of the Contractor, who shall cooperate with them. The Contractor shall participate with other separate contractors and the Owner in reviewing their construction schedules. The Contractor shall make any revisions to the construction schedule deemed necessary after a joint review and mutual agreement. The construction schedules shall then constitute the schedules to be used by the Contractor, separate contractors and the Owner until subsequently revised.

§ 6.1.4 Unless otherwise provided in the Contract Documents, when the Owner performs construction or operations related to the Project with the Owner's own forces, the Owner shall be deemed to be subject to the same obligations and to have the same rights that apply to the Contractor under the Conditions of the Contract, including, without excluding others, those stated in Article 3, this Article 6 and Articles 10, 11 and 12.

§ 6.2 MUTUAL RESPONSIBILITY

§ 6.2.1 The Contractor shall afford the Owner and separate contractors reasonable opportunity for introduction and storage of their materials and equipment and performance of their activities, and shall connect and coordinate the Contractor's construction and operations with theirs as required by the Contract Documents.

§ 6.2.2 If part of the Contractor's Work depends for proper execution or results upon construction or operations by the Owner or a separate contractor, the Contractor shall, prior to proceeding with that portion of the Work, promptly report to the Architect apparent discrepancies or defects in such other construction that would render it unsuitable for such proper execution and results. Failure of the Contractor so to report shall constitute an acknowledgment that the Owner's or separate contractor's completed or partially completed construction is fit and proper to receive the Contractor's Work, except as to defects not then reasonably discoverable.

§ 6.2.3 The Contractor shall reimburse the Owner for costs the Owner incurs that are payable to a separate contractor because of the Contractor's delays, negligence, lack of oversight, inattention to detail, breach of the Contract Documents, improperly timed activities or defective construction. The Owner shall be responsible to the Contractor for costs the Contractor incurs because of a separate contractor's delays, improperly timed activities, damage to the Work or defective construction.

§ 6.2.4 The Contractor shall promptly remedy damage the Contractor wrongfully causes to completed or partially completed construction or to property of the Owner or separate contractors as provided in Section 10.2.5.

§ 6.2.5 The Owner and each separate contractor shall have the same responsibilities for cutting and patching as are described for the Contractor in Section 3.14.

§ 6.3 OWNER'S RIGHT TO CLEAN UP

If a dispute arises among the Contractor, separate contractors and the Owner as to the responsibility under their respective contracts for maintaining the premises and surrounding area free from waste materials and rubbish, the Owner may clean up and the Architect will allocate the cost among those responsible.

ARTICLE 7 CHANGES IN THE WORK

§ 7.1 GENERAL

§ 7.1.1 Changes in the Work may be accomplished after execution of the Contract, and without invalidating the Contract, by Change Order, Construction Change Directive or order for a minor change in the Work, subject to the limitations stated in this Article 7 and elsewhere in the Contract Documents.

§ 7.1.2 A Change Order shall be based upon agreement among the Owner, Contractor and Architect; a Construction Change Directive requires agreement by the Owner and Architect and may or may not be agreed to by the Contractor; an order for a minor change in the Work may be issued by the Architect alone.

§ 7.1.3 Changes in the Work shall be performed under applicable provisions of the Contract Documents, and the Contractor shall proceed promptly, unless otherwise provided in the Change Order, Construction Change Directive or order for a minor change in the Work. Except as permitted in Section 7.3 and Section 9.7.2, a change in the Contract Sum or the Contract Time shall be accomplished only by Change Order. Accordingly, no course of conduct or dealings between the parties, nor express or implied acceptance of alterations or additions to the Work, and no claim that Owner has been unjustly enriched by any alteration of or addition to the Work, whether or not there is, in fact, any unjust enrichment to the Work, shall be the basis of any claim to an increase in any amounts due under the Contract Documents or a change in any time period provided for in the Contract Documents.

§ 7.2 CHANGE ORDERS

§ 7.2.1 A Change Order is a written instrument prepared by the Architect and signed by the Owner, Contractor and Architect stating their agreement upon all of the following:

.1 The change in the Work;
.2 The amount of the adjustment, if any, in the Contract Sum; and
.3 The extent of the adjustment, if any, in the Contract Time.

§ 7.2.2 Agreement on any Change Order shall constitute a final settlement of all matters relating to the change in the Work that is the subject of the Change Order, including, but not limited to, all direct and indirect costs and consequential damages associated with such change and any and all adjustments to the Contract Sum and the Contract Time/construction schedule.

§ 7.3 CONSTRUCTION CHANGE DIRECTIVES

§ 7.3.1 A Construction Change Directive is a written order prepared by the Architect and signed by the Owner and Architect, directing a change in the Work prior to agreement on adjustment, if any, in the Contract Sum or Contract Time, or both. The Owner may by Construction Change Directive, without invalidating the Contract, order changes in the Work within the general scope of the Contract consisting of additions, deletions or other revisions, the Contract Sum and Contract Time being adjusted accordingly.

§ 7.3.2 A Construction Change Directive shall be used in the absence of total agreement on the terms of a Change Order.

§ 7.3.3 If the Construction Change Directive provides for an adjustment to the Contract Sum, the adjustment shall be based on one of the following methods:

.1 Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;
.2 Unit prices stated in the Contract Documents or subsequently agreed upon;
.3 Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or
.4 As provided in Section 7.3.7.

§ 7.3.4 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are materially changed in a proposed Change Order or Construction Change Directive so that application of such unit prices to quantities of Work proposed will cause substantial inequity to the Owner or Contractor, the applicable unit prices shall be equitably adjusted.

§ 7.3.5 Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with the change in the Work involved and advise the Architect of the Contractor's agreement or disagreement with the method, if any, provided in the Construction Change Directive for determining the proposed adjustment in the Contract Sum or Contract Time.

§ 7.3.6 A Construction Change Directive signed by the Contractor indicates the Contractor's agreement therewith, including adjustment in Contract Sum and Contract Time or the method for determining them. Such agreement shall be effective immediately and shall be recorded as a Change Order.

§ 7.3.7 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Architect shall determine the method and the adjustment on the basis of reasonable expenditures and savings of

those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, an amount for overhead and profit as set forth in the Agreement, or if no such amount is set forth in the Agreement, a reasonable amount. In such case, and also under Section 7.3.3.3, the Contractor shall keep and present, in such form as the Architect may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.3.7 shall be limited to the following:

.1 Costs of labor, including social security, old age and unemployment insurance, fringe benefits required by agreement or custom, and workers' compensation insurance;

.2 Costs of materials, supplies and equipment, including cost of transportation, whether incorporated or consumed;

.3 Rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others, at the rates established in the Contract Documents;

.4 Costs of premiums for all bonds and insurance, permit fees, and sales, use or similar taxes related to the Work; and

.5 Additional costs of supervision and field office personnel directly attributable to the change.

§ 7.3.8 The amount of credit to be allowed by the Contractor to the Owner for a deletion or change that results in a net decrease in the Contract Sum shall be actual net cost as confirmed by the Architect. When both additions and credits covering related Work or substitutions are involved in a change, the allowance for overhead and profit shall be figured on the basis of net increase, if any, with respect to that change.

§ 7.3.9 Pending final determination of the total cost of a Construction Change Directive to the Owner, the Contractor may request payment for Work completed under the Construction Change Directive in Applications for Payment. The Architect will make an interim determination for purposes of monthly certification for payment for those costs and certify for payment the amount that the Architect determines, in the Architect's professional judgment, to be reasonably justified. The Architect's interim determination of cost shall adjust the Contract Sum on the same basis as a Change Order, subject to the right of either party to disagree and assert a Claim in accordance with Article 15.

§ 7.3.10 When the Owner and Contractor agree with a determination made by the Architect concerning the adjustments in the Contract Sum and Contract Time, or otherwise reach agreement upon the adjustments, such agreement shall be effective immediately and the Architect will prepare a Change Order. Change Orders may be issued for all or any part of a Construction Change Directive.

§ 7.4 MINOR CHANGES IN THE WORK

The Architect has authority to order minor changes in the Work not involving adjustment in the Contract Sum or extension of the Contract Time and not inconsistent with the intent of the Contract Documents. Such changes will be effected by written order signed by the Architect and shall be binding on the Owner and Contractor.

ARTICLE 8 TIME

§ 8.1 DEFINITIONS

§ 8.1.1 Unless otherwise provided, Contract Time is the period of time, including authorized adjustments, allotted in the Contract Documents for Substantial Completion of the Work.

§ 8.1.2 The date of commencement of the Work is the date established in the Agreement.

§ 8.1.3 The date of Substantial Completion is the date certified by the Architect in accordance with Section 9.8.

§ 8.1.4 The term "day" as used in the Contract Documents shall mean calendar day unless otherwise specifically defined.

§ 8.2 PROGRESS AND COMPLETION

§ 8.2.1 Time limits stated in the Contract Documents are of the essence of the Contract. By executing the Agreement the Contractor confirms that the Contract Time is a reasonable period for performing the Work.

§ 8.2.2 The Contractor shall not knowingly, except by agreement or instruction of the Owner in writing, prematurely commence operations on the site or elsewhere prior to the effective date of insurance required by Article 11 to be furnished by the Contractor and Owner. The date of commencement of the Work shall not be changed by the effective date of such insurance.

§ 8.2.3 The Contractor shall proceed expeditiously with adequate forces and shall achieve Substantial Completion within the Contract Time.

§ 8.3 DELAYS AND EXTENSIONS OF TIME

§ 8.3.1 If the Contractor is delayed at any time in the commencement or progress of the Work by an act or neglect of the Owner or Architect, or of an employee of either, or of a separate contractor employed by the Owner; or by changes ordered in the Work; or by labor disputes, fire, unusual delay in deliveries, unavoidable casualties or other causes beyond the Contractor's control; or by delay authorized by the Owner pending mediation and arbitration; or by other causes that the Architect determines may justify delay, then the Contract Time shall be extended by Change Order to the extent such actual, direct delay will prevent the Contractor from achieving Substantial Completion within the Contract Time and if the performance of the Work is not, was not, or would not have been delayed by any other cause for which the Contractor is not entitled to an extension in the Contract Time under the Contract Documents. The Contractor further acknowledges and agrees that adjustments in the Contract Time will be permitted for a delay only to the extent such delay (i) is not caused, or could not have been anticipated, by the Contractor, (ii) could not be limited or avoided by the Contractor's timely notice to the Owner of the delay or reasonable likelihood that a delay will occur, and (iii) is of a duration not less than one (1) day. For clarity, any extension will be net of any delays caused by or due to the fault or negligence of the Contractor and will also be net of any contingency or "float" time allowance included in the Project Schedule.

§ 8.3.2 Claims relating to time shall be made in accordance with applicable provisions of Article 15.

§ 8.3.3 This Section 8.3 does not preclude recovery of damages for delay by either party under other provisions of the Contract Documents.

§ 8.3.4 The Contractor shall not in any event be entitled to damages arising out of actual or alleged loss of efficiency; morale, fatigue, attitude, or labor rhythm; constructive acceleration; home office overhead; expectant under-run; trade stacking; reassignment of workers; concurrent operations; dilution of supervision; learning curve; beneficial or joint occupancy; logistics ripple; season change; extended overhead; profit upon damages for delay; impact damages; or similar damages.

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 CONTRACT SUM

The Contract Sum is stated in the Agreement and, including authorized adjustments, is the total amount payable by the Owner to the Contractor for performance of the Work under the Contract Documents.

§ 9.2 SCHEDULE OF VALUES

Where the Contract is based on a stipulated sum or Guaranteed Maximum Price, the Contractor shall submit to the Architect, within ten (10) days of the execution of GMP amendment to this Agreement, a schedule of values allocating the entire Contract Sum to the various portions of the Work and prepared in such form and supported by such data to substantiate its accuracy as the Architect may require. This schedule, unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment.

§ 9.3 APPLICATIONS FOR PAYMENT

§ 9.3.1 At least ten days before the date established for each progress payment, the Contractor shall submit to the Architect an itemized Application for Payment prepared in accordance with the schedule of values, if required under Section 9.2, for completed portions of the Work. Such application shall be notarized, if required, and supported by such data substantiating the Contractor's right to payment as the Owner or Architect may require, such as copies of requisitions from Subcontractors and material suppliers, and shall reflect retainage if provided for in the Contract Documents.

§ 9.3.1.1 As provided in Section 7.3.9, such applications may include requests for payment on account of changes in the Work that have been properly authorized by Construction Change Directives, or by interim determinations of the Architect, but not yet included in Change Orders.

§ 9.3.1.2 Applications for Payment shall not include requests for payment for portions of the Work for which the Contractor does not intend to pay a Subcontractor or material supplier, unless such Work has been performed by others whom the Contractor intends to pay.

§ 9.3.1.3 Each Application for Payment shall be accompanied by the following, all in form and substance satisfactory to the Owner: (i) a current Contractor's lien waiver and duly executed and acknowledged sworn statement showing all Subcontractors and material suppliers with whom the Contractor has entered into subcontracts, the amount of each such subcontract, the amount requested for any Subcontractor and material supplier in the requested progress payment, and the amount to be paid to the Contractor for such progress payment, together with similar sworn statements from all such Subcontractors and material suppliers; (ii) duly executed waivers of mechanics' and material suppliers' liens from all Subcontractors and, when appropriate, from material suppliers and lower tier Subcontractors establishing payment or satisfaction of payment of all amounts requested by the Contractor on behalf of such entities or persons in any previous Application for Payment; and (iii) all information and materials required to comply with the requirements of the Contract Documents or reasonably requested by the Owner or the Architect.

§ 9.3.2 Unless otherwise provided in the Contract Documents, payments shall be made on account of materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work. If approved in advance by the Owner, payment may similarly be made for materials and equipment suitably stored off the site at a location agreed upon in writing. Payment for materials and equipment stored on or off the site shall be conditioned upon compliance by the Contractor with procedures satisfactory to the Owner to establish the Owner's title to such materials and equipment or otherwise protect the Owner's interest, and shall include the costs of applicable insurance, storage and transportation to the site for such materials and equipment stored off the site.

§ 9.3.3 The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment all Work for which Certificates for Payment have been previously issued and payments received from the Owner shall, to the best of the Contractor's knowledge, information and belief, be free and clear of liens, claims, security interests or encumbrances in favor of the Contractor, Subcontractors, material suppliers, or other persons or entities making a claim by reason of having provided labor, materials and equipment relating to the Work. The Owner reserves the right to settle any disputed mechanic's or material supplier's lien claim by payments to the lien claimant or by such other means as the Owner, in the Owner's sole discretion, determines is the most economical or advantageous method of settling the dispute. The Contractor shall promptly reimburse the Owner, upon demand, for any payments so made.

§ 9.4 CERTIFICATES FOR PAYMENT

§ 9.4.1 The Architect will, within seven days after receipt of the Contractor's Application for Payment, either issue to the Owner a Certificate for Payment, with a copy to the Contractor, for such amount as the Architect determines is properly due, or notify the Contractor and Owner in writing of the Architect's reasons for withholding certification in whole or in part as provided in Section 9.5.1.

§ 9.4.2 The issuance of a Certificate for Payment will constitute a representation by the Architect to the Owner, based on the Architect's evaluation of the Work and the data comprising the Application for Payment, that, to the best of the Architect's knowledge, information and belief, the Work has progressed to the point indicated and that the quality of the Work is in accordance with the Contract Documents. The foregoing representations are subject to an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion, to results of subsequent tests and inspections, to correction of minor deviations from the Contract Documents prior to completion and to specific qualifications expressed by the Architect. The issuance of a Certificate for Payment will further constitute a representation that the Contractor is entitled to payment in the amount certified. However, the issuance of a Certificate for Payment will not be a representation that the Architect has (1) made exhaustive or continuous on-site inspections to check the quality or quantity of the Work, (2) reviewed construction means, methods, techniques, sequences or procedures, (3) reviewed copies of requisitions received from Subcontractors and material suppliers and other data requested by the Owner to substantiate the Contractor's right to payment, or (4) made examination to ascertain how or for what purpose the Contractor has used money previously paid on account of the Contract Sum.

§ 9.5 DECISIONS TO WITHHOLD CERTIFICATION

§ 9.5.1 The Architect may withhold a Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Architect's opinion the representations to the Owner required by Section 9.4.2 cannot

be made. If the Architect is unable to certify payment in the amount of the Application, the Architect will notify the Contractor and Owner as provided in Section 9.4.1. If the Contractor and Architect cannot agree on a revised amount, the Architect will promptly issue a Certificate for Payment for the amount for which the Architect is able to make such representations to the Owner. The Architect may also withhold a Certificate for Payment or, because of subsequently discovered evidence, may nullify the whole or a part of a Certificate for Payment previously issued, to such extent as may be necessary in the Architect's opinion to protect the Owner from loss for which the Contractor is responsible, including loss resulting from acts and omissions described in Section 3.3.2, because of

- **.1** defective Work not remedied;
- **.2** third party claims filed or reasonable evidence indicating probable filing of such claims unless security acceptable to the Owner is provided by the Contractor;
- **.3** failure of the Contractor to make payments properly to Subcontractors or for labor, materials or equipment;
- **.4** reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;
- **.5** damage to the Owner or a separate contractor;
- **.6** reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay; or
- **.7** repeated failure to carry out the Work in accordance with the Contract Documents.

§ 9.5.2 When the above reasons for withholding certification are removed, certification will be made for amounts previously withheld.

§ 9.5.3 If the Architect withholds certification for payment under Section 9.5.1.3, the Owner may, at its sole option, issue joint checks to the Contractor and to any Subcontractor or material or equipment suppliers to whom the Contractor failed to make payment for Work properly performed or material or equipment suitably delivered. If the Owner makes payments by joint check, the Owner shall notify the Architect and the Architect will reflect such payment on the next Certificate for Payment.

§ 9.5.4 If the Contractor disputes any determination by the Architect with regard to any Certificate of Payment, the Contractor nevertheless shall expeditiously continue the Work.

§ 9.6 PROGRESS PAYMENTS

§ 9.6.1 After the Architect has issued a Certificate for Payment, the Owner shall make payment in the manner and within the time provided in the Contract Documents, and shall so notify the Architect.

§ 9.6.2 The Contractor shall pay each Subcontractor no later than seven days after receipt of payment from the Owner the amount to which the Subcontractor is entitled, reflecting percentages actually retained from payments to the Contractor on account of the Subcontractor's portion of the Work. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to Sub-subcontractors in a similar manner.

§ 9.6.3 The Architect will, on request, furnish to a Subcontractor, if practicable, information regarding percentages of completion or amounts applied for by the Contractor and action taken thereon by the Architect and Owner on account of portions of the Work done by such Subcontractor.

§ 9.6.4 The Owner has the right to request written evidence from the Contractor that the Contractor has properly paid Subcontractors and material and equipment suppliers amounts paid by the Owner to the Contractor for subcontracted Work. If the Contractor fails to furnish such evidence within seven days, the Owner shall have the right to contact Subcontractors to ascertain whether they have been properly paid. Neither the Owner nor Architect shall have an obligation to pay or to see to the payment of money to a Subcontractor, except as may otherwise be required by law.

§ 9.6.5 Contractor payments to material and equipment suppliers shall be treated in a manner similar to that provided in Sections 9.6.2, 9.6.3 and 9.6.4.

§ 9.6.6 A Certificate for Payment, a progress payment, or partial or entire use or occupancy of the Project by the Owner shall not constitute acceptance of Work not in accordance with the Contract Documents.

§ 9.6.7 Unless the Contractor provides the Owner with a payment bond in the full penal sum of the Contract Sum, payments received by the Contractor for Work properly performed by Subcontractors and suppliers shall be held by the Contractor for those Subcontractors or suppliers who performed Work or furnished materials, or both, under contract with the Contractor for which payment was made by the Owner. Nothing contained herein shall require money to be placed in a separate account and not commingled with money of the Contractor, shall create any fiduciary liability or tort liability on the part of the Contractor for breach of trust or shall entitle any person or entity to an award of punitive damages against the Contractor for breach of the requirements of this provision.

§ 9.7 FAILURE OF PAYMENT

§ 9.7.1 If the Architect does not issue a Certificate for Payment, through no fault of the Contractor, within seven days after receipt of the Contractor's Application for Payment, or if the Owner does not pay the Contractor within seven days after the date established in the Contract Documents the amount certified by the Architect or awarded by binding dispute resolution, then the Contractor may, upon seven additional days' written notice to the Owner and Architect, stop the Work until payment of the amount owing has been received. The Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shut-down, delay and start-up, plus interest as provided for in the Contract Documents. Notwithstanding the foregoing, failure of payment does not exist under Section 9.7.1 if the Owner exercises authority granted by the Contract documents to withhold payment notwithstanding certification by the Architect.

§ 9.7.2 If the Owner is entitled to reimbursement or payment from the Contractor under or pursuant to the Contract Documents, such payment shall be made promptly upon demand by the Owner. Notwithstanding anything contained in the Contract Documents to the contrary, if the Contractor fails to promptly make any payment due the Owner, or if the Owner incurs any costs and expenses to cure any default of the Contractor or to correct defective Work, the Owner shall have an absolute right to offset such amount against the Contract Sum and may, in the Owner's sole discretion, elect either to (i) deduct an amount equal to that which the Owner is entitled from any payment then or thereafter due the Contractor from the Owner, or (ii) issue a written notice to the Contractor reducing the Contract Sum by an amount equal to that which the Owner is entitled.

§ 9.8 SUBSTANTIAL COMPLETION

§ 9.8.1 Substantial Completion is the stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use; provided, however, that as a condition precedent to Substantial Completion, the Owner has received all certificates of occupancy and any other permits, approvals, licenses, and other documents from any governmental authority having jurisdiction thereof necessary for the beneficial occupancy of the Project.

§ 9.8.2 When the Contractor considers that the Work, or a portion thereof which the Owner agrees to accept separately, is substantially complete, the Contractor shall prepare and submit to the Architect a comprehensive list of items to be completed or corrected prior to final payment. Failure to include an item on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

§ 9.8.3 Upon receipt of the Contractor's list, the Architect will make an inspection to determine whether the Work or designated portion thereof is substantially complete. If the Architect's inspection discloses any item, whether or not included on the Contractor's list, which is not sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work or designated portion thereof for its intended use, the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item upon notification by the Architect. In such case, the Contractor shall then submit a request for another inspection by the Architect to determine Substantial Completion.

§ 9.8.4 When the Work or designated portion thereof is substantially complete, the Architect will prepare a Certificate of Substantial Completion that shall establish the date of Substantial Completion, shall establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance, and shall fix the time within which the Contractor shall finish all items on the list accompanying the Certificate. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion.

§ 9.8.5 The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of responsibilities assigned to them in such Certificate. Upon such acceptance and consent of surety, if

any, the Owner shall make payment of retainage applying to such Work or designated portion thereof. Such payment shall be adjusted for Work that is incomplete or not in accordance with the requirements of the Contract Documents.

§ 9.9 PARTIAL OCCUPANCY OR USE

§ 9.9.1 The Owner may occupy or use any completed or partially completed portion of the Work at any stage when such portion is designated by separate agreement with the Contractor, provided such occupancy or use is consented to by the insurer as required under Section 11.3.1.5 and authorized by public authorities having jurisdiction over the Project. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage, if any, security, maintenance, heat, utilities, damage to the Work and insurance, and have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents. When the Contractor considers a portion substantially complete, the Contractor shall prepare and submit a list to the Architect as provided under Section 9.8.2. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld. The stage of the progress of the Work shall be determined by written agreement between the Owner and Contractor or, if no agreement is reached, by decision of the Architect.

§ 9.9.2 Immediately prior to such partial occupancy or use, the Owner, Contractor and Architect shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work.

§ 9.9.3 Unless otherwise agreed upon, partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents.

§ 9.10 FINAL COMPLETION AND FINAL PAYMENT

§ 9.10.1 Upon receipt of the Contractor's written notice that the Work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Architect will promptly make such inspection and, when the Architect finds the Work acceptable under the Contract Documents and the Contract fully performed, the Architect will promptly issue a final Certificate for Payment stating that to the best of the Architect's knowledge, information and belief, and on the basis of the Architect's on-site visits and inspections, the Work has been completed in accordance with terms and conditions of the Contract Documents and that the entire balance found to be due the Contractor and noted in the final Certificate is due and payable. The Architect's final Certificate for Payment will constitute a further representation that conditions listed in Section 9.10.2 as precedent to the Contractor's being entitled to final payment have been fulfilled.

§ 9.10.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect (1) an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect, (3) a written statement that the Contractor knows of no substantial reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) consent of surety, if any, to final payment, (5) three (3) bound volumes of all guarantees and warranties on material furnished by all manufacturers and suppliers to the Contractor and all its Subcontractors, with duly executed instruments properly assigning the guarantees and warranties to the Owner, which guarantees and warranties in each bound volume shall be grouped together by trade and properly indexed, and (6), if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts, releases and waivers of liens, claims, security interests or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner. If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against such lien. If such lien remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging such lien, including all costs and reasonable attorneys' fees.

§ 9.10.3 If, after Substantial Completion of the Work, final completion thereof is materially delayed through no fault of the Contractor or by issuance of Change Orders affecting final completion, and the Architect so confirms, the Owner shall, upon application by the Contractor and certification by the Architect, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance for Work not fully completed or corrected is less than retainage stipulated in the Contract Documents, and if bonds have been furnished, the written consent of surety to payment of the balance due for that

portion of the Work fully completed and accepted shall be submitted by the Contractor to the Architect prior to certification of such payment. Such payment shall be made under terms and conditions governing final payment, except that it shall not constitute a waiver of claims.

§ 9.10.4 The making of final payment shall constitute a waiver of Claims by the Owner except those arising from

- **.1** liens, Claims, security interests or encumbrances arising out of the Contract and unsettled;
- **.2** failure of the Work to comply with the requirements of the Contract Documents; or
- **.3** terms of special warranties required by the Contract Documents.

§ 9.10.5 Acceptance of final payment by the Contractor, a Subcontractor or material supplier shall constitute a waiver of claims by that payee except those previously made in writing and identified by that payee as unsettled at the time of final Application for Payment.

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.1 SAFETY PRECAUTIONS AND PROGRAMS

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

§ 10.2 SAFETY OF PERSONS AND PROPERTY

§ 10.2.1 The Contractor shall take reasonable precautions for safety of, and shall provide reasonable protection to prevent damage, injury or loss to

- **.1** employees on the Work and other persons who may be affected thereby;
- **.2** the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody or control of the Contractor or the Contractor's Subcontractors or Sub-subcontractors; and
- **.3** other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures and utilities not designated for removal, relocation or replacement in the course of construction.

§ 10.2.2 The Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities bearing on safety of persons or property or their protection from damage, injury or loss.

§ 10.2.3 The Contractor shall erect and maintain, as required by existing conditions and performance of the Contract, reasonable safeguards for safety and protection, including installing fencing, posting danger signs and other warnings against hazards, promulgating safety regulations and notifying owners and users of adjacent sites and utilities. The Contractor shall also be responsible, at the Contractor's sole cost and expense, for all measures necessary to protect any property or improvements within or adjacent to the Project. Any damage to such property or improvements shall be promptly repaired by the Contractor.

§ 10.2.4 When use or storage of explosives or other hazardous materials or equipment or unusual methods are necessary for execution of the Work, the Contractor shall exercise utmost care and carry on such activities under supervision of properly qualified personnel.

§ 10.2.5 The Contractor shall promptly remedy damage and loss (other than damage or loss insured under property insurance required by the Contract Documents) to property referred to in Sections 10.2.1.2 and 10.2.1.3 caused in whole or in part by the Contractor, a Subcontractor, a Sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible under Sections 10.2.1.2 and 10.2.1.3, except damage or loss attributable to acts or omissions of the Owner or Architect or anyone directly or indirectly employed by either of them, or by anyone for whose acts either of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under Section 3.18.

§ 10.2.6 The Contractor shall designate a responsible member of the Contractor's organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the Owner and Architect.

§ 10.2.7 The Contractor shall not permit any part of the construction or site to be loaded so as to cause damage or create an unsafe condition.

§ 10.2.8 INJURY OR DAMAGE TO PERSON OR PROPERTY

If either party suffers injury or damage to person or property because of an act or omission of the other party, or of others for whose acts such party is legally responsible, written notice of such injury or damage, whether or not insured, shall be given to the other party within a reasonable time not exceeding 21 days after discovery. The notice shall provide sufficient detail to enable the other party to investigate the matter.

§ 10.2.9 Without limiting any other requirement of this Section 10.2, the Contractor shall, at its sole cost and expense, promptly repair any unintended damage or disturbance to walls, utilities, sidewalks, curbs, and the property of third parties (including utility companies and governments) resulting from the performance of the Work, whether caused by the Contractor or by its Subcontractors at any tier. The Contractor shall maintain streets in good repair and traversable condition.

§ 10.3 HAZARDOUS MATERIALS

§ 10.3.1 The Contractor is responsible for compliance with any requirements included in the Contract Documents regarding hazardous materials. If the Contractor encounters a hazardous material or substance not addressed in the Contract Documents and if reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons resulting from such hazardous material or substance, including but not limited to asbestos or polychlorinated biphenyl (PCB), encountered on the site by the Contractor, the Contractor shall, upon recognizing the condition, immediately stop Work in the affected area and report the condition to the Owner and Architect in writing.

§ 10.3.2 Upon receipt of the Contractor's written notice, the Owner shall obtain the services of a licensed laboratory to verify the presence or absence of the material or substance reported by the Contractor and, in the event such material or substance is found to be present, to cause it to be rendered harmless. Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor and Architect the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of such material or substance or who are to perform the task of removal or safe containment of such material or substance. The Contractor and the Architect will promptly reply to the Owner in writing stating whether or not either has reasonable objection to the persons or entities proposed by the Owner. If either the Contractor or Architect has an objection to a person or entity proposed by the Owner, the Owner shall propose another to whom the Contractor and the Architect have no reasonable objection. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor. By Change Order, the Contract Time shall be extended appropriately and the Contract Sum shall be increased in the amount of the Contractor's reasonable additional costs of shut-down, delay and start-up.

§ 10.3.3 To the fullest extent permitted by law, the Owner shall indemnify and hold harmless the Contractor, Subcontractors, Architect, Architect's consultants and agents and employees of any of them from and against claims, damages, losses and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work in the affected area if in fact the material or substance presents the risk of bodily injury or death as described in Section 10.3.1 and has not been rendered harmless due to the negligence of the Owner, provided that such claim, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), except to the extent that such damage, loss or expense is due to the fault or negligence of the party seeking indemnity.

§ 10.3.4 The Owner shall not be responsible under this Section 10.3 for materials or substances the Contractor brings to the site unless such materials or substances are required by the Contract Documents. The Owner shall be responsible for materials or substances required by the Contract Documents, except to the extent of the Contractor's fault or negligence in the use and handling of such materials or substances.

§ 10.3.5 The Contractor shall indemnify the Owner for the cost and expense the Owner incurs (1) for remediation of a material or substance the Contractor brings to the site and negligently handles, or (2) where the Contractor fails to perform its obligations under Section 10.3.1, except to the extent that the cost and expense are due to the Owner's fault or negligence.

§ 10.3.6 If, without negligence on the part of the Contractor, the Contractor is held liable by a government agency for the cost of remediation of a hazardous material or substance solely by reason of performing Work as required by the Contract Documents, the Owner shall indemnify the Contractor for all cost and expense thereby incurred.

§ 10.4 EMERGENCIES

In an emergency affecting safety of persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury or loss. Additional compensation or extension of time claimed by the Contractor on account of an emergency shall be determined as provided in Article 15 and Article 7.

ARTICLE 11 INSURANCE AND BONDS

§ 11.1 CONTRACTOR'S LIABILITY INSURANCE

§ 11.1.1 The Contractor shall purchase from and maintain in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located such insurance as will protect the Contractor from claims set forth below which may arise out of or result from the Contractor's operations and completed operations under the Contract and for which the Contractor may be legally liable, whether such operations be by the Contractor or by a Subcontractor or by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable:

- **.1** Claims under workers' compensation, disability benefit and other similar employee benefit acts that are applicable to the Work to be performed;
- **.2** Claims for damages because of bodily injury, occupational sickness or disease, or death of the Contractor's employees;
- **.3** Claims for damages because of bodily injury, sickness or disease, or death of any person other than the Contractor's employees;
- **.4** Claims for damages insured by usual personal injury liability coverage;
- **.5** Claims for damages, other than to the Work itself, because of injury to or destruction of tangible property, including loss of use resulting therefrom;
- **.6** Claims for damages because of bodily injury, death of a person or property damage arising out of ownership, maintenance or use of a motor vehicle;
- **.7** Claims for bodily injury or property damage arising out of completed operations, which coverage shall be maintained for no less than four (4) years after final payment; and
- **.8** Claims involving contractual liability insurance applicable to the Contractor's obligations under Section 3.18.

§ 11.1.2 The insurance required by Section 11.1.1 shall be written for not less than limits of liability specified in the Contract Documents or required by law, whichever coverage is greater. Coverages, whether written on an occurrence or claims-made basis, shall be maintained without interruption from the date of commencement of the Work until the date of final payment and termination of any coverage required to be maintained after final payment, and, with respect to the Contractor's completed operations coverage, until the expiration of the period for correction of Work or for such other period for maintenance of completed operations coverage as specified in the Contract Documents.

§ 11.1.3

§ 11.1.3.1 The Contractor hereby agrees to deliver to the Owner, within ten (10) days of the date of the Owner-Contractor Agreement and prior to bringing any equipment or personnel onto the site of the Work or the Project site, certified copies of all insurance policies procured by the Contractor under or pursuant to this Section 11.1 or, with consent of the Owner, Certificates of Insurance in form and substance satisfactory to the Owner evidencing the required coverages with limits not less than those specified in Article 8 of the Agreement. The coverage afforded under any insurance policy obtained under or pursuant to this Section 11.1 shall be primary to any valid and collectible insurance carried separately by any of the Indemnitees. The Contractor shall provide written notification to the Owner of the cancellation or expiration of any insurance required by Section 11.1. The Contractor shall provide such written notice within five (5) business days of the date the Contractor is first aware of the cancellation or expiration, or is first aware that the cancellation or expiration is threatened or otherwise may occur, whichever comes first.

§ 11.1.3.2 In no event shall any failure of the Owner to receive certified copies or certificates of policies required under Section 11.1 or to demand receipt of such certified copies or certificates prior to the Contractor's commencing the Work be construed as a waiver by the Owner or the Architect of the Contractor's obligations to obtain insurance

pursuant to this Article 11. The obligation to procure and maintain any insurance required by this Article 11 is a separate responsibility of the Contractor and independent of the duty to furnish a certified copy or certificate of such insurance policies.

§ 11.1.3.3 If the Contractor fails to purchase and maintain, or require to be purchased and maintained, any insurance required under this Section 11.1, the Owner may, but shall not be obligated to, upon five (5) days' written notice to the Contractor, purchase such insurance on behalf of the Contractor and shall be entitled to be reimbursed by the Contractor upon demand.

§ 11.1.3.4 When any required insurance, due to the attainment of a normal expiration date or renewal date, shall expire, the Contractor shall supply the Owner with Certificates of Insurance and amendatory riders or endorsements that clearly evidence the continuation of all coverage in the same manner, limits of protection, and scope of coverage as was provided by the previous policy. In the event any renewal or replacement policy, for whatever reason obtained or required, is written by a carrier other than that with whom the coverage was previously placed, or the subsequent policy differs in any way from the previous policy, the Contractor shall also furnish the Owner with a certified copy of the renewal or replacement policy unless the Owner provides the Contractor with prior written consent to submit only a Certificate of Insurance for any such policy. All renewal and replacement policies shall be in form and substance satisfactory to the Owner and written by carriers acceptable to the Owner.

§ 11.1.3.5 Any aggregate limit under the Contractor's liability insurance shall, by endorsement, apply to this Project separately.

§ 11.1.4 The Contractor shall cause the commercial liability coverage required by the Contract Documents to include (1) the Owner, the Architect and the Architect's consultants as additional insureds for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's operations; and (2) the Owner as an additional insured for claims made under the Contractor's completed operations coverage. The Contractor shall also cause each Subcontractor to (i) procure insurance reasonably satisfactory to the Owner and (ii) name the Indemnitees as additional insureds under the Subcontractor's comprehensive general liability policy. The additional insured endorsement included on the Subcontractor's comprehensive general liability policy shall state that coverage is afforded the additional insureds with respect to claims arising out of operations performed by or on behalf of the Contractor. If the additional insureds have other insurance that is applicable to the loss, such other insurance shall be on an excess or contingent basis. The amount of the insurer's liability under this insurance policy shall not be reduced by the existence of such other insurance.

§ 11.2 OWNER'S LIABILITY INSURANCE

The Owner shall be responsible for purchasing and maintaining the Owner's usual liability insurance.

§ 11.3 PROPERTY INSURANCE

§ 11.3.1 The Contractor shall purchase and maintain, in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located, property insurance written on a builder's risk "all-risk" or equivalent policy form in the amount of the initial Contract Sum, plus value of subsequent Contract Modifications and cost of materials supplied or installed by others, comprising total value for the entire Project at the site on a replacement cost basis without optional deductibles. Such property insurance shall be maintained, unless otherwise provided in the Contract Documents or otherwise agreed in writing by all persons and entities who are beneficiaries of such insurance, until final payment has been made as provided in Section 9.10 or until no person or entity other than the Owner has an insurable interest in the property required by this Section 11.3 to be covered, whichever is later. This insurance shall include interests of the Owner, the Contractor, Subcontractors and Sub-subcontractors in the Project.

§ 11.3.1.1 Property insurance shall be on an "all-risk" or equivalent policy form and shall include, without limitation, insurance against the perils of fire (with extended coverage) and physical loss or damage including, without duplication of coverage, theft, vandalism, malicious mischief, collapse, earthquake, flood, windstorm, falsework, testing and startup, temporary buildings and debris removal including demolition occasioned by enforcement of any applicable legal requirements, and shall cover reasonable compensation for Architect's and Contractor's services and expenses required as a result of such insured loss. The Contractor shall make seperate arrangements for any insurance it may require on such construction equipment, and any policy obtained shall include a waiver of subrogation in accordance with the requirements of Section 11.3.7.

§ 11.3.1.4 This property insurance shall cover portions of the Work stored off the site, and also portions of the Work in transit.

§ 11.3.1.5 Partial occupancy or use in accordance with Section 9.9 shall not commence until the insurance company or companies providing property insurance have consented to such partial occupancy or use by endorsement or otherwise. The Owner and the Contractor shall take reasonable steps to obtain consent of the insurance company or companies and shall, without mutual written consent, take no action with respect to partial occupancy or use that would cause cancellation, lapse or reduction of insurance.

§ 11.3.2 BOILER AND MACHINERY INSURANCE

The Owner shall purchase and maintain boiler and machinery insurance required by the Contract Documents or by law, which shall specifically cover such insured objects during installation and until final acceptance by the Owner; this insurance shall include interests of the Owner, Contractor, Subcontractors and Sub-subcontractors in the Work, and the Owner and Contractor shall be named insureds.

§ 11.3.3 LOSS OF USE INSURANCE

The Owner, at the Owner's option, may purchase and maintain such insurance as will insure the Owner against loss of use of the Owner's property due to fire or other hazards, however caused. The Owner waives all rights of action against the Contractor for loss of use of the Owner's property, including consequential losses due to fire or other hazards however caused.

§ 11.3.5 If during the Project construction period the Owner insures properties, real or personal or both, at or adjacent to the site by property insurance under policies separate from those insuring the Project, or if after final payment property insurance is to be provided on the completed Project through a policy or policies other than those insuring the Project during the construction period, the Owner shall waive all rights in accordance with the terms of Section 11.3.7 for damages caused by fire or other causes of loss covered by this separate property insurance. All separate policies shall provide this waiver of subrogation by endorsement or otherwise.

§ 11.3.6 Evidence of the above coverage issued by a company satisfactory to the District shall be provided to the District by way of Certificate of Insurance before any work commences. A 30 day notice of cancellation or material change in coverage clause shall be included. It is the Contractor's obligation to provide 30 days notice if not done so by Contractor's insurance company. Failure to maintain the proper insurance shall be grounds for immediate termination of this Agreement.

§ 11.3.7 WAIVERS OF SUBROGATION

The Owner and Contractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents and employees, each of the other, and (2) the Architect, Architect's consultants, separate contractors described in Article 6, if any, and any of their subcontractors, sub-subcontractors, agents and employees, for damages caused by fire or other causes of loss to the extent of actual recovery of any insurance proceeds under any property insurance obtained pursuant to this Section 11.3 or other property insurance applicable to the Work, except such rights as they have to proceeds of such insurance held by the Contractor as fiduciary. The Owner or Contractor, as appropriate, shall require of the Architect, Architect's consultants, separate contractors described in Article 6, if any, and the subcontractors, sub-subcontractors, agents and employees of any of them, by appropriate agreements, written where legally required for validity, similar waivers each in favor of other parties enumerated herein. The policies shall provide such waivers of subrogation by endorsement or otherwise. A waiver of subrogation shall be effective as to a person or entity even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, did not pay the insurance premium directly or indirectly, and whether or not the person or entity had an insurable interest in the property damaged.

§ 11.3.8 A loss insured under the Contractor's property insurance shall be adjusted by the Contractor as fiduciary and made payable to the Contractor and Owner as fiduciary for the insureds, as their interests may appear, subject to requirements of any applicable mortgagee clause and of Section 11.3.10. The Contractor shall pay Subcontractors their just shares of insurance proceeds received by the Contractor, and by appropriate agreements, written where legally required for validity, shall require Subcontractors to make payments to their Sub-subcontractors in similar manner.

Contractor. If after such loss no other special agreement is made and unless the Owner terminates the Contract for convenience, replacement of damaged property shall be performed by the Contractor after notification of a Change in the Work in accordance with Article 7.

§ 11.3.10 The Contractor in good faith shall have power to adjust and settle a loss with insurers unless one of the parties in interest shall object in writing within five days after occurrence of loss to the Contractor's exercise of this power; if such objection is made, the dispute shall be resolved in the manner selected by the Owner and Contractor as the method of binding dispute resolution in the Agreement. If the Owner and Contractor have selected arbitration as the method of binding dispute resolution, the Contractor as fiduciary shall make settlement with insurers or, in the case of a dispute over distribution of insurance proceeds, in accordance with the directions of the arbitrators.

§ 11.4 PERFORMANCE BOND AND PAYMENT BOND

§ 11.4.1 The Owner shall have the right to require the Contractor to furnish bonds covering faithful performance of the Contract and payment of obligations arising thereunder as stipulated in bidding requirements or specifically required in the Contract Documents on the date of execution of the Contract. Except as otherwise required by statute, the form and substance of such bonds shall be satisfactory to the Owner in the Owner's sole judgment.

§ 11.4.2 Upon the request of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations arising under the Contract, the Contractor shall promptly furnish a copy of the bonds or shall authorize a copy to be furnished.

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

§ 12.1 UNCOVERING OF WORK

§ 12.1.1 If a portion of the Work is covered contrary to the Architect's request or to requirements specifically expressed in the Contract Documents, it must, if requested in writing by the Architect, be uncovered for the Architect's examination and be replaced at the Contractor's expense without change in the Contract Time.

§ 12.1.2 If a portion of the Work has been covered that the Architect has not specifically requested to examine prior to its being covered, the Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, costs of uncovering and replacement shall, by appropriate Change Order, be at the Owner's expense. If such Work is not in accordance with the Contract Documents, such costs and the cost of correction shall be at the Contractor's expense unless the condition was caused by the Owner or a separate contractor in which event the Owner shall be responsible for payment of such costs.

§ 12.2 CORRECTION OF WORK

§ 12.2.1 BEFORE OR AFTER SUBSTANTIAL COMPLETION

The Contractor shall promptly correct Work rejected by the Architect or failing to conform to the requirements of the Contract Documents, whether discovered before or after Substantial Completion and whether or not fabricated, installed or completed. Costs of correcting such rejected Work, including additional testing and inspections, the cost of uncovering and replacement, and compensation for the Architect's services and expenses made necessary thereby, shall be at the Contractor's expense. If prior to the date of Substantial Completion the Contractor, a Subcontractor, or anyone for whom either is responsible uses or damages any portion of the Work, including, without limitation, mechanical, electrical, plumbing, and other building systems, machinery, equipment, or other mechanical device, the Contractor shall cause such item to be restored to "like new" condition at no expense to the Owner. In addition, the Contractor shall promptly remedy damage and loss arising in conjunction with the Project caused in whole or in part by the Contractor, a Subcontractor, a Sub-subcontractor, or anyone directly or indirectly employed by any of them, or anyone for whose acts they may be liable and for which the Contractor is responsible.

§ 12.2.2 AFTER SUBSTANTIAL COMPLETION

§ 12.2.2.1 In addition to the Contractor's obligations under Section 3.5, if, within one year after the date of Substantial Completion of the Work or designated portion thereof or after the date for commencement of warranties established under Section 9.9.1, or by terms of an applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of written notice from the Owner to do so unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discovery of the condition. During the one-year period for correction of Work, if the Owner fails to notify the

Contractor and give the Contractor an opportunity to make the correction, the Owner waives the rights to require correction by the Contractor. If the Contractor fails to correct nonconforming Work within a reasonable time during that period after receipt of notice from the Owner or Architect, the Owner may correct it in accordance with Section 2.4.

§ 12.2.2.2 The one-year period for correction of Work shall be extended with respect to portions of Work first performed after Substantial Completion by the period of time between Substantial Completion and the actual completion of that portion of the Work.

§ 12.2.2.3 Upon completion of any Work under or pursuant to this Section 12.2, the one (1) year correction period in connection with the Work requiring correction shall be renewed and recommence. The obligations under Section 12.2 shall cover any repairs and replacement to any part of the Work or other property that is damaged by the defective Work.

§ 12.2.3 The Contractor shall remove from the site portions of the Work that are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the Owner.

§ 12.2.4 The Contractor shall bear the cost of correcting destroyed or damaged construction, whether completed or partially completed, of the Owner or separate contractors caused by the Contractor's correction or removal of Work that is not in accordance with the requirements of the Contract Documents.

§ 12.2.5 Nothing contained in this Section 12.2 shall be construed to establish a period of limitation with respect to other obligations the Contractor has under the Contract Documents. Establishment of the one-year period for correction of Work as described in Section 12.2.2 relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

§ 12.3 ACCEPTANCE OF NONCONFORMING WORK

If the Owner prefers to accept Work that is not in accordance with the requirements of the Contract Documents, the Owner may do so instead of requiring its removal and correction, in which case the Contract Sum will be reduced as appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made.

ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 GOVERNING LAW

The Contract shall be governed by the law of the place where the Project is located except that, if the parties have selected arbitration as the method of binding dispute resolution, the Federal Arbitration Act shall govern Section 15.4.

§ 13.2 SUCCESSORS AND ASSIGNS

§ 13.2.1 The Owner and Contractor respectively bind themselves, their partners, successors, assigns and legal representatives to covenants, agreements and obligations contained in the Contract Documents. Except as provided in Section 13.2.2 or elsewhere in the Contract Documents, neither party to the Contract shall assign the Contract as a whole without written consent of the other. If either party attempts to make such an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

§ 13.2.2 The Owner may, without consent of the Contractor, assign the Contract to a lender providing construction financing for the Project, if the lender assumes the Owner's rights and obligations under the Contract Documents. The Contractor shall execute all consents reasonably required to facilitate such assignment.

§ 13.3 WRITTEN NOTICE

Written notice shall be deemed to have been duly served if delivered in person to the individual, to a member of the firm or entity, or to an officer of the corporation for which it was intended; or if delivered at, or sent by registered or certified mail or by courier service providing proof of delivery to, the last business address known to the party giving notice.

§ 13.4 RIGHTS AND REMEDIES

§ 13.4.1 Except as expressly provided in the Contract Documents, duties and obligations imposed by the Contract Documents and rights and remedies available thereunder shall be in addition to and not a limitation of duties, obligations, rights and remedies otherwise imposed or available by law.

§ 13.4.2 No action or failure to act by the Owner, Architect or Contractor shall constitute a waiver of a right or duty afforded them under the Contract, nor shall such action or failure to act constitute approval of or acquiescence in a breach there under, except as may be specifically agreed in writing.

§ 13.5 TESTS AND INSPECTIONS

§ 13.5.1 Tests, inspections and approvals of portions of the Work shall be made as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules and regulations or lawful orders of public authorities. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections and approvals. The Contractor shall give the Architect timely notice of when and where tests and inspections are to be made so that the Architect may be present for such procedures. The Owner shall bear costs of (1) tests, inspections or approvals that do not become requirements until after bids are received or negotiations concluded, and (2) tests, inspections or approvals where building codes or applicable laws or regulations prohibit the Owner from delegating their cost to the Contractor.

§ 13.5.2 If the Architect, Owner or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection or approval not included under Section 13.5.1, the Architect will, upon written authorization from the Owner, instruct the Contractor to make arrangements for such additional testing, inspection or approval by an entity acceptable to the Owner, and the Contractor shall give timely notice to the Architect of when and where tests and inspections are to be made so that the Architect may be present for such procedures. Such costs, except as provided in Section 13.5.3, shall be at the Owner's expense.

§ 13.5.3 If such procedures for testing, inspection or approval under Sections 13.5.1 and 13.5.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure including those of repeated procedures and compensation for the Architect's services and expenses shall be at the Contractor's expense.

§ 13.5.4 Required certificates of testing, inspection or approval shall, unless otherwise required by the Contract Documents, be secured by the Contractor and promptly delivered to the Architect.

§ 13.5.5 If the Architect is to observe tests, inspections or approvals required by the Contract Documents, the Architect will do so promptly and, where practicable, at the normal place of testing.

§ 13.5.6 Tests or inspections conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work.

§ 13.6 INTEREST

Payments due and unpaid under the Contract Documents shall bear interest from the date payment is due at such rate as the parties may agree upon in writing or, in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.

§ 13.7 TIME LIMITS ON CLAIMS

The Owner and Contractor shall commence all claims and causes of action, whether in contract, tort, breach of warranty or otherwise, against the other arising out of or related to the Contract in accordance with the requirements of the final dispute resolution method selected in the Agreement within the time period specified by applicable law. The Owner and Contractor waive all claims and causes of action not commenced in accordance with this Section 13.7.

§ 13.8 GENERAL PROVISIONS

§ 13.8.1 All personal pronouns used in this Contract, whether used in the masculine, feminine, or neuter gender, shall include all other genders; and the singular shall include the plural and vice versa. Titles of articles, sections, and subsections are for convenience only and neither limit nor amplify the provisions of this Contract. The use herein of

the word "including," when following any general statement, term, or matter, shall not be construed to limit such statement, term, or matter to the specific items or matters set forth immediately following such word or to similar items or matters, whether or not non-limiting language (such words as "without limitation," or "but not limited to," or words of similar import) is used with reference thereto, but rather shall be deemed to refer to all other items or matters that could reasonably fall within the broadest possible scope of such general statement, term, or matter.

§ 13.8.2 Wherever possible, each provision of this Agreement shall be interpreted in a manner as to be effective and valid under applicable law. If, however, any provision of this Agreement, or portion thereof, is prohibited by law or found invalid under any law, only such provision or portion thereof shall be ineffective, without in any manner invalidating or affecting the remaining provisions of this Agreement or valid portions of such provision, which are hereby deemed severable.

§ 13.8.3 Each party hereto agrees to do all acts and things and to make, execute and deliver such written instruments, as shall from time to time be reasonably required to carry out the terms and provisions of the Contract Documents.

§ 13.8.4 Any specific requirement in this Contract that the responsibilities or obligations of the Contractor also apply to a Subcontractor is added for emphasis and is also hereby deemed to include a Subcontractor of any tier. The omission of a reference to a Subcontractor in connection with any of the Contractor's responsibilities or obligations shall not be construed to diminish, abrogate, or limit any responsibilities or obligations of a Subcontractor of any tier under the Contract Documents or the applicable subcontract.

§ 13.9 NO ORAL WAIVER

The provisions of the Contract Document shall not be changed, amended, waived, or otherwise modified in any respect except by a writing signed by Owner. No person is authorized on behalf of Owner to orally change, amend, waive, or otherwise modify the terms of the Contract Documents or any of the Contractor's duties or obligations under or arising out of the Contract Documents. Any change, waiver, approval, or consent granted to the Contractor shall be limited to the specific matters stated in the writing signed by Owner, and shall not relieve Contractor of any other of the duties and obligations under the Contract Documents. No "constructive" changes shall be allowed.

§ 13.10 NOTICES REGARDING LIENS

Contractor shall provide all notices required or permitted by Oregon law for protection of Owner from liens and claims of lien if permitted or required by applicable law. Contractor shall be responsible for filing in the appropriate court or other governmental office records all such notices as required or permitted by the laws of Oregon. Contractor shall provide Owner with copies of all notices received by Contractor from subcontractors, sub-subcontractors, and/or suppliers to Contractor.

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 TERMINATION BY THE CONTRACTOR

§ 14.1.1 The Contractor may terminate the Contract if the Work is stopped for a period of 30 consecutive days through no act or fault of the Contractor or a Subcontractor, Sub-subcontractor or their agents or employees or any other persons or entities performing portions of the Work under direct or indirect contract with the Contractor, for any of the following reasons:

.1 Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be stopped; or

.2 An act of government, such as a declaration of national emergency that requires all Work to be stopped.

§ 14.1.2 The Contractor may terminate the Contract if, through no act or fault of the Contractor or a Subcontractor, Sub-subcontractor or their agents or employees or any other persons or entities performing portions of the Work under direct or indirect contract with the Contractor, repeated suspensions, delays or interruptions of the entire Work by the Owner as described in Section 14.3 constitute in the aggregate more than 100 percent of the total number of days scheduled for completion, or 120 days in any 365-day period, whichever is less.

§ 14.1.3 If one of the reasons described in Section 14.1.1 or 14.1.2 exists, the Contractor may, upon seven days' written notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work executed, including reasonable overhead and profit, costs incurred by reason of such termination, and damages.

§ 14.1.4 If the Work is stopped for a period of 60 consecutive days through no act or fault of the Contractor or a Subcontractor or their agents or employees or any other persons performing portions of the Work under contract with the Contractor because the Owner has repeatedly failed to fulfill the Owner's obligations under the Contract Documents with respect to matters important to the progress of the Work, the Contractor may, upon seven additional days' written notice to the Owner and the Architect, terminate the Contract and recover from the Owner as provided in Section 14.1.3.

§ 14.2 TERMINATION BY THE OWNER FOR CAUSE

§ 14.2.1 The Owner may terminate the Contract if the Contractor

- **.1** repeatedly refuses or fails to supply enough properly skilled workers or proper materials;
- **.2** fails to make payment to Subcontractors for materials or labor in accordance with the respective agreements between the Contractor and the Subcontractors;
- **.3** repeatedly disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority; or
- **.4** otherwise is guilty of substantial breach of a provision of the Contract Documents.

§ 14.2.2 When any of the above reasons exist, the Owner, upon certification by the Initial Decision Maker that sufficient cause exists to justify such action, may without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, seven days' written notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:

- **.1** Exclude the Contractor from the site and take possession of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;
- **.2** Accept assignment of subcontracts pursuant to Section 5.4; and
- **.3** Finish the Work by whatever reasonable method the Owner may deem expedient. Upon written request of the Contractor, the Owner shall furnish to the Contractor a detailed accounting of the costs incurred by the Owner in finishing the Work.

§ 14.2.3 When the Owner terminates the Contract for one of the reasons stated in Section 14.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished.

§ 14.2.4 If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Architect's services and expenses made necessary thereby, and other damages incurred by the Owner and not expressly waived, such excess shall be paid to the Contractor. If such costs and damages exceed the unpaid balance, the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or Owner, as the case may be, shall be certified by the Initial Decision Maker, upon application, and this obligation for payment shall survive termination of the Contract.

§ 14.3 SUSPENSION BY THE OWNER FOR CONVENIENCE

§ 14.3.1 The Owner may, without cause, order the Contractor in writing to suspend, delay or interrupt the Work in whole or in part for such period of time as the Owner may determine.

§ 14.3.2 The Contract Sum and Contract Time shall be adjusted for increases in the cost and time caused by suspension, delay or interruption as described in Section 14.3.1. Adjustment of the Contract Sum shall include profit. No adjustment shall be made to the extent

- **.1** that performance is, was or would have been so suspended, delayed or interrupted by another cause for which the Contractor is responsible; or
- **.2** that an equitable adjustment is made or denied under another provision of the Contract.

§ 14.4 TERMINATION BY THE OWNER FOR CONVENIENCE

§ 14.4.1 The Owner may, at any time, terminate the Contract for the Owner's convenience and without cause.

§ 14.4.2 Upon receipt of written notice from the Owner of such termination for the Owner's convenience, the Contractor shall

- **.1** cease operations as directed by the Owner in the notice;
- **.2** take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; and

.3 except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.

§ 14.4.3 Upon such termination, the Contractor shall recover as its sole remedy payment for Work properly performed in connection with the terminated portion of the Work prior to the effective date of termination and for items properly and timely fabricated off the Project site delivered and stored in accordance with the Owner's instructions. The Contractor hereby waives and forfeits all other claims for payment and damages, including, without limitation, anticipated profits. The Owner shall be credited for (i) payments previously made to the Contractor for the terminated portion of the Work, (ii) claims that the Owner has against the Contractor under the Contract, and (iii) the value of the materials, supplies, equipment, or other items that are to be disposed of by the Contractor that are part of the Contract Sum.

§ 14.4.4 The Owner may terminate a portion of the Work for the Owner's convenience and without cause, in which case the provisions of this Section 14.4 shall apply only to the portion of the Work terminated and the Contractor shall continue with performance of the remaining Work that is not terminated.

ARTICLE 15 CLAIMS AND DISPUTES

§ 15.1 CLAIMS

§ 15.1.1 DEFINITION

A Claim is a demand or assertion by one of the parties seeking, as a matter of right, payment of money, or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. The responsibility to substantiate Claims shall rest with the party making the Claim.

§ 15.1.2 NOTICE OF CLAIMS

Claims by either the Owner or Contractor must be initiated by written notice to the other party and to the Initial Decision Maker with a copy sent to the Architect, if the Architect is not serving as the Initial Decision Maker; provided, however, that the claimant shall use its best efforts to furnish the Initial Decision Maker and the other party, as expeditiously as possible, with notice of any Claim including, without limitation, those in connection with concealed or unknown conditions, once such claim is recognized, and shall cooperate with the Architect and the party against whom the claim is made in any effort to mitigate the alleged or potential damages, delay, or other adverse consequences arising out of the condition that is the cause of such a Claim. Claims by either party must be initiated within 21 days after occurrence of the event giving rise to such Claim or within 21 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later.

§ 15.1.3 CONTINUING CONTRACT PERFORMANCE

Pending final resolution of a Claim, except as otherwise agreed in writing or as provided in Section 9.7 and Article 14, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents. The Architect will prepare Change Orders and issue Certificates for Payment in accordance with the decisions of the Initial Decision Maker.

§ 15.1.4 CLAIMS FOR ADDITIONAL COST

If the Contractor wishes to make a Claim for an increase in the Contract Sum, written notice as provided herein shall be given before proceeding to execute the Work. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.4.

§ 15.1.5 CLAIMS FOR ADDITIONAL TIME

§ 15.1.5.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, written notice as provided herein shall be given. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. In the case of a continuing delay, only one Claim is necessary.

§ 15.1.5.2 If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time, could not have been reasonably anticipated and had an adverse effect on the scheduled construction.

§ 15.1.6 CLAIMS FOR CONSEQUENTIAL DAMAGES

The Contractor and Owner waive Claims against each other for consequential damages arising out of or relating to this Contract. This mutual waiver includes

.1 damages incurred by the Owner for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons; and

.2 damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit except anticipated profit arising directly from the Work.

This mutual waiver is applicable, without limitation, to all consequential damages due to either party's termination in accordance with Article 14. Nothing contained in this Section 15.1.6 shall be deemed to preclude an award of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.

§ 15.2 INITIAL DECISION

§ 15.2.1 Claims, excluding those arising under Sections 10.3, 10.4, 11.3.9, and 11.3.10, shall be referred to the Initial Decision Maker for initial decision. The Architect will serve as the Initial Decision Maker, unless otherwise indicated in the Agreement. Except for those Claims excluded by this Section 15.2.1, a decision by the Initial Decision Maker shall be required as a condition precedent to mediation of any Claim arising prior to the date final payment is due, unless 30 days have passed after the Claim has been referred to the Initial Decision Maker with no decision having been rendered. Unless the Initial Decision Maker and all affected parties agree, the Initial Decision Maker will not decide disputes between the Contractor and persons or entities other than the Owner.

§ 15.2.2 The Initial Decision Maker will review Claims and within ten days of the receipt of a Claim take one or more of the following actions: (1) request additional supporting data from the claimant or a response with supporting data from the other party, (2) reject the Claim in whole or in part, (3) approve the Claim, (4) suggest a compromise, or (5) advise the parties that the Initial Decision Maker is unable to resolve the Claim if the Initial Decision Maker lacks sufficient information to evaluate the merits of the Claim or if the Initial Decision Maker concludes that, in the Initial Decision Maker's sole discretion, it would be inappropriate for the Initial Decision Maker to resolve the Claim.

§ 15.2.3 In evaluating Claims, the Initial Decision Maker may, but shall not be obligated to, consult with or seek information from either party or from persons with special knowledge or expertise who may assist the Initial Decision Maker in rendering a decision. The Initial Decision Maker may request the Owner to authorize retention of such persons at the Owner's expense.

§ 15.2.4 If the Initial Decision Maker requests a party to provide a response to a Claim or to furnish additional supporting data, such party shall respond, within ten days after receipt of such request, and shall either (1) provide a response on the requested supporting data, (2) advise the Initial Decision Maker when the response or supporting data will be furnished or (3) advise the Initial Decision Maker that no supporting data will be furnished. Upon receipt of the response or supporting data, if any, the Initial Decision Maker will either reject or approve the Claim in whole or in part.

§ 15.2.5 The Initial Decision Maker will render an initial decision approving or rejecting the Claim, or indicating that the Initial Decision Maker is unable to resolve the Claim. This initial decision shall (1) be in writing; (2) state the reasons therefor; and (3) notify the parties and the Architect, if the Architect is not serving as the Initial Decision Maker, of any change in the Contract Sum or Contract Time or both. The initial decision shall be final and binding on the parties but subject to mediation and, if the parties fail to resolve their dispute through mediation, to binding dispute resolution.

§ 15.2.6 Either party may file for mediation of an initial decision at any time, subject to the terms of Section 15.2.6.1.

§ 15.2.6.1 Either party may, within 30 days from the date of an initial decision, demand in writing that the other party file for mediation within 60 days of the initial decision. If such a demand is made and the party receiving the demand fails to file for mediation within the time required, then both parties waive their rights to mediate or pursue binding dispute resolution proceedings with respect to the initial decision.

§ 15.2.7 In the event of a Claim against the Contractor, the Owner may, but is not obligated to, notify the surety, if any, of the nature and amount of the Claim. If the Claim relates to a possibility of a Contractor's default, the Owner may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

§ 15.2.8 If a Claim relates to or is the subject of a mechanic's lien, the party asserting such Claim may proceed in accordance with applicable law to comply with the lien notice or filing deadlines.

§ 15.2.9 The decision of the Initial Decision Maker in response to a Claim shall not be a condition precedent to mediation and binding dispute resolution in the event (1) the positions of the Initial Decision Maker and Architect are vacant, or (2) the Claim relates to a construction lien.

§ 15.3 MEDIATION

§ 15.3.1 Claims, disputes, or other matters in controversy arising out of or related to the Contract except those waived as provided for in Sections 9.10.4, 9.10.5, and 15.1.6 shall be subject to mediation as a condition precedent to binding dispute resolution.

§ 15.3.2 The parties shall endeavor to resolve their Claims by mediation which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Mediation Procedures in effect on the date of the Agreement. A request for mediation shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the mediation. The request may be made concurrently with the filing of binding dispute resolution proceedings but, in such event, mediation shall proceed in advance of binding dispute resolution proceedings, which shall be stayed pending mediation for a period of 60 days from the date of filing, unless stayed for a longer period by agreement of the parties or court order. If an arbitration is stayed pursuant to this Section 15.3.2, the parties may nonetheless proceed to the selection of the arbitrator(s) and agree upon a schedule for later proceedings.

§ 15.3.3 The parties shall share the mediator's fee and any filing fees equally. The mediation shall be held in the place where the Project is located, unless another location is mutually agreed upon. Agreements reached in mediation shall be enforceable as settlement agreements in any court having jurisdiction thereof. In no event shall any mediator in connection with a Claim be permitted to serve as an arbitrator for that, or any other, Claim that is not resolved pursuant to mediation.

§ 15.4 ARBITRATION

§ 15.4.1 If the parties have selected arbitration as the method for binding dispute resolution in the Agreement, any Claim subject to, but not resolved by, mediation shall be subject to arbitration which, unless the parties mutually agree otherwise, shall be administered by Arbitration Services of Portland ("ASP") in accordance with the ASP Rules in effect on the date of the Agreement. A demand for arbitration shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the arbitration. Exclusive venue for arbitration hearings shall be in Lane County, Oregon.

§ 15.4.1.1 A demand for arbitration shall be made no earlier than concurrently with the filing of a request for mediation, but in no event shall it be made after the date when the institution of legal or equitable proceedings based on the Claim would be barred by the applicable statute of limitations. For statute of limitations purposes, receipt of a written demand for arbitration by the person or entity administering the arbitration shall constitute the institution of legal or equitable proceedings based on the Claim.

§ 15.4.2 The award rendered by the arbitrator or arbitrators shall be final, and judgment may be entered upon it in accordance with applicable law in any court having jurisdiction thereof.

§ 15.4.3 The foregoing agreement to arbitrate and other agreements to arbitrate with an additional person or entity duly consented to by parties to the Agreement shall be specifically enforceable under applicable law in any court having jurisdiction thereof.

§ 15.4.4 CONSOLIDATION OR JOINDER

§ 15.4.4.1 The Contractor and Owner waive all objections to joinder of the Contractor or Owner as a party to any Project-related mediation, arbitration or litigation in which either the Contractor or Owner is joined or is otherwise positioned as a party in which the Contractor's conduct or its performance is the source of the dispute.

§ 15.4.4.2 Either party, at its sole discretion, may include by joinder persons or entities substantially involved in a common question of law or fact whose presence is required if complete relief is to be accorded in arbitration, provided that the party sought to be joined consents in writing to such joinder. Consent to arbitration involving an additional person or entity shall not constitute consent to arbitration of any claim, dispute or other matter in question not described in the written consent.

§ 15.4.4.3 The Owner and Contractor grant to any person or entity made a party to an arbitration conducted under this Section 15.4, whether by joinder or consolidation, the same rights of joinder and consolidation as the Owner and Contractor under this Agreement.

DOCUMENT 00 73 43
PREVAILING WAGE RATES

PART 1 – GENERAL

1.1 PREVAILING WAGE RATES

A. The Prevailing Wage Rates dated January 01, 2020 including any subsequent corrections or amendments issued by the Oregon Bureau of Labor and Industries, are included as a portion of the Contract Documents by reference. Copies are available for review at the office of Facilities Management, School District 4J, and can be viewed on line at www.boli.state.or.us. Click on Prevailing Wages, then PWR Rate Publications, and then Prevailing Wage Rates for Public Works Contracts in Oregon (subject only to state law).

PART 2 – PRODUCTS

Not Used.

PART 3 – EXECUTION

Not Used.

END OF DOCUMENT 00 73 43

SECTION 01 11 00
SUMMARY OF WORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 WORK COVERED BY CONTRACT DOCUMENTS

A. Project Identification: Project consists of interior improvements to existing classrooms, new striping at existing parking and drive areas, and new playground additions. Work includes selective demolition, site work, concrete, rough carpentry, finish carpentry, insulation, openings, finishes, equipment, plumbing, mechanical, and electrical.

1. Project Locations:
   a. Kelly Middle School 850 Howard, Ave, Eugene, OR 97404.
   b. North Eugene High School 200 Silver Lane, Eugene, OR 97404.
2. Owner: Eugene School District 4J, 715 West Fourth Avenue, Eugene, OR 97402.

B. Architect Identification: The Contract Documents, dated March 3, 2020 were prepared for Project by GMA Architects, 860 W Park Street, Eugene, OR 97401.

C. Project Manager: Patrick Mucker has been appointed by Owner to serve as Project Coordinator.

1.3 CONTRACT

A. Project will be constructed under a general construction contract.

1. The form of Agreement will be executed on AIA Form A101, Standard Form of Agreement Between Owner and Contractor, 2017 edition.

1.4 WORK SEQUENCE

A. Do not commence Work until after execution of Agreement and receipt of Notice-to-Proceed from Owner. Work on site shall commence June 15th, 2020. Site investigation that does not impact operations may occur at an earlier date with prior approval from Owner.

B. Perform work in order to achieve Substantial Completion by August 7, 2020.

C. Achieve Final Completion within seven (7) days following the date of Substantial Completion.

1.5 USE OF PREMISES

A. Work Area Access: Buildings will be occupied during work. Access to the work area will be available on a week-day basis from approximately 7:00 am to 4:00 pm. Coordinate all other work hour schedules with Owner so as not to interfere with Owner's use of the building.

B. Limit use of the premises to construction activities in areas indicated; allow for Owner occupancy and use by the public, subject to approval by a District Safety Specialist.

C. Site Access: Maintain drives and building entrances and exits clear and protected at all times to Owner's, employees, and public access and for use by emergency personnel. Do not use these areas for parking or storage. Schedule deliveries to minimize space and time requirements for storage of materials at site.

D. Parking: Contractor may use existing parking areas as indicated on Drawings.

E. Contractor Staging Areas: Limit staging to areas indicated on Drawings.

F. Construction Operations: Limited to areas indicated on Drawings.

1.6 WORK UNDER SEPERATE CONTRACTS

A. Separate Contract: Owner will award a separate contract for performance of certain construction operations at Project site. Those operations will be conducted simultaneously with work under this Contract. This contract will include the following:
1. Asbestos abatement.
2. Playground equipment, including equipment footings and rubber mats.
3. Softball Field and associated pathways, field house, and fencing.
4. Interior Signage, unless otherwise noted in Drawings.
5. Low voltage cabling and terminations.
6. Furnishings and appliances.

B. Cooperate fully with separate contractors so work on those contracts may be carried out smoothly, without interfering with or delaying work under this Contract.

1.7 FUTURE WORK

A. Future Contract: Owner may award a separate contract for additional work to be performed at the site after Substantial Completion. Completion of that work will depend on successful completion of preparatory work under this Contract.

1.8 OWNER-FURNISHED PRODUCTS

A. Owner will furnish the following products to the Contractor for installation as part of the Work. The Work includes providing support systems to receive Owner's equipment and plumbing, mechanical, and electrical connections.
1. Restroom accessories as follows:
    a. Soap Dispensers
    b. Paper Towel Dispensers
    c. Toilet Paper Dispensers
    d. Electric Hand Dryers
    e. Slim-Jim Trash Cans (Resin Type)
2. Casework relocated from Silver Lea Elementary School.
3. Smartboards, markerboards, and projectors.

B. Owner will arrange for and deliver Shop Drawings, Product Data, and Samples to Contractor.
1. Casework scheduled for relocation will be available for visual inspection prior to work. Additional drawings and product data will not be provided.

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

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

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

F. Contractor shall review Shop Drawings, Product Data, and Samples and return them to Architect noting discrepancies or anticipated problems in use of product.

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

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

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

1.9 MISCELLANEOUS PROVISIONS

A. BACKGROUND CHECK –

1. Individuals with whom the District contracts with, or any employee, agent, subcontractor or provider who will have direct, unsupervised contact with students, shall be required to submit a 4J Volunteer Background check and undergo a state nationwide fingerprinting and criminal history records check, in accordance with the provisions of ORS 326.603 and ORS 326.607. Individuals or Proposer, and not the District, shall be responsible for the fees associated with fingerprinting and the criminal history records check, not to exceed the actual costs (ODE $59.00 and outside fingerprinting vendor $12.50). Individuals contracting with the District will be required to fill out and submit a background check by logging on the following site: https://www.4j.lane.edu/hr/icbackgroundprocess/ and follow the process.

B. DRUG AND ALCOHOL POLICY

1. The possession, use, or distribution of illicit drugs and alcohol on school premises is prohibited. Prescription medications brought to the project site shall be in the original container bearing the name of the drug, the name of the physician and the prescribed dosage.

C. USE OF TOBACCO PRODUCTS

1. Smoking and the other use of tobacco products is prohibited on all school district property pursuant to OAR 581-021-0110.

D. SAFETY REQUIREMENTS

1. Safety must not be sacrificed for the sake of productivity or expedience. Safety of students, staff, and the public is critical. Take all reasonable precautions to prevent endangerment or injury. Advise and coordinate operations with the school office.
2. All contractors who perform work on District property, and their employees, are expected to know the District's expectations for safe work and to adhere to those expectations.
3. Contractors are to adhere to the regulations of Oregon OSHA for all projects within the School District.

E. GENERAL SAFE WORK PRACTICES

1. Students, public and school staff shall not be put at risk by the activities of contractors or their employees.
2. Safe vehicle operation rules are to be followed at all times. These include positioning vehicles to minimize the necessity of backing and providing a "spotter", someone who will make sure that

people do not run into the path of a vehicle when driving on a playground or field that is occupied by students.

3. Tools shall never be left out when an unsecured work area is vacated.
4. Ladders and scaffolding will be taken down when an unsecured work area is vacated.
5. Open holes and other tripping hazards shall be fenced or barricaded when an unsecured work area is vacated.
6. Operations resulting in vapors, emissions or flying objects shall be conducted in such a way as to prevent exposure to any unprotected parties or property.
7. "Secured Work Area" is defined as an area having a perimeter cyclone fence at least 6 feet in height, with gates which close and lock so that no casual entrance is possible by unauthorized adults or children.
8. Contractor to follow all OR-OSHA rules for Confined Spaces, where applicable.

F. COMMUNICATIONS REGARDING UNSAFE PRACTICES

1. Upon perceiving a problem, the District will immediately communicate the concern to the Contractor or Contractor's representative on the work site.
2. If agreement on correction of unsafe conditions cannot be reached, the concerns of the District shall prevail and safety concerns shall be addressed in accordance with the District requirements.

G. ELECTRICAL PANELS - LOCKOUT/TAGOUT

1. Contractor shall implement a Lockout/Tag-out program for his employees who take equipment out of service or place equipment back into service. Contractor shall review the District's Energy Control Program prior to commencing work. Rules applying to this procedure are Oregon Occupational Safety and Health Code OAR 437, Division 2, Subdivision J, General Environmental Controls Lockout/Tag-out (1919.147), or latest edition.

H. ARC FLASH – ELECTRICAL SAFETY

1. Contractor shall comply with NFPA 70E (Electrical Safety in the Workplace), current edition. Contractor shall comply with Oregon OSHA 1910.137 (Personal Protective Equipment). The Contractor shall review with the School District Project Manager the 'Eugene School District Electrical Safety Program' before any work commences. The Contractor shall comply with all 'Arc Flash' and 'Electrical Safety' protocols referenced in any and all NFPA, OSHA, OROSHA, NEC, NESC, UL, IBC, IFC and ANSI documents (current editions).

I. POTENTIALLY HAZARDOUS PRODUCTS

1. The District attempts to maintain a safe and healthy environment for students and staff. The Contractor is therefore required to follow District guidelines controlling the use of potentially hazardous products and to use these products in a safe manner. Guidelines include the use of materials (adhesives, coatings, carpeting, etc.) which are known to emit little or no airborne pollutants.
2. MSDS information is required for all potentially hazardous products. The Project Manager and a District Safety Specialist will review these and determine what, if any, mitigation procedures will be required.
3. Contractor is to maintain and post copies of all MSDS information at the project site and adhere to the required controls.
4. Contractor is to ensure that work area by students and teachers is restricted. The District will provide signage appropriate for this purpose. The Contractor is to construct and maintain appropriate barriers. This shall include provision of physical separation barriers between "construction" and "occupied" spaces.
5. Contractor to adopt means of maintaining the construction space in negative air pressure in relation to occupied spaces.

6. Where there is a new or existing ventilation system in an affected space, the system shall be adjusted to provide the maximum amount of outside air possible with the system.
7. Efforts shall be made to install and operate new ventilation systems as soon in the construction process as practical.

J. ASBESTOS CONTAINING MATERIALS WARNING

1. Asbestos containing materials are known to exist in areas of the Work. The Contractor shall not, in any way, disturb materials which are known to contain asbestos, assumed to contain asbestos, or otherwise have not been tested and confirmed to be asbestos free.
2. Where access to concealed spaces is required, or it is necessary to disturb building materials such as for drilling of holes, cutting, etc., notify the Owner so that proper investigation and/or removal procedures are followed.
3. Prior to commencing Work, the Contractor shall meet with the District Safety Specialist and review the Owner's Asbestos Management Plan for the locations of asbestos-containing materials and/or materials assumed to contain asbestos. After reviewing the Owner's Asbestos Management Plan, the Contractor is required to sign Form 01 11 00A, Asbestos-containing Materials Notification Statement, provided at the end of this Section.
4. Contractor must not install any asbestos-containing materials when performing the Work of this project. At the completion of the Work, Contractor will be required to furnish a statement stating that no asbestos-containing materials were installed during the course of the Work. Refer to Sample Form 01 11 00B at the end of this Section.

K. FULL TIME SUPERINTENDENT DISCLOSURE STATEMENT

1. Prior to or in conjunction with the Preconstruction Conference, the Contractor shall submit the disclosure statement which identifies the Full Time Superintendent for this Project. The form for this statement, Form 01 11 00C, is provided at the end of this Section.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

PART 4 - SCHEDULE OF PRODUCTS ORDERED IN ADVANCE

PART 5 - ASBESTOS FORMS, [FULL TIME SUPERINTENDENT DISCLOSURE STATEMENT]

Updated 1/4/18

Form 01 11 00A

ASBESTOS-CONTAINING MATERIALS NOTIFICATION STATEMENT
FOR CONTRACTORS

This form must be completed and signed by the Contractor prior to beginning work in any Eugene School District 4J building.

The presence of known and assumed asbestos containing materials is documented in the AHERA Management Plan for each building. Copies of the AHERA Management Plan are available in the main office of each building and in the Facilities Management Office at 715 West Fourth Avenue, Eugene, Oregon. The District Asbestos Specialist must be informed of the Contractor's activities in each building prior to the start of work so that the Contractor can be informed on how to use the AHERA Management Plan and to determine if any asbestos-containing materials are likely to be impacted by the work of the Contractor.

The Contractor is responsible for notifying all employees and subcontractors of the presence of asbestos in the building. The Contractor shall not disturb known or assumed asbestos-containing materials. If the Contractor discovers suspected asbestos-containing materials that have not been identified, the Contractor must stop any work impacting the suspected materials and notify the District Asbestos Specialist so that the material can be sampled. Any asbestos-containing materials that must be removed to allow the Contractor to complete the Contractor's work will be removed by the District under separate contract. If the Contractor disturbs asbestos-containing materials, the Contractor will be responsible for the cost of the cleanup and decontamination.

I _____, Representing _____,
(Print Name of Representative) (Business Name)

have been notified of the location of the AHERA Management Plan and agree to avoid impacting all known or assumed asbestos-containing materials in the performance of the Work.

_____ _____
Signature of Representative Date

_____ _____
Work Site CIP #

Form 01 11 00B

The Environmental Protection Agency (AHERA) rules require the School District obtain a signed statement from the Site Superintendent that, to the best of his/her knowledge, no asbestos-containing building materials were installed during the Work. Therefore, the following statement must be submitted on the Contractors letterhead prior to Project Closeout.

SAMPLE FORM
(To be submitted on the Contractor's letterhead)

ASBESTOS-CONTAINING MATERIALS STATEMENT

EUGENE SCHOOL DISTRICT 4J

_____
(Name of Project and CIP Number)

We the undersigned, (Name of Company), hereby warrant that to the best of our knowledge all materials furnished for the above referenced project contain 0% asbestos.

_____
(Name of Construction Company)

_____
(Signature and Date)

_____
Printed Name

_____
Job Title

END OF SECTION 01 11 00

Form 01 11 00 C

FULL TIME SUPERINTENDENT DISCLOSURE STATEMENT

Prior to or in conjunction with the Preconstruction Conference, the Contractor shall submit this disclosure statement which identifies the Full Time Superintendent for this Project.

Project Title: Kelly Middle School Improvements and North Eugene High School Improvements
Eugene School District 4J
Eugene, Oregon
CIP No. 461.524.003

CONTRACTOR INFORMATION

Company Name: _____

Company Address: _____

City, State, Zip: _____

List below the name, address, telephone, cellular phone FAX numbers and e-mail address (if available) for the full time Superintendent for this Project:

Superintendent's Name: _____

Address: _____
(if different from Contractor's)

_____

Phone: _____ Fax: _____
Cell: _____ e-mail: _____

The undersigned acknowledges that this project requires and will provide a full-time superintendent throughout this project.

Signature: _____
Authorized Signature

Printed Name: _____

Title: _____

Signature Notarized by:

Subscribed and sworn before me this _____ day of _____, 20__.

Notary Public: _____
Signature

My commission expires: _____

SECTION 01 25 00

CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements for handling and processing Contract modifications.

B. Related Sections include the following:

1. Division 0 Document 00 52 13 “Form of Agreement” for monetary values of established Unit Prices and Alternates.
2. Division 0 Document 00 72 13 “General Conditions” for additional requirements for Changes in the Work, Contract Sum, and Contract Time.
3. Division 1 Section 00 73 00 “Supplementary Conditions” for allowable percentages for Contractors’ Overhead and Profit.
4. Division 1 Section 01 33 00 “Submittal Procedures” for Schedule of Values requirements.
5. Division 1 Section 01 60 00 "Product Requirements" for administrative procedures for handling requests for substitutions made after Contract award.
6. Division 1 Section 01 78 39 “Project Record Documents” documentation requirements.

1.3 MINOR CHANGES IN THE WORK

A. Architect, with the concurrence of the Owner, will issue supplemental instructions authorizing Minor Changes in the Work, not involving adjustment to the Contract Sum or the Contract Time.

1.4 CHANGE REQUEST/PROCEED ORDER (CONSTRUCTION CHANGE DIRECTIVE)

A. Architect or Owner may issue a Change Request/Proceed Order on form included at end of Part 3.

1. Change Request contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.
2. Proceed Order, when signed by the Owner, instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.

B. Documentation: Maintain detailed records on a time and material basis of work required by the Proceed Order.

1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

C. Authorization Required: When a Change Request is approved and signed by the Owner, it becomes a Proceed Order authorizing the change requested. Do not proceed with any change without the Owner’s signature on the Change Request/Proceed Order.

D. Owner-Initiated Change Requests: Architect will issue a Change Request, which will include a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.

1. Change Requests issued by Architect are for information only. Do not consider them instructions either to stop work in progress or to execute the proposed change.
2. Within time specified in Change Request after receipt of Change Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.

    a. Include a complete cost breakdown including a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
    b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
    c. Include costs of labor, supervision, overhead, and profit directly attributable to the change.
    d. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.

E. Contractor-Initiated Requests: If latent or unforeseen conditions require modifications to the Contract, Contractor may propose changes by submitting a request for a change to the Architect.

1. Changes requested by the Contractor will be authorized only by signature of the Owner on the prescribed. Do not proceed with any changes without this authorization.
2. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
3. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
4. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
5. Include costs of labor, supervision, overhead, and profit directly attributable to the change.
6. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
7. Comply with requirements in Division 1 Section 01 60 00 "Product Requirements" if the proposed change requires substitution of one product or system for product or system specified.

F. Change Request Form: Use forms provided by Owner. Sample copies are included at end of Section 3.

1.5 CHANGE ORDER PROCEDURES

A. On Owner's approval of a Change Request, and at intervals to be determined, Architect will collect Change Requests and issue a Change Order for signatures of Owner and Contractor on AIA Document G701.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

Not Used.

SECTION 01 25 00
CONTRACT MODIFICATION PROCEDURES

CHANGE REQUEST/PROCEED ORDER
Capital Improvement Program
Eugene School District 4J

……

CHANGE REQUEST NOTICE

Change Request No.: _____

Project No.:_____ Contract No.:_____ Date:_____

Project Title:_____

Contractor:_____

1. **REQUEST INFORMATION**

   Estimated $_____Time_____ Days_____ Initiated by _____

   Reason for change:

_____

_____

2. **DESCRIPTION**

   Describe changes:

_____

_____

   Describe affected work:

_____

   List plan and spec sections:

_____

   Describe impacted activities:

_____

   Comment:

_____

3. **DATES**

   Need for change first known _____ By whom _____

   Contractor first notified _____ How _____

   Owner first notified _____

   Date approved or rejected _____ By whom _____

4. **RECOMMENDATION (cost and time)** _____

……

PROCEED ORDER

PROCEED ORDER NO.: _____ Date: _____

1. **PAYMENT/COST**

   Actual amount of change $_____ The contract time will be:

   Contractor amount $_____ ( ) increased ( ) decreased by _____ days

   Subcontractor amount $_____ ( ) will remain unchanged

   Type of payment (LS/T&M) _____

2. **MISCELLANEOUS**

   Subcontractors involved:

_____

   Major materials:

_____

   The cost is not to exceed $_____ Date: _____

3. **CHANGE REQUEST ACCEPTED BY:**

   Contractor: _____ Date: _____

   Architect: _____ Date: _____

   4J CIP Project Manager: _____ Date: _____

   4J CIP Program Manager: _____ Date: _____

   4J Facilities Director: _____ Date: _____

Without the signature of Facilities Director, or the acting Director, this Proceed Order is neither accepted or authorized, except by written authorization of other specific delegation.

END OF SECTION 01 25 00

SECTION 01 29 00

PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.

B. Related Sections include the following:
   1. Division 1 Section 01 25 00 "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
   2. Division 1 Section 01 32 00 "Construction Progress Documentation" for administrative requirements governing preparation and submittal of Contractor's Construction Schedule and Submittals Schedule.
   3. Division 1 Section 01 77 00 “Closeout Procedures” for final Application for Payment.

1.3 DEFINITIONS

A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.4 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the Schedule of Values with preparation of Contractor's Construction Schedule.
   1. Correlate line items in the Schedule of Values with other required administrative forms and schedules, including the following:
      a. Application for Payment forms with Continuation Sheets.
      b. Submittals Schedule.
      c. Contractor's Construction Schedule.
   2. Submit the Schedule of Values to Architect and Owner at earliest possible date but no later than seven days before the date scheduled for submittal of initial Application for Payment.

B. Format and Content: Use the Project Manual table of contents as a guide to establish line items for the Schedule of Values. Provide at least one line item for each Specification Section.
   1. Identification: Include the following Project identification on the Schedule of Values:
      a. Project name and location.
      b. Name of Architect.
      c. Architect's project number.
      d. Contractor's name and address.
      e. Date of submittal.
   2. Submit draft of AIA Document G703 Continuation Sheets.

3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Provide several line items for principal subcontract amounts, where appropriate.
4. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
5. Provide a separate line item in the Schedule of Values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
    a. Differentiate between items stored on-site and items stored off-site. If specified, include evidence of insurance or bonded warehousing.
6. Provide separate line items in the Schedule of Values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
7. Allowances: Provide a separate line item in the Schedule of Values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.
8. Each item in the Schedule of Values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.
    a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the Schedule of Values or distributed as general overhead expense, at Contractor's option.
9. Schedule Updating: Update and resubmit the Schedule of Values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.
10. Submit separate Schedule of Values for each School or otherwise identify Work at each School separately.

1.5 APPLICATIONS FOR PAYMENT

A. Each Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.
    1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.

B. Payment Application Forms: Use AIA Document G702 and AIA Document G703 Continuation Sheets as form for Applications for Payment.

C. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.
    1. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions were made.
    2. Include amounts of Change Orders issued before last day of construction period covered by application.
    3. Transmittal: Submit 2 signed and notarized original copy of each Application for Payment to Architect by a method ensuring receipt within 24 hours.

D. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
    1. List of subcontractors.
    2. Schedule of Values (draft submitted previously).
    3. Contractor's Construction Schedule (preliminary if not final).
    4. Products list.
    5. Schedule of unit prices.
    6. Submittals Schedule (based Architect’s list or required submittals).

7. List of Contractor's staff assignments.
8. Initial progress report.
9. Report of preconstruction conference.

E. Application for Payment at Substantial Completion: After Architect issues the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
   1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
   2. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

F. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
   1. Evidence of completion of Project closeout procedures (See itemized list in Section 01 77 00 “Closeout Procedures”).
   2. Updated final statement, accounting for final changes to the Contract Sum.
   3. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
   4. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
   5. AIA Document G707, "Consent of Surety to Final Payment."
   6. Evidence that claims have been settled.
   7. Final, liquidated damages settlement statement.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 29 00

SECTION 01 31 00

PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
   1. Administrative and supervisory personnel.
   2. Project meetings.

B. Related Sections include the following:
   1. Division 1 Section 01 32 00 "Construction Progress Documentation" for preparing and submitting Contractor's Construction Schedule.
   2. Division 1 Section 01 73 00 "Execution Requirements" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
   3. Division 1 Section 01 77 00 "Closeout Procedures" for coordinating Contract closeout.

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, which depend on each other for proper installation, connection, and operation.

   1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
   2. Coordinate installation of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair.
   3. Make adequate provisions to accommodate items scheduled for later installation.
   4. Where availability of space is limited, coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair of all components, including mechanical and electrical.

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

   1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.

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

1. Preparation of Contractor's Construction Schedule.
2. Preparation of the Schedule of Values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. 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 SUBMITTALS

A. Key Personnel Names: Within 15 days of Notice-to-Proceed, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including pager, cell, and office telephone numbers. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.

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. Schedule meeting dates and times with Owner and Architect.
2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
3. Minutes: Architect will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, within three days of receiving them from the Architect.

B. Preconstruction Conference: Owner’s Project Manager will schedule a preconstruction conference before starting construction, 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.

1. Attendees: Owner’s Project Manager, Architect, and their consultants, as required; 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 (see sample agenda at the end of Part 3):

a. Introduction of persons present.

b. Tentative construction schedule.
c. Phasing.
d. Critical work sequencing and long-lead items.
e. Designation of key personnel and their duties.
f. Procedures for processing field decisions and Change Orders.
g. Procedures for requests for interpretations (RFIs).
h. Procedures for testing and inspecting.
i. Procedures for processing Applications for Payment.
j. Distribution of the Contract Documents.
k. Communications.
l. Role of District's Project Manager.
m. Submittal procedures, including MSDS information.
n. Energy design requirements.
o. Preparation of Record Documents.
p. Use of the premises and existing building.
q. Work hours and restrictions.
r. Owner's occupancy requirements.
s. Responsibility for temporary facilities and controls.
t. Construction waste management and recycling.
u. Parking availability.
v. Office, work, and storage areas.
w. Equipment deliveries and priorities.
x. Safety and first aid.
y. Security.
z. Progress cleaning.

3. Minutes: Architect will record and distribute meeting minutes.
4. Statements made by the Contracting Agency's representative at the pre-construction conference are not binding upon the Contracting Agency unless confirmed by Written Addendum.

C. Preinstallation Conferences: When required by individual specification sections, conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.

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 and Owner's Project Manager a minimum of four days prior to scheduled meeting dates.
2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:

a. Contract documents.
b. Related requests for interpretations (RFIs).
c. Related Change Orders.
d. Purchases.
e. Deliveries.
f. Submittals.
g. Possible conflicts.
h. Compatibility problems.
i. Time schedules.
j. Weather limitations.
k. Manufacturer's written recommendations.
l. Warranty requirements.

m. Compatibility of materials.
n. Acceptability of substrates.
o. Space and access limitations.
p. Regulations of authorities having jurisdiction.
q. Testing and inspecting requirements.
r. Installation procedures.
s. Coordination with other work.
t. Required performance results.
u. Protection of adjacent work.

3. Contractor to record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
4. Distribute minutes of the meeting to each party present and to parties who should have been present, within three working days.
5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

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

1. Attendees: In addition to the Owner's Project Manager and Architect, each contractor, 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.
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. Provide in a format no larger than 11x17" and discuss a 3 week look-ahead schedule. The look-ahead schedule is required to be directly from the Project Master Schedule and to only show 3 weeks of work. 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.

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

1) Interface requirements.
2) Sequence of operations.
3) Status of submittals.
4) Deliveries.
5) Off-site fabrication.
6) Access.
7) Site utilization.
8) Temporary facilities and controls.
9) Work hours.
10) Hazards and risks.
11) Progress cleaning.
12) Quality and work standards.

13) Status of correction of deficient items.
14) Field observations.
15) Requests for interpretations (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: Architect will record and distribute to Contractor the meeting minutes.
4. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

Not Used.

PRECONSTRUCTION CONFERENCE AGENDA (SAMPLE)

Eugene School District 4J
[Enter Project Name]

[Date]

AGENDA

1. ( ) Introduction of Persons Present
   - ( ) District 4J
   - ( ) Consultants
   - ( ) Contractor (including job foreman)
   - ( ) Subcontractors

2. ( ) Availability of Contract Documents

3. ( ) Building Permit Status
   - ( ) Plan check and Building Permit paid by District
   - ( ) Pick up Permit at City of Eugene by Contractor
   - ( ) Location of site stored approved contract documents
   - ( ) Utility permits
   - ( ) LRAPA Permit

4. ( ) Prevailing Wage Requirements
   - ( ) Submittal schedule
   - ( ) Conformance with requirements

5. ( ) Communications
   - ( ) Notification of problems

6. ( ) Role of District's representative
   - ( ) Limits of authority
   - ( ) Visitation schedules

7. ( ) Work Description and Schedule
   - ( ) General work description
   - ( ) Proposed start date: _____
   - ( ) Proposed completion date: _____
   - ( ) Proposed project schedule and phasing
   - ( ) Progress schedule updates
   - ( ) Methods to be employed to maintain schedule
   - ( ) Work requiring Shop Drawings or submittals shall not commence until review is complete.

8. ( ) Submittals Required per Contract Documents
   - ( ) MSDS Information
   - ( ) Written proof of Asbestos Worker Certification
   - ( ) Name, Experience and Qualifications of Asbestos Supervisor
   - ( ) Copy of Contractor's Asbestos Abatement License
   - ( ) Other information as required by Section 01 31 00.
   - ( ) Schedule of values
   - ( ) List of subcontractors including name of contact person, telephone number, and address

9. ( ) Construction
    - ( ) Working hours
    - ( ) Use of premises/set up locations
    - ( ) Protection of existing facilities
    - ( ) Traffic and protection
    - ( ) Excavation and clean-up
    - ( ) Weather restrictions
    - ( ) Deviation from details and/or specifications

10. ( ) Correction of Defects
    - ( ) Daily and/or as observed

11. ( ) Weekly On-Site Progress Meetings
    - ( ) Establish day and time: Day _____Time _____
    - ( ) Provide updated project schedules
    - ( ) Discuss project progress, problems, etc.
    - ( ) Review applications for payment
    - ( ) Required attendance
    - ( ) Observation report distribution

12. ( ) Change Order Requests and Change Order Procedures
    - ( ) Written Change Order requests required
    - ( ) Supporting back-up will be required for all Change Orders
    - ( ) Mark-up limitations on Change Orders
        - ( ) Contractor - 15 percent
        - ( ) Subcontractors - 10 percent
    - ( ) Progressive requests and Change Orders
    - ( ) Processing time required

13. ( ) Applications for Payment
    - ( ) Use AIA documents G702 and G703 latest edition
    - ( ) Owner accepts electronic copy; plus provide one hard copy original signed and notarized.
    - ( ) Wage certifications to be attached

14. ( ) Safety and Emergency Procedures

15. ( ) Clean-up Daily
    - ( ) Project completion

16. ( ) Project Closeout
    - ( ) Inspections for
        - ( ) Air Clearance
        - ( ) AHERA Close Out Requirements
        - ( ) Substantial completion
            - ( ) Contractor provided list of items to be completed
            - ( ) Inspection with job foreman
        - ( ) Final Acceptance
            - ( ) Written notice from Contractor that all work is done and ready for inspection
            - ( ) Inspection with job foreman
        - ( ) Responsibility for cost of additional inspections
        - ( ) Submittals for Closeout
            - ( ) Final application for payment

( ) Final set of wage certifications
( ) Release of liens from all Subcontractors and General Contractor

17. ( ) Tour of Project Sites to Examine and Document Existing Conditions

18. ( ) Additional Comments

The undersigned acknowledges that the items listed above were discussed during this preconstruction conference and are fully understood.

Date:

A/E Firm:

Contractor:

Subcontractors:

END OF SECTION 01 31 00

SECTION 01 32 00

CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:

1. Preliminary Construction Schedule.
2. Contractor's Construction Schedule.
3. Submittals Schedule.

B. Related Sections include the following:

1. Division 1 Section 01 29 00 "Payment Procedures" for submitting the Schedule of Values.
2. Division 1 Section 01 31 00 "Project Management and Coordination" for submitting and distributing meeting and conference minutes.
3. Division 1 Section 01 33 00 "Submittal Procedures" for submitting schedules and reports.
4. Division 1 Section 01 40 00 "Quality Requirements" for submitting a schedule of tests and inspections.

1.3 SUBMITTALS

A. Submittals Schedule: Submit three copies of schedule. Arrange the following information in a tabular format.

1. Scheduled date for first submittal.
2. Specification Section number and title.
3. Submittal category (action or informational).
4. Name of subcontractor.
5. Description of the Work covered.
6. Scheduled date for Architect's final release or approval.

B. Contractor's Construction Schedule: Submit two opaque copies of initial schedule, large enough to show entire schedule for entire construction period.

1.4 COORDINATION

A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.

B. Coordinate Contractor's Construction Schedule with the Schedule of Values, list of subcontracts, Submittals Schedule, progress reports, payment requests, and other required schedules and reports.

1. Secure time commitments for performing critical elements of the Work from parties involved.
2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.1 SUBMITTALS SCHEDULE

A. Preparation: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, resubmittal, ordering, manufacturing, fabrication, and delivery when establishing dates.

1. Coordinate Submittals Schedule with list of subcontracts, the Schedule of Values, and Contractor's Construction Schedule.
2. Initial Submittal: List those required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's Construction Schedule.

2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

A. Time Frame: Extend schedule from date established for the Notice to Proceed to date of Final Completion.

B. Activities: Treat each floor or separate area as a separately numbered activity for each principal element of the Work

C. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.

D. Products Ordered in Advance: Include a separate activity for each product. Include delivery date indicated in Division 1 Section 01 11 00 "Summary of Work." Delivery dates indicated stipulate the earliest possible delivery date.

E. Owner-Furnished Products: Include a separate activity for each product. Include delivery date indicated in Division 1 Section 01 11 00 "Summary of Work." Delivery dates indicated stipulate the earliest possible delivery date.

F. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and Final Completion**.**

G. Cost Correlation: At the head of schedule, provide a cost correlation line, indicating planned and actual costs. On the line, show dollar volume of the Work performed as of dates used for preparation of payment requests.

2.3 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal Gantt-chart Contractor’s Construction Schedule within 10 days of date established for the Notice to Proceed. Base schedule on the Preliminary Construction Schedule and whatever updating and feedback was received since the start of Project. This schedule will be considered the Baseline Project Master Schedule for use throughout the project.

B. Preparation:

1. Each task to include the following minimum, data field/columns information:
   a. line/task ID or unique number, task name/description, task duration, start date, finish date, predecessor, successor, % complete.
   b. additional data field/columns may be included upon approval of Owner's Project Manager.
2. All tasks and milestones are to have a text description next to the Gantt bar and are required to show the logic bar ties to predecessor and successor tasks.
3. Any task with a duration longer than 10 working days and more than one trade working on the task, needs to be separated into tasks by individual trades.
4. Split the schedule up, at a minimum, by floor and sector, unless approved by Owner's Project Manager. Further separation of the schedule for sequencing needs the parent/blanket task description to indicate gridlines and level(s) included. No parent/blanket tasks for multiple levels or sectors unless they have no impact to the critical patch and the task description indicates the extent of work included.
5. Show any materials, equipment, contractors and submittals that have the potential to delay construction activities and indicate what work they have potential to impact by logic ties (predecessor and successor relationships).
6. Schedule is to be based on working days with the allotted hours necessary. If overtime is necessary to complete a task then it must be indicated.
7. Schedule must identify which items are on the critical path.
8. Hard copies for distribution are to be no larger than 11x17 format.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Contractor's Construction Schedule Updating: The schedule produced in section 2.3 is to be used for updating the Project Master Gantt schedule throughout the entire project. At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.
1. The baseline is to be indicated for all tasks tied to the critical path. Any tasks that subsequently become part of the critical path need to indicate the baseline activities also. Any change in critical path needs to be identified and discussed during the weekly project meeting.
2. Update each task to indicate the actual completion percentage at the time of schedule update, in 5% increments.
3. Hard copies are to be no larger than 11x17 format.
4. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
5. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.

B. Distribution: Distribute copies of approved schedule to Architect, Owner's Project Manager, testing and inspection agencies and other parties identified by the Contractor and owner with a need-to-know schedule responsibility.
1. Post copies in Project meeting room at the temporary field offices in a large enough format to be able to read the text and see the entire schedule without flipping sheets.

END OF SECTION 01 32 00

SECTION 01 33 00

SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

B. Related Sections include the following:

1. Division 1 Section 01 29 00 "Payment Procedures" for submitting Applications for Payment and the Schedule of Values.
2. Division 1 Section 01 31 00 "Project Management and Coordination" for submitting and distributing meeting and conference minutes and for submitting Coordination Drawings.
3. Division 1 Section 01 32 00 "Construction Progress Documentation" for submitting schedules and reports, including Contractor's Construction Schedule and the Submittals Schedule.
4. Division 1 Section 01 40 00 "Quality Requirements" for submitting test and inspection reports and for mockup requirements, if any.
5. Division 1 Section 01 77 00 "Closeout Procedures" for submitting warranties.
6. Division 1 Section 01 78 23 "Operation and Maintenance Data" for submitting operation and maintenance manuals.
7. Division 1 Section 01 78 39 "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
8. Divisions 2 through 49 Sections for specific requirements for submittals in those Sections.

1.3 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.

1.4 SUBMITTAL PROCEDURES

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

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.

B. Submittals Schedule: Comply with requirements in Division 1 Section 01 32 00 "Construction Progress Documentation" for list of submittals and time requirements for scheduled performance of related construction activities.

C. 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 14 calendar 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.

D. 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.

E. Deviations: Highlight, encircle, or otherwise specifically identify deviations from the Contract Documents on submittals.

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

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

a. Project name.
b. Date.
c. Destination (To:).
d. Source (From:).
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. Submittal and transmittal distribution record.
k. Remarks.
l. Signature of transmitter.

G. 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 “Reviewed without Exceptions."

H. 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.

I. Use for Construction: Use only final submittals with mark indicating “Reviewed without Exceptions” taken by Architect.

PART 2 - PRODUCTS

2.1 ACTION SUBMITTALS

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

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. Printed performance curves.
    h. Operational range diagrams.
    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.
    m. MSDS information, where applicable.

4. Submit Product Data before or concurrent with Samples.
5. Number of Copies: Submit the number required by the Contractor plus four (4) copies of Product Data, unless otherwise indicated. Architect will return two copies to Contractor and one to Owner. 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 in the Contract Documents. Include the following information, as applicable:

    a. Dimensions.
    b. Identification of products.
    c. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring.
    d. Schedules.
    e. Design calculations.
    f. Compliance with specified standards.
    g. Notation of coordination requirements.
    h. Notation of dimensions established by field measurement.
    i. Relationship to adjoining construction clearly indicated.
    j. Seal and signature of professional engineer if specified.

2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches but no larger than 30 by 40 inches.
3. 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 **c**opies, including one for the Owner's Project Manager; remainder will be returned. Mark up and retain one returned copy as a Project Record Drawing.

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

    c. Number of Samples: Submit three sets of Samples. Architect will retain two Sample sets; remainder will be returned.

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.
3. Test and Inspection Reports: Comply with requirements specified in Division 1 Section 01 40 00 "Quality Requirements."

B. Coordination Drawings: Comply with requirements specified in Division 1 Section 01 31 00 "Project Management and Coordination."

C. Contractor's Construction Schedule: Comply with requirements specified in Division 1 Section 01 32 00 "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. Schedule of Tests and Inspections: Comply with requirements specified in Division 1 Section 01 40 00 "Quality Requirements."

M. Preconstruction Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.

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 01 78 23 "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.

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.

T. Material Safety Data Sheets (MSDSs): Submit information directly to Owner; do not submit to Architect.

2.3 DELEGATED DESIGN

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

B. Delegated-Design Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit three 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.

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:

1. Reviewed without Exceptions.
2. Reviewed, with Exceptions Noted.
3. Revise and 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 01 33 00

SECTION 01 40 00

QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 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. Division 1 Section 01 32 00 "Construction Progress Documentation" for developing a schedule of required tests and inspections.
2. Divisions 2 through 49 Sections for specific test and inspection requirements.

1.3 CONFLICTING REQUIREMENTS

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

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

1.4 SUBMITTALS

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

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

1. Date of issue.
2. Project title and number.
3. Name, address, and telephone number of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
7. Identification of product and Specification Section.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and reinspecting.

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

1.5 QUALITY 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. Payment for these services will be made by Owner.
3. 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.
2. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
4. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

C. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Division 1 Section 01 33 00 "Submittal Procedures."

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.

1. Schedule times for tests, inspections, obtaining samples, and similar activities.

1.6 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 the Owner.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

A. Prepare a record of tests and inspections. Include the following:

1. Date test or inspection was conducted.
2. Description of the Work tested or inspected.
3. Date test or inspection results were transmitted to Architect.
4. Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at Project site. Post changes and modifications as they occur. Provide access to test and inspection log for Architect's reference during normal working hours.

3.2 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

1. Provide materials and comply with installation requirements specified in other Specification Sections. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible.

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 01 40 00

SECTION 01 50 00

TEMPORARY FACILITIES AND CONTROL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes requirements for temporary utilities, support facilities, and security and protection facilities.

B. Related Sections include the following:

1. Division 1 Section 01 11 00 "Summary of Work" for limitations on utility interruptions and other work restrictions.
2. Division 1 Section 01 33 00 "Submittal Procedures" for procedures for submitting copies of implementation and termination schedule and utility reports.
3. Division 1 Section 01 73 00 "Execution Requirements" for progress cleaning requirements.
4. Divisions 2 through 49 Sections for temporary heat, ventilation, and humidity requirements for products in those Sections.

1.3 DEFINITIONS

A. Permanent Enclosure: As determined by Architect, permanent or temporary roofing is complete, insulated, and weathertight; exterior walls are insulated and weathertight; and all openings are closed with permanent construction or substantial temporary closures.

1.4 USE CHARGES

A. General: Cost or use charges for temporary facilities shall be included in the Contract Sum. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Owner's construction forces, Architect, testing agencies, and authorities having jurisdiction.

1.5 SUBMITTALS

A. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.

1.6 QUALITY ASSURANCE

A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.

B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

1.7 PROJECT CONDITIONS

A. Temporary Use of Permanent Facilities: Installer of each permanent service shall assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Chain-Link Fencing: Minimum 2-inch (50-mm), 0.148-inch- (3.76-mm-) thick, galvanized steel, chain-link fabric fencing; minimum 6 feet (1.8 m) high with galvanized steel pipe posts; minimum 2-3/8-inch- (60-mm-) OD line posts and 2-7/8-inch- (73-mm-) OD corner and pull posts**,** with 1-5/8-inch- (42-mm-) OD top rails.

B. Portable Chain-Link Fencing: Minimum 2-inch (50-mm), 9-gage, galvanized steel, chain-link fabric fencing; minimum 6 feet (1.8 m) high with galvanized steel pipe posts; minimum 2-3/8-inch- (60-mm-) OD line posts and 2-7/8-inch- (73-mm-) OD corner and pull posts, with 1-5/8-inch- (42-mm-) OD top and bottom rails. Provide concrete bases for supporting posts.

C. Lumber and Plywood: Comply with requirements in Division 6

D. Gypsum Board: Minimum 1/2 inch (12.7 mm) thick by 48 inches (1219 mm) wide by maximum available lengths; regular-type panels with tapered edges. Comply with ASTM C 36/C 36M.

2.2 TEMPORARY FACILITIES

A. Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.

B. Common-Use Field Office: Of sufficient size to accommodate needs of construction personnel. Keep office clean and orderly. Furnish and equip offices as follows:

1. Furniture required for Project-site documents including file cabinets, plan tables, plan racks, and bookcases.
2. Conference room of sufficient size to accommodate meetings of 10 individuals. Provide electrical power service and 120-V ac duplex receptacles, with not less than 1 receptacle on each wall. Furnish room with conference table, chairs, and 4-foot-6 (1.2-m-) square tack board.
3. Drinking water and private toilet.
4. Coffee machine and supplies.
5. Heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 72 deg F (20 to 22 deg C).
6. Lighting fixtures capable of maintaining average illumination of 20 fc (215 lx) at desk height.

C. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.

D. Do not store materials within ten (10) feet of exterior walls, awnings, or other building overhangs.

E. Secure staging area with portable chain-link fencing.

F. Secure playground area with portable chain-link fencing prior to equipment installation by others.

2.3 EQUIPMENT

A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.

B. Heating Equipment: Unless Owner authorizes use of permanent heating system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.

1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
2. Heating Units: Listed and labeled for type of fuel being consumed, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.

B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION

A. General: Install temporary service or connect to existing service.

1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.

B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.

1. Connect temporary sewers to municipal system as directed by authorities having jurisdiction.

C. Water Service: Use of Owner's existing water service facilities will be permitted, as long as facilities are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.

D. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.

E. Heating: Provide temporary heating required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.

F. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.

G. Electric Power Service: Use of Owner's existing electric power service will be permitted, as long as equipment is maintained in a condition acceptable to Owner.

H. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.

1. Connect temporary service to Owner's existing power source, as directed by Owner.

I. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.

1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.
2. Install lighting for Project identification sign.

J. Telephone Service: Provide temporary telephone service in common-use facilities for use by all construction personnel. Install two telephone line(s) for each field office.

1. At each telephone, post a list of important telephone numbers.

a. Police and fire departments.
b. Ambulance service.
c. Contractor's home office.
d. Architect's office.
e. Engineers' offices.
f. Owner's office.
g. Principal subcontractors' field and home offices.

2. Provide superintendent with cellular telephone or portable two-way radio for use when away from field office.

3.3 SUPPORT FACILITIES INSTALLATION

A. General: Comply with the following:

1. Provide incombustible construction for offices, shops, and sheds located within construction area or within 30 feet (9 m) of building lines. Comply with NFPA 241.
2. Maintain support facilities until near Substantial Completion. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.

B. Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate for construction operations. Locate temporary roads and paved areas **as** indicated on Drawings.

1. Provide dust-control treatment that is nonpolluting and nontracking. Reapply treatment as required to minimize dust.

C. Traffic Controls: Comply with requirements of authorities having jurisdiction.

1. Protect existing site improvements to remain including curbs, pavement, and utilities.
2. Maintain access for fire-fighting equipment and access to fire hydrants.

D. Parking: Arrange for temporary parking areas for construction personnel.

E. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.

1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties nor endanger permanent Work or temporary facilities.
2. Remove snow and ice as required to minimize accumulations.

F. Project Identification and Temporary Signs: Provide Project identification and other signs as indicated on Drawings. Install signs where indicated to inform public and individuals seeking entrance to Project. Unauthorized signs are not permitted.

1. Provide temporary, directional signs for construction personnel and visitors.
2. Maintain and touchup signs so they are legible at all times.

G. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with Division 1 Section 01 77 00 "Execution Requirements" for progress cleaning requirements.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.

1. Comply with work restrictions specified in Division 1 Section 01 11 00 "Summary of Work."

B. Temporary Erosion and Sedimentation Control: Comply with requirements specified in Division 2 Section "Site Clearing", and requirements of authority having jurisdiction.

C. Stormwater Control: Comply with authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.

D. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.

E. Site Enclosure Fence: Before construction operations begin, furnish and install site enclosure fence in a manner that will prevent people and animals from easily entering site except by entrance gates.

1. Extent of Fence: As required to enclose entire Project site or portion determined sufficient to accommodate construction operations.
2. Maintain security by limiting number of keys and restricting distribution to authorized personnel. Provide Owner with one set of keys.

F. Security Enclosure and Lockup: Install substantial temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security.

G. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.

H. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.

1. Where heating or cooling is needed and permanent enclosure is not complete, insulate temporary enclosures.

I. Temporary Partitions: Provide floor-to-ceiling dustproof partitions to limit dust and dirt migration and to separate areas occupied by Owner from fumes and noise.

1. Construct dustproof partitions with gypsum wallboard with joints taped on occupied side, and fire-retardant plywood on construction operations side.
2. Insulate partitions to provide noise protection to occupied areas.
3. Seal joints and perimeter. Equip partitions with dustproof doors and security locks.
4. Protect air-handling equipment.
5. Weather strip openings.
6. Provide walk-off mats at each entrance through temporary partition.

J. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241.

1. Prohibit smoking in construction areas.
2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
4. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

3.5 OPERATION, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.

B. Maintenance: Maintain facilities in good operating condition until removal.

1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.

C. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

END OF SECTION 01 50 00

SECTION 01 60 00
PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 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 01 77 00 "Closeout Procedures" for submitting warranties for Contract closeout.
   2. Divisions 2 through 49 Sections for specific requirements for warranties on products and installations specified to be warranted.

1.3 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.

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

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

1.4 SUBMITTALS

A. Substitution Requests: Instructions to Bidders specify time restrictions for submitting requests for Substitutions during the bidding period, in compliance with this Section.

B. After execution of Agreement, the Owner may, at the Owner’s option, consider formal requests from the Contractor for substitution of products for those specified. One or more of the following conditions must be documented:
   1. Compliance with final interpretation of code requirements or insurance regulations which require that the use of a substituted Product.
   2. Unavailability of a specified Product through no fault of the Contractor.
   3. Inability of specified Product to perform properly of fit in designated place.
   4. Manufacturer’s or Fabricator’s refusal or inability of certify or guarantee performance of a specified Product in the application intended.

C. A Substitution Request constitutes a representation that the Bidder/Contractor:

1. Has investigated the proposed Product and determined that it meets or exceeds the quality level of the specified Product.
2. Will provide the same warranty for the Substituted Product as for the specified Product.
3. Will coordinate installation and make changes to the Work which may be required for the Work to be completed with no additional cost to the Owner.
4. Waives claims for additional costs or time extension which may subsequently become apparent.
5. Will reimburse the Owner for review or redesign services associated with re-approval by authorities.

D. Substitutions will not be considered when they are indicated or implied on Shop Drawings or Product Data Submittals, without separate request on the form provided, or when acceptance will require revision to the Contract Documents.

E. Submit three copies of each request for consideration. Limit each request to one proposed Substitution. 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 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. Provide MSDS information to confirm that the product is no more harmful that he products specified.
    f. Samples, where applicable or requested.
    g. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
    h. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
    i. Research/evaluation reports evidencing compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.
    j. 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.
    k. Cost information, including a proposal of change, if any, in the Contract Sum.
    l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents and is appropriate for applications indicated.
    m. 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.

1.5 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.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

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

B. Delivery and Handling:

1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products on delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.

C. Storage:

1. Store products to allow for inspection and measurement of quantity or counting of units.
2. Store materials in a manner that will not endanger Project structure.
3. Store products that are subject to damage by the elements, under cover in a 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.
8. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.
9. Provide bonded and insured off-site storage and protection when site does not permit on-site storage and protection.

1.7 PRODUCT WARRANTIES

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

1. Manufacturer's Warranty: Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
2. Special Warranty: Written warranty required by or incorporated into the Contract Documents, either to extend time limit provided by manufacturer's warranty or to provide more rights for Owner.

B. Submittal Time: Comply with requirements in Division 1 Section 01 77 00 "Closeout Procedures."

PART 2 - PRODUCTS

Not Used.

PART 3 – EXECUTION

Not Used.

SECTION 01 60 00
PRODUCT REQUIREMENTS

SUBSTITUTION REQUEST FORM

TO: GMA Architects
860 W. Park St Suite 300
Eugene, OR 97401

DEADLINE: March 14, 2020

PROJECT: Kelly Middle School Improvements and North Eugene High School Improvements
CIP # 461.524.003
Eugene School District 4J

SPECIFIED ITEM: _____ _____ _____
Section No. Paragraph Description

The Undersigned requests consideration of the following substitution:

_____

The Undersigned states that the following paragraphs are true, except where noted otherwise:

1. The function, appearance and quality of the proposed substitution are equivalent or superior to the specified item;
2. The proposed substitution does not affect dimensions shown on the Drawings;
3. The Undersigned will pay for changes to the building design, including engineering and design services, detailing and construction costs caused by the requested substitution;
4. The proposed substitution will have no adverse effect on other trades, the construction schedule, or specified warranty requirements;
5. Maintenance and service parts will be locally available for the proposed substitution;
6. The Undersigned has attached data concerning the proposed substitution, including: Manufacturers product description, specifications, drawings, photographs, performance and test data, adequate for evaluation of the request, with applicable portions of the data clearly indicated. Attachments also include description of changes to Contract Documents which the proposed substitution will require for its proper installation.

Submitted by: _____ Signature: _____ Firm: _____ Address: _____ Date: _____ Tel: _____ Fax: _____ Attachments: _____	For use by Architect: ☐ Approved ☐ Approved as noted. ☐ Not Approved ☐ Received too late By: _____ Date: _____ For use by 4J Project Manager: ☐ Approved ☐ Approved as noted. ☐ Not Approved ☐ Received too late By: _____ Date: _____

END OF SECTION 01 60 00

SECTION 01 73 00
EXECUTION REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 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 01 31 00 "Project Management and Coordination" for procedures for coordinating field engineering with other construction activities.
2. Division 1 Section 01 33 00 "Submittal Procedures" for submitting surveys.
3. Division 1 Section 01 77 00 "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.

1.3 SUBMITTALS

A. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.

B. Final Property Survey: Submit 2 copies showing the Work performed and record survey data.

1.4 QUALITY ASSURANCE

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

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 and Owner's Project Manager promptly.
   1. General: Engage a land surveyor to lay out the Work using accepted surveying practices.

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

C. 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.

D. 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 and Owner's Project Manager.

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.

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.

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 seven feet in spaces without a suspended ceiling.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated. Bring any conflicts to the Architect for review.

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. 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.

F. 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.

G. 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 where possible. Obtain Architect and Owner’s Project Manager approval for all questionable conditions.

H. 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 (27 deg C).
3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to applicable 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 safety and 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.

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 01 40 00 "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.

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 01 73 00

SECTION 01 73 29
CUTTING AND PATCHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes procedural requirements for cutting and patching.

B. Related Sections include the following:

1. Division 1 Section 01 31 00 – “Project Management and Coordination” for pre- construction and pre-installation conferences.
2. Division 2 Section "Demolition" for demolition of selected portions of the building.
3. Divisions 2 through 49 Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.

1.3 DEFINITIONS

A. Cutting: Removal of in-place construction necessary to permit installation or performance of other Work.

B. Patching: Fitting and repair work required to restore surfaces to original conditions after installation of other Work.

1.4 SUBMITTALS

A. Cutting and Patching Proposal: Submit a written request describing procedures prior to the time cutting and patching will be performed, requesting approval to proceed, for cutting or alteration which affects:
1. Structural integrity of any element of Project.
2. Integrity of weather-exposed or moisture-resistant element.
3. Efficiency, maintenance, or safety of any operational element.
4. Visual qualities of site-exposed elements.
5. Work of Owner or separate contractor.

B. Include the following information:
1. Identification of Project and CIP number
2. Location and description of the affected Work.
3. Necessity for cutting or alteration.
4. Description of proposed Work and Products to be used.
5. Alternatives to cutting and patching.
6. Effect on work of Owner or separate contractor.
7. Written permission of affected separate contractor, if any.
8. date and time work will be executed.

1.5 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.
   1. 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.
   2. 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**.**

B. 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.

1.6 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: Use materials identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

   1. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.

   1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with in-place finishes or primers.
   2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Temporary Support: Provide temporary support of Work to be cut.

B. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

D. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to minimize interruption to occupied areas.

3.3 PERFORMANCE

A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
3. Concrete 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 2 Sections where required by cutting and patching operations.
5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
6. Proceed with patching after construction operations requiring cutting are complete.

C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.

    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.

a. 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.

4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.

D. Cleaning: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.

END OF SECTION 01 73 29

SECTION 01 77 00

CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 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 include the following:

1. Division 1 Section 01 29 00 "Payment Procedures" for requirements for Applications for Payment for Substantial and Final Completion.
2. Division 1 Section 01 73 00 "Execution Requirements" for progress cleaning of Project site.
3. Division 1 Section 01 78 23 "Operation and Maintenance Data" for operation and maintenance manual requirements.
4. Division 1 Section 01 78 39 "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
5. Divisions 2 through 49 Sections for specific closeout and special cleaning requirements for the Work in those Sections.

1.3 SUBSTANTIAL COMPLETION

A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete in request.

1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
2. Advise Owner of pending insurance changeover requirements.
3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
4. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
5. Prepare and submit Project Record Documents, operation and maintenance manuals, damage or settlement surveys, property surveys, and similar final record information.
6. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
7. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
8. Complete startup testing of systems.
9. Submit test/adjust/balance records.

10. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
11. Advise Owner of changeover in heat and other utilities.
12. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
13. Complete final cleaning requirements, including touchup painting.
14. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

B. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Architect and Owner's Project Manager 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.

1.4 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. Submit the following completed forms, items and documents:
    a. AIA Document G706 Contractor's Affidavit of Payment of Debts and Claims.
    b. AIA Document G706A Contractor's Affidavit of Release of Liens.
    c. AIA Document G707 Consent of Surety Company to Final Payment.
    d. Operation and Maintenance Manuals
    e. Warranties and Bonds. Submit original documents, including Contractor's General Warranty,
    f. Record Documents.
    g. Keys.
    h. Testing and Start-Up records.
    i. Affidavit of Prevailing Wages paid.
    j. Complete list of Contractor and all Subcontractors with address, phone numbers, and work
    k. Asbestos-Containing Materials Statement (Form 01100B).
    l. Proof of final acceptance and compliance from governing authorities having jurisdiction.
    m. Certificate of insurance evidencing continuation of liability coverage including coverage for completed operations until the expiration of the specified warranty periods.
5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.

B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Architect and Owner's Project Manager will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

2. Cost of additional re-inspections by Architect and Owner's Project manager will be deducted from Final Payment to the Contractor.

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 10 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-by-11-inch (215-by-280-mm) 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

MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 FINAL CLEANING

A. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:

a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
d. Remove tools, construction equipment, machinery, and surplus material from Project site.
e. Remove snow and ice to provide safe access to building.
f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
h. Sweep concrete floors broom clean in unoccupied spaces.
i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
k. Remove labels that are not permanent.
l. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.

    1) Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.

m. Wipe surfaces of mechanical and electrical equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
n. Replace parts subject to unusual operating conditions.
o. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
p. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
q. Clean ducts, blowers, and coils if units were operated without filters during construction.
r. 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.
s. Leave Project clean and ready for occupancy.

C. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.

END OF SECTION 01 77 00

SECTION 01 78 23

OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 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. Emergency manuals.
3. Operation manuals for systems, subsystems, and equipment.
4. Maintenance manuals for the care and maintenance of products, material, finishes, systems, and equipment.

B. Related Sections include the following:

1. Division 1 Section 01 33 00 "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.
2. Division 1 Section 01 77 00 "Closeout Procedures" for submitting operation and maintenance manuals.
3. Division 1 Section 01 78 39 "Project Record Documents" for preparing Record Drawings for operation and maintenance manuals.
4. Divisions 2 through 49 Sections for specific operation and maintenance manual requirements for the Work in those Sections.

1.3 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.

1.4 SUBMITTALS

A. Initial Submittal: Submit 2 draft copies of each manual at least 15 working days before requesting inspection for Final 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 2 hard copies and one electronic copy of each corrected manual within 15 days of receipt of Architect's comments.

1.5 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.
2. List of systems.
3. List of equipment.
4. List of all subcontractors and material suppliers, including names, addresses and phone numbers.
5. 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 emergency, operation, and maintenance manual.

E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with 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.

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 (215-by-280-mm) paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.

a. 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 a Table of Contents for each volume with a list of products and major components of equipment included in the section on the face of 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 media for computerized electronic equipment.
4. Supplementary Text: Prepared on 8-1/2-by-11-inch (215-by-280-mm) 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 EMERGENCY MANUALS

A. Content: Organize manual into a separate section for each of the following:

1. Type of emergency.
2. Emergency instructions.
3. Emergency procedures.

B. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:

1. Fire.
2. Flood.
3. Gas leak.

4. Water leak.
5. Power failure.
6. Water outage.
7. System, subsystem, or equipment failure.
8. Chemical release or spill.

C. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.

D. Emergency Procedures: Include the following, as applicable:

1. Instructions on stopping.
2. Shutdown instructions for each type of emergency.
3. Operating instructions for conditions outside normal operating limits.
4. Required sequences for electric or electronic systems.
5. Special operating instructions and procedures.

2.4 OPERATION MANUALS

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. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

C. Operating Procedures: Include the following, as applicable:

1. Startup procedures.
2. Equipment or system break-in procedures.
3. Routine and normal operating instructions.
4. Regulation and control procedures.
5. Instructions on stopping.

6. Normal shutdown instructions.
7. Seasonal and weekend operating instructions.
8. Required sequences for electric or electronic systems.
9. Special operating instructions and procedures.

D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

2.5 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.
5. Repair instructions.
6. Contact information.

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.

2.6 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, including disassembly and component removal, replacement, and assembly.
3. Identification and nomenclature of parts and components.
4. List of items recommended to be stocked as spare parts.

D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:

1. Test and inspection instructions.
2. Troubleshooting guide.
3. Precautions against improper maintenance.
4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
5. Aligning, adjusting, and checking instructions.
6. Demonstration and training 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.

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. 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 emergency, operation, and maintenance manuals.

B. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.

C. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

D. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.

1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.
3. Electronic Copy: Provide a single PDF file with bookmarks matching tabbed sections in Binders.

E. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.

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.

F. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in Record Drawings to ensure correct illustration of completed installation.

1. Do not use original Project Record Documents as part of operation and maintenance manuals.
2. Comply with requirements of newly prepared Record Drawings in Division 1 Section 01 78 39 "Project Record Documents."

G. Comply with Division 1 Section 01 77 00 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION 01 78 23

SECTION 01 78 39

PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 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.

B. Related Sections include the following:
1. Division 1 Section 01 77 00 "Closeout Procedures" for general closeout procedures.
2. Division 1 Section 01 78 23 "Operation and Maintenance Data" for operation and maintenance manual requirements.
3. Divisions 2 through 49 Sections for specific requirements for Project Record Documents of the Work in those Sections.

1.3 SUBMITTALS

A. Record Drawings: Comply with the following:

1. Number of Copies: Submit copies of Record Drawings as follows:
   a. Final Submittal: Submit one set of marked-up Record Prints (not “Job Shack” set).

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 blue- or black-line white prints of the Contract Drawings and Shop Drawings.

1. Preparation: Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.

a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
b. 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.
k. Changes made following Architect's written orders.
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 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. Record Transparencies: Organize into unbound sets matching Record Prints. Place transparencies in durable tube-type drawing containers with end caps. Mark end cap of each container with identification. If container does not include a complete set, identify Drawings included.
3. Identification: As follows:

a. Project name.
b. Date.
c. Designation "PROJECT RECORD DRAWINGS."
d. Name of Architect and Owner’s Project Manager.
e. Name of Contractor.

2.2 RECORD SPECIFICATIONS

A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.

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.
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 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 and Owner’s Project Manager’s reference during normal working hours.

END OF SECTION 10 78 39

KELLY MIDDLE SCHOOL IMPROVEMENTS TECHNICAL SPECIFICATIONS

SECTION 02 41 00
DEMOLITION

PART 1 – GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

A. Cutting and Patching
B. Temporary Facilities and Controls

1.2 EXTENT OF WORK

A. Perform demolition required for completion of new work as shown on drawings or specified. Remove existing construction at areas shown for new work. Remove loose material caused by or remaining from demolition work.

1.3 ALTERATIONS TO EXISTING CONSTRUCTION

A. Remove portions of existing work only as required to install new materials as specified and as shown on drawings. Repair or replace those portions of existing work outside of new work damaged as result of new work. Repairs or replacement work shall reinstate damaged areas to match original conditions.

1.4 REQUIREMENTS OF REGULATORY AGENCIES

A. Coordinate work with Utility companies, Municipal and State agencies as required.
B. Comply with applicable jurisdictional standards, including but not limited to:
   1. Occupational Safety and Health Administration (OSHA)
   2. Oregon Occupational and Health Administration (OR-OSHA)
   3. National Emission Standards for Hazardous Air Pollutants (NESHAPS)
   4. National Institute for Occupational Safety and Health (NIOSH)
   5. Department of Environmental Quality (DEQ)
   6. Lane Regional Air Pollution Authority (LRAPA)
C. Comply with Oregon Administrative Rules (OAR) Chapter 437, for hazardous material communication procedures. Post Material Data Safety Sheets (MSDS) on site in conspicuous location.
D. Dispose of materials contaminated with lead, asbestos, mercury and other heavy metals according to Federal, State and Local jurisdictional regulations.

1.5 CODES AND STANDARDS

A. Conform with applicable portions of National Electric Code, latest edition, and other applicable codes within the jurisdiction of the work.

1.6 PERMITS

A. Obtain and pay for necessary permits and inspections required by local and state authorities having jurisdiction. Make such tests as may be required by law.

1.7 ENVIRONMENTAL CONDITIONS

A. Conduct demolition to minimize interference with adjacent building areas.
B. Provide, erect and maintain temporary barriers and safety devices to ensure protection including ground protection to prevent soil contamination.

1.8 COORDINATION

A. Coordinate with other trades affecting or affected by Work of Section.
B. Coordinate demolition with Owner's Representative.

1.9 PROTECTION

A. Protect portions of existing building and facilities against damage and discoloration.
B. Protect active utilities and maintain in continuous operation.
C. Provide barriers as required to protect public from areas under demolition.

PART 2 – PRODUCTS

2.1 SALVAGE

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A. All salvage except items specifically noted becomes property of Contractor. Salvage may be reused on Work if so specified or scheduled or if Architect judges it equal to new products specified, with the appropriate adjustment in contract sum. Remove material from site.

PART 3 – EXECUTION

3.1 REVIEW OF EXISTING CONDITIONS

A. Visit project site and review existing conditions affecting Work before submitting Bid Proposal.

3.2 PREPARATION

A. Erect and maintain temporary barriers to prevent spread of dust, fumes, noise, and smoke.
B. Protect existing items that are not indicated to be altered.

3.3 DEMOLITION

A. Demolish in orderly and careful manner.
B. Protect existing work to remain.
C. Except where noted otherwise, immediately remove demolished material from site.
D. Remove materials to be reinstalled or retained in manner to prevent damage.
E. Remove, store, and protect for reinstallation materials and equipment listed on the drawings accordingly.
F. Remove and promptly dispose of contaminated, vermin infested, or dangerous materials encountered.
G. Remove demolished materials from site as work progresses.
H. Do not burn or bury materials on site.
J. Leave areas of work in clean condition.

3.4 CLEANING AND REPAIRING

A. Do not allow debris to accumulate in building or on site - haul away from site as soon as removed and dispose of at Contractor's expense.
B. Clean, repair, touch up, or replace when directed, adjacent surfaces which have been soiled, discolored, or damaged by work of Section.

END OF SECTION 02 41 00

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SECTION 03 20 00
CONCRETE REINFORCEMENT

PART I - GENERAL

1.1 SECTION INCLUDES

A. Reinforcing steel for cast-in-place concrete.
B. Supports and accessories for steel reinforcement.

1.2 RELATED SECTIONS

A. Section 03 30 00 - Concrete

1.3 REFERENCES

A. ACI 301 - Specifications for Structural Concrete for Buildings; American Concrete Institute International
B. ACI SP-66 & ACI 315 Detailing Manual; American Concrete Institute International;
C. ASTM A 82 - Standard Specification for Steel Wire, Plain, for Concrete Reinforcement;
D. ASTM A 615/A 61 SM - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement;
F. CRSI (DA4) - Manual of Standard Practice; Concrete Reinforcing Steel Institute

1.4 QUALITY ASSURANCE

A. Perform work of Section in accordance with ACI 301.

PART 2 - PRODUCTS

2.1 REINFORCEMENT

A. Reinforcing Steel: ASTM A 615/A 61 SM Grade 60 (420).
   1. Plain billet-steel bars.
   2. Unfinished.
B. Reinforcement Accessories:
   1. Tie Wire: Annealed, minimum 16 gage.
   2. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement.
C. Weldable bar #4 through #8 per ASTM A706, Grade 60.

2.2 FABRICATION

A. Fabricate concrete reinforcing in accordance with CRSI (DA4) - Manual of Standard Practice.
B. Welding of reinforcement is not permitted.

PART 3 - EXECUTION

3.1 PLACEMENT

A. Place, support and secure reinforcement against displacement.
B. Maintain 1½ inches concrete cover around reinforcing, with minimum 3 inches when placed against earth; 2 inches when concrete exposed to weather.
C. Conform to OSSC and ACI 301 for concrete cover over reinforcement.
D. Splices - maintain lap minimum of 48 bar diameters, for tension and other bar placements.
E. Field bending of bent bars requires approval by Architect.

END OF SECTION 03 20 00

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SECTION 03 30 00
CONCRETE

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Concrete slabs and foundations.
B. Accessories such as joint devices and below-grade vapor barriers.
C. Concrete curing.

1.2 RELATED SECTIONS

A. Section 03 20 00, Concrete Reinforcing

1.3 REFERENCES

A. ACI 301 - Specifications for Structural Concrete for Buildings; American Concrete Institute International
B. ACI 302.1 R - Guide for Concrete Floor and Slab Construction; American Concrete Institute International
C. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete; American Concrete Institute International
D. ACI 306R - Cold Weather Concreting; American Concrete Institute International
E. ACI 308 - Standard Practice for Curing Concrete; American Concrete Institute International
F. ACI 318- Building Code Requirements for Reinforced Concrete and Commentary; American Concrete Institute International
G. ASTM C 33-Standard Specification for Concrete Aggregates
H. ASTM C 39/C 39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
J. ASTM C ISO-Standard Specification for Portland cement
K. ASTM C 260- Standard Specification for Air-Entraining Admixtures for Concrete
L. ASTM C 309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
M. ASTM C 494/C 494M - Standard Specification for Chemical Admixtures for Concrete; 1 999a.

1.4 SUBMITTALS

A. See Section 01 30 00- Administrative Requirements, for submittal procedures.
B. Concrete Mix Design
    1. Minimum 28 day compressive strengths.
    2. Proportioning Normal Weight Concrete: Comply with ACI 211.1.
    3. Concrete Strength: Establish required average strength for each type of concrete on basis of field experience or trial mixtures, as specified in OSSC 1905
    4. Provide concrete mix design along with recent test results indicating mix design exceeding specified performance strengths
    5. Admixtures: Add acceptable admixtures as recommended in ACI 211.1 at rates recommended by manufacturer.
    6. Supplier is responsible for achieving or exceeding concrete design strengths.
    7. Adjust cement ratio when mix calls for air entrainment.
    8. Maximum water to cement ration: 0.46
    9. Maximum slump interior mix: 4 inches. 7 inches with water-reducing agents.
    10. Maximum slump exterior mix: 5 inches.

1.5 QUALITY ASSURANCE

A. Perform work of this section in accordance with ACI 301 and ACI 318.
B. Follow recommendations of ACI 306R when concreting during cold weather.

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PART 2 – PRODUCTS

2.1 CONCRETE MATERIALS

A. Cement: ASTM C 150, Type I - Normal Portland type.

B. Fine and Coarse Aggregates: ASTM C 33.
C. Water: Clean and not detrimental to concrete.

2.2 ADMIXTURES

A. Air Entrainment Admixture: ASTM C 260. Add 6% air entrainment for concrete exposed to freeze/thaw cycles.
B. Optional "Superplasticizer" Admixtures: ASTM C 494, Type A - Water Reducing.
C. Admixtures: Do not use calcium chloride admixtures.

2.3 CONCRETE ACCESSORIES

A. Liquid Curing Compound: ASTM C 309, Type 1, clear or translucent.
   1. Provide: Burke Sparten Coat; Horn Clearseal 20; Masco 12% Cure and Seal; Sonneborn Kure and Seal; or approved.

2.4 JOINT DEVICES AND MATERIALS

A. Joint Filler: ASTM 0 1751; Asphalt impregnated fiberboard or felt, ½ inch thick.

2.5 BELOW-GRADE VAPOR BARRIER

A. Sheet Vapor Barrier:
   1. Material: Polyolefin vapor retarder meeting ASTM E1745 Class A.
      a. Minimum Thickness: 15-mil.
      b. Perm Rating: 0.01 or less after conditioning, tested to ASTM E 154.
   2. Manufacturers:
      a. Stego Industries Stego Wrap, Fortifiber Corp. Moistop, Reef Industries Griffolyn, WR Meadows Perminator, or approved.

2.6 CONCRETE STRENGTHS

A. Exterior footings, retaining walls and slabs – 3,500 psi, minimum 28 day compressive strength.
B. Interior footings, stem walls, trenches and slabs - 3,000 psi min. 28 day compressive strength.
C. Non-structural concrete, including sidewalks and curbs - 2,500 psi - with no special inspection.

PART 3 – EXECUTION

3.1 PLACING CONCRETE

A. Place concrete in accordance with ACI 304R.
B. Place concrete for slabs in accordance with ACI 302.1 R.
C. Ensure reinforcement, inserts, waterstops, embedded parts, and formed construction joint devices will not be disturbed during concrete placement.
D. Do not interrupt successive placement; do not permit cold joints to occur.

3.2 CONCRETE FINISHING

A. Repair surface defects, including tie holes, immediately after removing formwork.
B. Unexposed Form Finish: Rub-down or chip off fins or other raised areas ¼ inch or more in height.
C. Concrete Slabs: Finish to requirements of ACI 302.1 R, and as follows:
   1. Exterior concrete slabs: heavy-broom, detectable warning.
D. Provide 1/4 inch radius at exposed outside concrete corners unless otherwise detailed.
E. Make sawn control joints when concrete will not be damaged by saw blade and before random shrinkage cracking begins. Hand-tool continuation of control joints at vertical surfaces or where conditions do not permit completion of machine sawing.

3.3 CURING AND PROTECTION

A. Comply with requirements of ACI 308. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
   1. Normal concrete: Not less than 7 days.
C. Surfaces Not in Contact with Forms:

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1. Start initial curing as soon as free water has disappeared and before surface is dry. Keep continuously moist for not less than three days by water ponding, water-saturated sand, water-fog spray, or saturated burlap.
2. Begin final curing after initial curing but before surface is dry.

D. Protect retaining walls from heavy equipment vibration by maintaining horizontal no-traffic boundary equal to height of wall.

3.4 FIELD QUALITY CONTROL

A. Submit proposed mix design of each class of concrete to inspection and testing firm for review prior to commencement of concrete operations.

B. Tests of concrete and concrete materials may be performed at any time to ensure conformance with specified requirements.

C. Compressive Strength Tests: ASTM C 39/C 39M. For each test, mold and cure three concrete test cylinders. Obtain test samples for every 100 cubic yards, or less of each class of concrete placed.

D. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.

F. Perform one slump test for each set of test cylinders taken.

3.5 DEFECTIVE CONCRETE

A. Defective Concrete: Concrete not conforming to required lines, details, dimensions, tolerances, appearances, textures or specified requirements.

1. Repair or replacement of defective concrete will be determined by Architect. Cost of additional testing shall be borne by Contractor when defective concrete is identified.

END OF SECTION 03 30 00

SECTION 03 54 00

CAST UNDERLAYMENT

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Liquid-applied self-leveling floor underlayment.

B. Related Requirements:
   1. Section 01 70 00 - Execution and Closeout Requirements: Alteration project procedures; selective demolition for remodeling.

1.2 REFERENCE STANDARDS

A. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or (50-mm) Cube Specimens); 2013.

B. ASTM C348 - Standard Test Method for Flexural Strength of Hydraulic-Cement Mortars; 2014.

C. ASTM C472 - Standard Test Methods for Physical Testing of Gypsum, Gypsum Plasters and Gypsum Concrete; 1999 (Reapproved 2014).

D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2014.

1.3 SUBMITTALS

A. Product Data: Provide manufacturer's data sheets documenting physical characteristics and product limitations of underlayment materials. Include information on surface preparation, environmental limitations, and installation instructions.

B. Certificate: Certify that products meet or exceed specified requirements.

1.4 QUALITY ASSURANCE

A. Applicator Qualifications: Company specializing in performing the work of this section, and approved by manufacturer.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Keep dry and protect from direct sun exposure, freezing, and ambient temperature greater than 105 degrees F.

1.6 FIELD CONDITIONS

A. Do not install underlayment until floor penetrations and peripheral work are complete.

B. Maintain minimum ambient temperatures of 50 degrees F 24 hours before, during and 72 hours after installation of underlayment.

C. During the curing process, ventilate spaces to remove excess moisture.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Cast Underlayments, General:
   1. Conform to applicable code for combustibility or flame spread requirements.
   2. Provide certificate of compliance from authority having jurisdiction indicating approval of underlayment materials in the required fire rated assembly.

B. Gypsum-Based Underlayment: Gypsum based mix, that when mixed with water in accordance with manufacturer's directions will produce self-leveling underlayment with the following properties:
   1. Compressive Strength: Minimum 2500 psi, tested per ASTM C472.
   2. Density: Maximum 115 lb/cu ft.
   3. Final Set Time: 1 to 2 hours, maximum.
   4. Thickness: 3/4 inch to maximum 3-1/2 inch.
   5. Surface Burning Characteristics: Flame spread/Smoke developed index of 0/0 in accordance with ASTM E84.

C. Cementitious Underlayment: Blended cement mix, that when mixed with water in accordance with manufacturer's directions will produce self-leveling underlayment with the following properties:
   1. Compressive Strength: Minimum 4000 psi after 28 days, tested per ASTM C109/C109M.
   2. Flexural Strength: Minimum 1000 psi after 28 days, tested per ASTM C348.
   3. Density: 125 lb/cu ft, nominal.
   4. Final Set Time: 1-1/2 to 2 hours, maximum.
   5. Thickness: Capable of thicknesses from feather edge to maximum 3-1/2 inch.
   6. Surface Burning Characteristics: Flame spread/Smoke developed index of 0/0 in accordance with ASTM E84.

D. Aggregate: Dry, well graded, washed silica aggregate, approximately 1/8 inch in size and acceptable to underlayment manufacturer.

E. Reinforcement: Galvanized metal lath complying with recommendations of underlayment manufacturer for specific project circumstances.

F. Water: Potable and not detrimental to underlayment mix materials.

G. Primer: Manufacturer's recommended type.

H. Joint and Crack Filler: Latex based filler, as recommended by manufacturer.

2.2 MIXING

A. Site mix materials in accordance with manufacturer's instructions.

B. Add aggregate for areas where thickness will exceed 1/2 inch. Mix underlayment and water for at least two minutes before adding aggregate, and continue mixing to assure that aggregate has been thoroughly coated.

C. Mix to self-leveling consistency without over-watering.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify that substrate surfaces are clean, dry, unfrozen, do not contain petroleum byproducts, or other compounds detrimental to underlayment material bond to substrate.

3.2 PREPARATION

A. Concrete: Mechanically prepare steel troweled concrete to create a textured surface necessary to achieve the best bond; acceptable methods include bead blasting and scarifying. Do not use acid etching.

B. Remove substrate surface irregularities. Fill voids and deck joints with filler. Finish smooth.

C. Vacuum clean surfaces.

D. Prime substrate in accordance with manufacturer's instructions. Allow to dry.

E. Close floor openings.

3.3 APPLICATION

A. Install underlayment in accordance with manufacturer's instructions.

B. Pump or pour material onto substrate. Do not retemper or add water.
   1. Pump, move, and screed while the material is still highly flowable.
   2. Be careful not to create cold joints.
   3. Wear spiked shoes while working in the wet material to avoid leaving marks.

C. Place to indicated thickness, with top surface level to 1/8 inch in 10 ft.

D. For final thickness over 1-1/2 inches, place underlayment in layers. Allow initial layer to harden to the point where the material has lost its evaporative moisture. Immediately prime and begin application of the subsequent layer within 24 hours.

E. Place before partition installation.

F. Where additional aggregate has been used in the mix, add a top layer of neat mix (without aggregate), if needed to level and smooth the surface.

G. If a fine, feathered edge is desired, steel trowel the edge after initial set, but before it is completely hard.

3.4 CURING

A. Once underlayment starts to set, prohibit foot traffic until final set has been reached.

B. Air cure in accordance with manufacturer's instructions.

3.5 FIELD QUALITY CONTROL

A. An independent testing agency will perform field inspection and testing, as specified in Section 01 40 00.

B. Placed Material: Agency will inspect and test for conformance to specification requirements.

3.6 PROTECTION

A. Protect against direct sunlight, heat, and wind; prevent rapid drying to avoid shrinkage and cracking.

B. Do not permit traffic over unprotected floor underlayment surfaces.

END OF SECTION 03 54 00

ROUGH CARPENTRY
SECTION 06 10 00

PART 1 – GENERAL

1.1 DESCRIPTION

A. Section specifies wood blocking, framing, sheathing, furring, nailers, rough hardware, and light wood construction.

1.2 RELATED SECTIONS

A. Finish Carpentry - Section 06 20 00
B. Composition Siding – Section 07 46 43.

1.3 PRODUCT DELIVERY, STORAGE & HANDLING

A. Protect lumber and other products from dampness both during and after delivery at site.
B. Pile lumber to provide air circulation around surfaces of each piece.
C. Stack plywood and other board products to prevent warping.
D. Locate stacks on well-drained areas, supported at least 6 inches above grade and cover with to protect lumber from moisture.

1.4 REFERENCES

A. WCLIB - West Coast Lumber Inspection Bureau
B. WWPA - Western Wood Products Association

PART 2 – PRODUCTS

2.1 LUMBER

A. Provide dimensional lumber of grades indicated according to American Lumber Standards Committee National Grading Rule provisions of grading agency indicated.
   1. Douglas Fir, 19% Maximum Moisture Content when installed.
B. Wall Studs and Plates
   1. No. 2 grade, S-Dry
C. Plates, Blocks, Light Framing and Misc.
   1. No. 2, S-Dry
D. Furring, blocking, nailers and similar items 2 inches nominal and narrower No. 2 grade; and, members 46 inches and wider nominal, Number 1 Grade.
E. Preservative Treated Lumber:
   1. No. 2 grade
   2. Hem-fir WCLIB, or WWPA
F. Moisture Content
   1. At time of delivery and maintained at site
   2. Boards and lumber 2 inches and less in thickness: 19 percent or less
   3. Lumber over 2 inches thick: 25 percent or less

2.2 PRESERVATIVE TREATMENT

A. Provide dry lumber with 19 percent maximum moisture content at time of dressing for 2-inch nominalthickness or less, unless otherwise indicated.
B. Application: Treat unless otherwise indicated:
   1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
   2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
   3. Wood floor plates installed over concrete slabs.

2.3 QUALITY ASSURANCE

A. Identify lumber with grade stamp of agency certified by Board of Review of American Lumber Standards committee in conformance with Product Standard PS-20.
B. Identify sheathing with grade stamp in conformance with PS 1-95.

2.4 CONNECTORS, FASTENERS AND ACCESSORIES

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A. Nails and Spikes: Sizes and types as required suiting application. Common wire nails unless shown otherwise on Drawings. Refer to nailing schedule for connections not shown on Drawings.

B. Sheathing Nails: 10d, electroplate galvanized common (0.148 inches diameter) or hot-dipped galvanized box (.128 inches diameter) wire nails. Length as required for minimum 1-5/8 inches penetration into framing members.

C. Self-drilling Wood Screws: ¼ inch diameter: Simpson Strong Drive S-Series Wood Screw, length as noted, or approved. Simpson SD1.25 wood screws or approved where noted on drawings for strap and clip installations.

D. Staples: 16 gage, 7/16 crown galvanized staples having a minimum penetration of 1inch into wood decking. Use of staples is limited to applications shown on Drawings.

E. Bolt, Nuts, Washers, Lags, and Screws: Medium carbon steel; galvanized at exterior locations; self-tapping wood screws; sizes as scheduled or shown on Drawings. Cap nuts at exposed installations.

F. Framing Anchors: Simpson Strong-Tie Co., Silver Metal Products, or approved. Sizes and types as shown.

G. Compression (Drive) Pins: Size, type for intended use; Hilti DX series with washer or approved.

H. Building Paper: 100 percent Spunbonded olefin polyethylene sheet; Tyvek by DuPont Company, or approved.

I. Use special nails designed for use with ties, strap anchors, framing connectors, joists hangers, and similar items. Nails not less than 1½ inches long, 8d and deformed or annular ring shank

PART 3 – EXECUTION

3.1 INSTALLATION, GENERAL

A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.

B. Do not notch, bore or cut structural members for pipes, ducts, conduits or other reasons except as shown on Drawings or as approved by Architect.

C. Do not use materials with defects that impair quality of rough carpentry or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

D. Attach rough carpentry work securely to substrate by anchoring and fastening as indicated, comply with the following:

1. Published requirements of metal framing anchor manufacturer.
2. Nailing Schedule - refer to last page of Section
3. Use common wire nails, unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood; predrill if required. Replace or repair split or damaged blocking or framing, whether new or existing, if split, broken, or damaged by nailing or other connections made under Section at no additional cost to Owner.

E. Use hot-dip galvanized where exposed to weather or in-ground contact and for nailing to preservative treated lumber

3.2 WOOD FRAMING INSTALLATION - GENERAL

A. Framing Standard: Comply with AFPA "Manual for Wood Frame Construction," unless otherwise indicated.

B. Install framing connectors per manufacturer's instructions and requirement to achieve full capacity without adversely affecting existing construction.

3.3 GENERAL BLOCKING

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A. Install blocking as shown on Drawings and as required to support items of finish, and to cut off concealed draft openings, vertical and horizontal, between ceiling and floor.

B. Fire-stop blocking to be two inches nominal thickness by width of opening being blocked. Install at:

1. Stud walls at ceilings and floors and at 10-foot maximum intervals.
2. Intersections of vertical and horizontal cavities such as soffits, drop ceiling cove ceilings.
3. Openings around vents, pipes and ducts at penetrations of ceilings and floors.

3.4 PRESERVATIVE TREATMENT

A. Treat wood in contact with concrete or masonry, and as indicated.

B. Treat cut ends and holes through treated framing.

C. Flood area with preservative at remaining dry rot repair areas prior to enclosing or covering incidental decay

3.5 CLEANING

A. Upon completion of work of Section, promptly remove working area scraps, debris and surplus material of Section

3.6 NAILING SCHEDULE

A. Unless otherwise indicated on Drawings or required by OSSC, provide at least the following nailing with common nails:

Block to joist bearing:	Two 10d toenailed each side
Blocking to joist or stud:	Two 10d toenailed each side
One inch brace to stud:	Two 8d toenailed
Two inch brace to stud:	Two 16d face nailed
Bridging to joist:	Two 8d toenailed
Built-up beams:	16d @ 12inches on center, staggered
To support:	Two 16d toenailed each side
At laps (12inches minimum):	Four16d face nailed
Multiple joists:	16d @ 12inches on center, staggered
Joists to sill or girder:	Three 8d toenailed
Studs toenailed to plate:	Four 8d
Studs nailed together:	16d @ 12inches on center staggered
Plates:	1/4-inch nom. diameter drive pins @ 16inches on center
Upper to Lower:	16d @ 12inches on center staggered
At splices:	Two16d face nailed
Plate lap at corners:	Two16d face nailed

Box nails - increase to next larger size or increased quantity by 20%.

3.07 INSPECTION

A. Provide notice to Architect or Engineer 48 hours prior to installation of metal straps on roof and framing clips in concealed spaces.

B. Allow Architect or Engineer to observe installed items prior to concealment.

END OF SECTION 06 10 00

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SECTION 06 20 00
FINISH CARPENTRY

PART 1 – GENERAL

1.1 RELATED SECTIONS

A. Section 06 10 00 – Rough Carpentry

1.2 DELIVERY AND STORAGE

A. Delivery when site conditions are adequate to receive work of Section. Protect materials from weather while in transit to site.

B. Adequately protect finish surfaces during delivery, handling and storage.

1.3 ENVIRONMENTAL CONDITIONS

A. Install interior materials only in areas with constant and minimum 50 degree F. temperature.

1.4 COORDINATION

A. Coordinate provision of concealed blocking or supports.

B. Ensure back-priming of finish carpentry surfaces concealed after installation, has been performed.

1.5 STANDARDS

A. Architectural Woodwork Institute Premium Grade.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Softwood lumber: average moisture content of 6% and maximum of 9% for interior work, an average of 12% and maximum of 15% for exterior work.

B. Fasteners: to suit size and nature of components being fastened.

2.2 EXTERIOR TRIM AND WINDOW FRAMING

A. Western Red Cedar, selected for appearance depending on location.
Grade: A or B

2.3 INTERIOR TRIM OR GLASS STOPS SCHEDULED FOR STAIN

A. Flat Grain KD Douglas Fir
Grade: Clear Select (Carefully select straight free of heart center grain materials).

2.4 INTERIOR TRIM OR GLASS STOPS SCHEDULED FOR PAINT

A. Douglas Fir, Grade Number One; Alder, selected for straightness, or approved.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Scribe and cut as required to fit abutting walls, and surfaces, to fit properly into recesses and to accommodate intersecting or penetrating objects.

B. Install trim in single lengths without splicing. Prep frames for Hardware specified.

C. Fit backs casing snugly to wall surfaces to eliminate cracks at junction of casing with walls.

D. Set and secure materials and components in place, rigid, plumb and square, with tight, hairline joints.

E. Form joints to conceal shrinkage.

F. Set finishing nails to receive filler. Where screws are used to secure components countersink screw in round cleanly cut hole and plug with wood plug to match material being secured.

G. Cut right angle joints of moldings.

H. After installation, adjust operating hardware to ensure correct operation.

J. Reset trim removed during Demolition.

END OF SECTION 06 20 00

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SECTION 06 41 00
ARCHITECTURAL WOOD CASEWORK

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Specially fabricated cabinet units.
   2. Countertops.
   3. Cabinet hardware.

B. Related Requirements:
   1. Section 08 80 00 - Glazing: Glass for casework.
   2. Division 22 Plumbing, Division 23 HVAC and Division 26 Electrical. Provide for installation of concealed and semi-conceal electrical and mechanical cutouts and items into casework. Include coordination for electrical equipment into electrical equipment closets.

1.2 REFERENCE STANDARDS

A. Reference Standards: Current edition at date of Bid.

B. AWI (QCP) - Quality Certification Program, www.awiqcp.org; current edition at www.awiqcp.org.

C. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014.

D. BHMA A156.9 - American National Standard for Cabinet Hardware; Builders Hardware Manufacturers Association; 2010 (ANSI/BHMA A156.9).

E. NEMA LD 3 - High-Pressure Decorative Laminates; National Electrical Manufacturers Association; 2005.

1.3 DEFINITIONS

A. Terminology for Surface Visibility: As defined in AWS Section 10.

B. Exposed Exterior Surfaces: Defined as all exterior surfaces exposed to view, including:
   1. All surfaces visible when doors and drawers are closed, including knee spaces.
   2. Underside of cabinet bottom over 42 inches above the finish floor, including cabinet bottoms behind light valances and the bottom edge of light valances.
   3. Cabinet tops under 80 inches above the finish floor, or if 80 inches and over and visible from an upper building level or floor.
   4. Visible front edge of stretcher, ends, divisions, tops, bottoms, shelves, and nailers.
   5. Sloping tops of cabinets that are visible.

C. Exposed Interior Surfaces: Defined as all interior surfaces exposes to view in open casework or behind transparent doors, including:
   1. Shelves, including edge banding.
   2. Division and partitions.
   3. Interior face of ends (sides), backs and bottoms (including pull-outs). Also included are the interior surfaces of cabinet top members 36 inches or more above the finished floor.
   4. Interior face of door and applied drawer fronts.

D. Semi-Exposed Surfaces: Defined as those interior surfaces only exposed to view when doors or drawers are opened, including:
   1. Shelves, including edge banding.
   2. Division and partitions.
   3. Interior face of ends (sides), backs and bottoms (including bank of drawers). Also included are the interior surfaces of cabinet top members 36 inches or more above the finished floor.
   4. Drawer sides, sub fronts, backs and bottoms.
   5. The underside of cabinet bottoms between 24 inches and 42 inches above the finished floor.
   6. Security and dust panels or drawer stretchers.

E. Concealed Surfaces: Defined as those exterior or interior surfaces that are covered or not normally exposed to view, including:
   1. Toes space unless otherwise specified.

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2. Sleepers, stretchers, and solid sub tops.
3. The underside of cabinet bottoms less than 24 inches above the finished floor.
4. The flat tops of cabinets 80 inches or move above the finished floor, except if visible from an upper floor or building level.
5. The three non-visible edge of adjustable shelves.
6. The underside of countertops, knee spaces, and drawer aprons.
7. The faces of cabinet ends of adjoining units that butt together.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a preinstallation meeting not less than one week before starting work of this section; require attendance by all affected installers.

1.5 SUBMITTALS

A. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.
   1. Minimum Scale of Detail Drawings: 1-1/2 inch to 1 foot.
   2. Provide the information required by AWI/AWMAC/WI (AWS).
   3. Include certification program label.
B. Product Data: Provide data for hardware accessories.
C. Samples: Submit three (3) actual samples of each finish specified, minimum 4” x 6” in size.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Product Handling: Do not deliver shop-fabricated items until installation areas are ready (including completion of painting, wet work, grinding, and similar operations that could damage, soil or deteriorate casework and millwork).
B. Store in areas meeting requirements for installation areas.
C. Protect units from moisture damage.
D. Protect finished surfaces from soiling and damage during handling and installation. Keep covered with polyethylene film or other protective covering.

1.7 FIELD CONDITIONS

A. During and after installation of custom cabinets, maintain temperature and humidity conditions in building spaces at same levels planned for occupancy.

1.8 FIELD MEASUREMENTS

A. Verify field dimensions indicated on shop drawings prior to beginning work of this Section.

1.9 COORDINATION

A. Section 06 10 00 for backing and attachments as necessary for casework and bracket supports at open casework.
B. Division 22 - Plumbing, Division 23 - HVAC and Division 26 - Electrical: Provide for installation of concealed and semi-concealed electrical and mechanical cutouts and items into casework.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Single Source Responsibility: Provide and install this work from single fabricator.

2.2 MATERIALS - GENERAL

A. Low-Emitting Materials: Provide manufactured wood casework, including countertops, made with adhesives and composite wood products containing no urea formaldehyde.

2.3 CABINETS

A. Quality Grade: Unless otherwise indicated provide products of quality specified by AWI//AWMAC/WI (AWS) for Custom Grade.
B. Plastic Laminate Faced Cabinets: Custom grade.
C. Cabinets:

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1. Finish - Exposed Exterior Surfaces: Decorative laminate.
2. Finish - Exposed Interior Surfaces: Decorative laminate.
3. Finish - Concealed Surfaces: Manufacturer's option.
4. Door and Drawer Front Edge Profiles: Square edge with thin applied band.
5. Door and Drawer Front Retention Profiles: Fixed panel.
6. Cabinet Design Series: As indicated on drawings.

2.4 WOOD MATERIALS

A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
   1. Do not use plain-sawn softwood lumber with exposed, flat surfaces more than 3 inches wide.
   2. Wood Moisture Content: 5 to 10 percent.

B. Composite Wood and Agrifiber Products: Comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
   1. Recycled Content of Medium-Density Fiberboard and Particleboard: Postconsumer recycled content plus one-half of pre-consumer recycled content not less than 20 percent.
   2. Medium-Density Fiberboard: ANSI A208.2, Grade 130 made with binder containing no urea formaldehyde.
   3. Particleboard: ANSI A208.1, Grade M-2, made with binder containing no urea formaldehyde.
   4. Veneer-Faced Panel Products (Hardwood Plywood): HPVA HP-1, made with adhesive containing no urea formaldehyde.
   5. Thermoset Decorative Panels: Particleboard or medium-density fiberboard finished with thermally fused, melamine-impregnated decorative paper and complying with requirements of NEMA LD 3, Grade VGL, for test methods 3.3, 3.4, 3.6, 3.8, and 3.10.

2.5 LAMINATE MATERIALS

A. Manufacturers:
   1. Formica Corporation: www.formica.com.
   2. Panolam Industries International, Inc./Nevamar: www.nevamar.com.
   3. Wilsonart, LLC www.wilsonart.com.
   4. Substitutions: See Section 01 60 00.

B. High Pressure Decorative Laminate (HPDL): NEMA LD 3, types as recommended for specific applications.

C. Provide specific types as scheduled.

D. Finish: As selected from manufacturer standards, unless otherwise noted.

2.6 COUNTERTOPS

A. Solid Laminated Surfacing: Custom quality hardwood; maple, plain sawn, exposed edge grain; laminated with waterproof adhesives; thickness as recommended by fabricator; suitable for transparent finish.

B. Plastic Laminate Countertops: Medium density fiberboard substrate covered with HPDL, conventionally fabricated and self-edge banded.

C. Moisture Resistant Countertop Core:
   1. Provide for countertops subject to moisture conditions, such as those with sink cutouts:
      a. Plywood: APA PSI-95, Marine Grade A-A or A-B.

2.7 ACCESSORIES

A. Adhesive: Type recommended by fabricator to suit application.

B. Plastic Edge Banding: Extruded PVC, flat shaped; smooth finish; self-locking serrated tongue; of width to match component thickness.

C. PVC Edge Banding:

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1. Manufacturer:
   a. Doellken Woodtape, specified for type and quality. www.doellken-woodtape.com.
2. Typical PVC Edge Banding: Provide at plastic laminated faced casework edges.
   a. Exposed and Semi-Exposed Edges: 3 mm (1/8 inch) thick.
   b. Semi-Exposed Edges: 0.02 inch thick.
   c. Concealed Edges: No banding, except at front and back face of shelves.
   d. Trim edges and corners and buff smooth, same thickness as edge.
3. PVC Upturned Edge Banding: 3mm by 1-3/16 inch. Provide at open athletic shelves and laboratory shelves.
4. Adhere with hot melt waterproof adhesive under heat and pressure.
5. PVC Edge Banding Color:
   a. Match color of adjacent plastic laminate from full selection of manufacturer's color selection, as accepted by Architect.
   b. Match melamine where not adjacent to plastic laminate.

D. Glass: As specified in Section 08 80 00.

E. Mirror: Manufacturer's standard glass mirror.

F. Fasteners: Size and type to suit application.

G. Bolts, Nuts, Washers, Lags, Pins, and Screws: Of size and type to suit application; galvanized or chrome-plated finish in concealed locations and stainless steel or chrome-plated finish in exposed locations.

H. Grommets: Standard plastic grommets for cut-outs, in color black.
   1. Grommet with slotted cap, 2-3/8 inch diameter.
   2. Design to accommodate plugs up to 2-1/4 inches such as computer peripheral and business machine plugs.

2.8 HARDWARE

A. Hardware: BHMA A156.9, types as indicated for quality grade specified.

B. Adjustable Shelf Supports: Standard side-mounted system using recessed metal shelf standards or multiple holes for pin supports and coordinated self-rests, polished chrome or satin chrome finish, for nominal 1 inch spacing adjustments.
   1. Product:
      a. Pilaster Standards: Knape & Vogt, No. 255 ZC, 19 gauge steel by 5/8 inch wide, zinc plated.
      b. Support Clips: Knape & Vogt, No. 256 ZC, zinc plated.

C. Heavy Duty Storage Shelves: 12 gauge steel, 2 inch adjustment brackets. Capacity 1060 pounds at 12 inch shelf depth, with brackets at 16 inch on center.
   1. Standards: Reeve 40 and K&V 87 ANO.
   2. Brackets: Reeve 81 and K&V 187 ANO with 210 shelf rest.
   3. Screws: Suitable for purpose, flat heads set flush into standards so as not to interfere with mounting of brackets. Screw head finish to visually match standards.

D. Wall Mounted Fixed Shelf Bracket: Welded construction, finished with powder coat or enamel coating matching color of PVC edge banding.
   1. Minimum 1-1/2 inch wide by 1/4-inch thick cold rolled steel flatbar with minimum10 inch horizontal and vertical legs, braced with 1/4 inch diameter steel rod or flat bar welded at junctures.
   2. Product:
      a. Knape & Vogt 208 L-Bracket, 0.20 inch by 1-3/16 inch cold rolled steel flatbar with 11-1/2 inch horizontal and vertical legs, braced with 0.20 inch thick flat bar welded at junctures, 1,000 pound load capacity at 16 inch centers per pair, tested ANSI A156.9.

E. Counter Support Bracket: Manufacturer's standard shelf angle, welded construction, minimum 15 gauge by 1-1/2 inch tube steel or 1/4 inch flat bar. Support counters exceeding 36-inch span.

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1. Horizontal Leg: Less 3-inch width of counter.
2. Vertical Leg: Minimum 18 inch deep.
3. Leg Brace: 1/4 inch thick by 1-1/2 inch flat bar gusset plate at 45 degree angle, 6 inch out.
4. Continuous blocking at back of support bracket.

F. Drawer and Door Pulls: Round Wire Pulls.
1. Manufacturer: Stanley, or approved.
2. Model: 5 inch wire pull, nickel color.

G. Cabinet Locks.
1. Manufacturer: Olympus, www.olympus-lock.com.
   a. Locks: Provide where shown on Drawings.
      1) Door Lock: Olympus 100 DR, 5 pin, 7/8" barrel.
      2) Drawer Lock: Olympus 200DW, 5 pin, 7/8" barrel.
   b. Keying: Master keyed to Owner's keying system.
      1) Single Doors: Keyed locks at each cabinet door and drawer.
         (a) See Drawings for locations.
      2) Double Doors:
         (a) One keyed lock at door noted on Drawings.
         (b) One interior catch at adjacent door.
   c. Six keys per Lock, each lock keyed separately, each key stamped with key code.
   d. Stamp Key Code on Lock Bolt, visible when lock is in "locked" position.
2. Elbow Catch: Ives No. 2 Elbow Catch.
   a. Install at inactive leaf of double doors where a lock is shown on the active leaf.

H. Drawer Slides:
1. Type: Extension types as required.
2. Static Load Capacity: As scheduled.
3. Mounting: Side mounted.
4. Stops: Integral type.
5. Features: Provide self-closing/stay closed type.
6. Medium Duty Standard Drawer Slides:
   a. Maximum 16 Inch Drawer Width: Lever disconnect side mounting, 90 pound load rating, 1 inch over travel extension slides.
      1) Accuride 3834
      2) Knape & Vogt No. 8400
   b. Maximum 24 Inch Drawer Width: Rail disconnect side mounting, 100 pound load rating, 1 inch over travel extension slides.
      1) Accuride 7434
7. Heavy Duty Lateral Drawer Slides and File Drawer Slides:
   a. Up to 24 inch Drawer Width: Rail disconnect side mounting, 150 pound load rating, 1-1/2 inch over-travel extension slides.
      1) Accuride 4034
      2) Knape & Vogt No. 8505
   b. Up to 42 Inch Drawer Width: Rail disconnect side mounting, 200 pound load rating, 1-1/2 inch over-travel extension slides.
      1) Accuride 3640

I. Cabinet Door Hinges:
1. Concealed, self-closing, wide angle with integrated side adjustment, 170 degree opening angle.
2. Opening Angle: 170 degrees.
3. Product:
   a. Blum, or approved.
4. Finish:

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a. Nickel-plated.

J. Closet Hardware:
1. Closet Coat and Hat Hook: Double-prong robe hook, stainless steel, brushed mat finish.

K. Cafe Door Hinges:
1. McKinney Gravity Pivot Hinge 8007 or approved.

L. Mobile Casework Swivel Casters:
1. Steel ball bearing, minimum 5 inch diameter, non-marking neoprene tread wheels, minimum 200 to 300 pound load capacity.
a. Product: Faultless Caster, Series 400. www.faultlesscaster.com.

M. Mobile Storage Wheels:
1. Fixed Casters: Rigid plate, 6 inch diameter black rubber wheels, minimum 300 pound load capacity.
a. Product: Faultless, www.faultlesscaster.com.
2. Swivel Casters: Swivel, steel ball bearing, 6 inch black rubber wheels, minimum 300 pound load capacity.
a. Product: Häfele 663.25.921. www.hafele.com.

2.9 SHOP TREATMENT OF WOOD MATERIALS

A. Provide UL approved identification on fire retardant treated material.

B. Deliver fire retardant treated materials cut to required sizes. Minimize field cutting.

2.10 FABRICATION, GENERAL

A. Assembly: Shop assemble cabinets for delivery to site in units easily handled and to permit passage through building openings.

B. Edging: Fit shelves, doors, and exposed edges with specified edging. Do not use more than one piece for any single length.

C. Fitting: When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide matching trim for scribing and site cutting.

D. Plastic Laminate: Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arises. Locate counter butt joints minimum 2 feet from sink cut-outs.
1. Apply laminate backing sheet to reverse side of plastic laminate finished surfaces.
2. Cap exposed plastic laminate finish edges with material of same finish and pattern.

E. Matching Wood Grain: Comply with requirements of quality standard for specified Grade and as follows:
1. Provide center matched panels at each elevation.
2. Provide sequence matching across each elevation.
3. Carry figure of cabinet fronts to toe kicks.

F. Mechanically fasten back splash to countertops as recommended by laminate manufacturer at 16 inches on center.

G. Provide cutouts for plumbing fixtures. Verify locations of cutouts from on-site dimensions. Prime paint cut edges.

H. Shop glaze glass materials using the Interior Dry method specified in Section 08 80 00.

2.11 CASEWORK AND MILLWORK FABRICATION:

A. AWS Section 10, Custom Grade, Reveal Overlay construction.

B. Plastic Laminate Faced Casework: Shop fabricate conforming to AWS Section 10.

C. Hardwood Faced Casework: Shop fabricate conforming to AWS Section 10.

D. Casework Construction Joints:
1. Doweled: 6 minimum 10mm diameter hardwood, fluted dowels. Glued and clamped.
2. Lock Shoulder Joint: Glued and stapled or screwed.
3. Rabbeted Construction Joints: Glued and stapled or screwed.
4. Spline or Biscuit Joints: 3 per foot, glued under pressure.

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5. Flush Butt Panel Joints: Accepted only at concealed backs. Glued and screwed. Not accepted at drawer bottoms.

2.12 COUNTERTOP AND BACKSPLASH FABRICATION

A. Plastic Laminate Countertop Fabrication:
   1. Core: 3/4 inch thick MDF or agrifiber with 3/4-inch thick buildup at edges and spans exceeding 36 inch.
      a. Moisture resistant MDF core at sink countertops and where subject to moisture.
      b. Fire-resistant MDF core at counters extending through fire-resistive rated wall construction.
   2. Plastic Laminate Face Sheet: Horizontal Grade HPDL.
      a. Post Forming Grade at countertops with integral backsplash.
   3. Backing Sheet: Liner Grade at countertops and backsplashes.
   4. PVC Edge Banding: 1-1/2 inch face exposure at countertop edge. Scribe to wall at top edge of back splash.
   5. Back Splash Fabrication: 4 inch high by 1/2 deep

2.13 CABINET FABRICATION

A. Wall and Base Cabinets:
   1. Panel Core: 3/4 inch thick MDF or agrifiber panels.
   2. Exposed Vertical Surface Finish: Vertical Grade HDPL. Include areas that will be exposed when movable appliances are removed.
   3. Semi-Exposed Surface Finish: Melamine laminate.
   4. Concealed Surface Finish: Liner Grade balancing sheet, including at concealed tops, bottoms, sides, and backs of casework.
   5. Edges: Specified PVC edge banding at horizontal and vertical edges.
   6. Underside Surfaces: Underside surfaces that might be exposed to moisture should have barrier seal.

B. Base Cabinet Subtops: Solid, except 4 inch wide front to back rails at each side of sink openings.

C. Toe Kicks: 4 inch high by 3/4-inch thick plywood or MDF panels set into 3-inch deep toe kick at front and open ends of base cabinets.

D. Base Cabinet Toe Kicks: 4 inch high by 3/4-inch thick veneer core plywood set into 3-inch deep toe kick at front and open ends of base cabinets. MDF and agrifiber not accepted.
   1. Base Cabinets Set on Continuous Bases: Build in place, level, and shim. Align with adjoining casework
   2. Base Cabinets Set Directly On Floor: Extend end and back panels to floor. Make level and aligned with adjoining cabinets.

E. Exposed MDF Cabinets:
   1. Exposed, Semi-Exposed, and Concealed Surfaces: 3/4 inch thick MDF panels.
   2. Edges: Exposed MDF. No edge banding.

F. Hardwood Veneer Plywood Panels:
   1. Core: 3/4 inch thick MDF panels.
   2. Faces: Hardwood veneer both sides.
   3. Edges: Exposed plywood edge laminations. No edge banding. Finish exposed edges smooth and free of voids and other visual imperfections.
   4. Fasteners: Concealed at locations exposed to view.

G. Hardwood Veneer Faced/Cross-Laminated Plywood Core Cabinets:
   1. Exposed, Semi-Exposed, and Concealed Surfaces: 3/4 inch thick cross-laminated hardwood veneer plywood panel. AWI Quality Standards as specified.
   2. Edges: Exposed plywood edge laminations. No edge banding.

H. Cabinet Backs:
   1. Concealed Backs Installed Against Walls:

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a. 1/2 inch thick MDF or agrifiber panel.
b. Seal concealed panel face to prevent moisture intrusion.

2. Exposed Backs at Freestanding Casework: Vertical Grade HDPL face over 3/4 inch thick MDF or agrifiber panel [or hardwood veneer plywood panel, as applicable, exposed cabinet finish to match.
3. 3/4-inch thick MDF or cross-laminated hardwood veneer plywood panel, as applicable.

I. Hardwood Veneer Faced Casework:
1. Faces: Hardwood veneer at both door faces.
a. Edges: Exposed plywood edge laminations. No edge banding.

J. Hardware:
1. Pulls: One vertically mounted pull for each door and horizontally mounted for each drawer, except 2 pulls on drawers exceeding 30 inch width.
2. Keyed Locks: One lock for each door or double door opening.
3. Hinges: Two hinges per door, except three hinges on doors 48 inch high and over.

2.14 CABINET DOOR AND DRAWER FABRICATION

A. Cabinet Doors:
1. Plastic Laminated Casework:
a. Core: 3/4 inch thick MDF or agrifiber panels.
b. Faces: Vertical Grade HDPL at outside door face and melamine laminate at inside door face.
c. Edges: PVC edge banding.
2. Hardwood Veneer Faced Casework:
a. Front: Hardwood veneer face and back.
b. Edges:
1) Exposed plywood edge laminations. No edge banding.
3. Exposed MDF Casework:
a. Faces: 3/4 inch MDF panels.
b. Edges: Exposed MDF. No edge banding.
4. Hardware:
a. Pulls: One vertically mounted pull per door.
b. Keyed Locks:
1) Right Hand Door: One keyed lock.
2) Left Hand Door: One catch at interior side of door to hold door closed using single keyed lock.
c. Hinges: Two hinges per door, except three hinges on doors 36 inch high and over.
d. Magnetic Catches: One magnetic catch per door, two magnetic catches on doors 48 inch high and over.

B. Cabinet Drawers:
1. Plastic Laminate Faced Casework:
a. Front: 3/4 inch MDF or agrifiber core.
b. Face: Vertical Grade HDPL. Back with melamine laminate
c. Edges: PVC edge banding.
2. Exposed MDF Casework:
a. Front: 3/4 inch MDF panels.
b. Edges: Exposed MDF. No edge banding.
3. Hardwood Veneer Faced Casework:
a. Front: Hardwood veneer face and back.
b. Edges: Exposed plywood edge laminations. No edge banding.] [Hardwood edge trim matching face veneer.
4. Subfronts and Backs: 11/16 to 3/4 inch MDF or agrifiber, faced with melamine laminate.
5. Sides: 1/2 inch MDF or agrifiber faced with melamine laminate.

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6. Bottoms: 1/2 inch thick MDF, agrifiber, or marine grade plywood faced with melamine laminate.
   a. House into sides, front, and back with continuous dado or lock shouldered construction.
   b. Completely glued around perimeter with hot-melt or PVA adhesive.
7. Edges of Drawer Box: PVC edge banding.
8. Drawers Over 30 Inch Wide: MDF or agrifiber stiffeners or metal reinforcing.
9. Drawer Joints: Assemble true and square with doweled, lock-shoulder, or rabbeted joints.
10. Hardware:
    a. Drawer Slides: Mount with positive in and out stops for permanent alignment and quiet operation.
    b. Pull: One horizontally mounted pull for each drawer.
    c. Keyed Lock: One lock for each drawer.

2.15 SHELVING FABRICATION

A. Fixed and Adjustable Casework Shelves:
   1. Shelf Span:
   a. Spans up to 30 inches: 3/4 inch thickness MDF or agrifiber.
   b. Spans between 30 and 42 inches: 1 inch thickness MDF or agrifiber.
   c. 1-1/8 inch thick veneer core plywood over 42 inch span.
   2. Faces: Melamine cabinet liner both sides.
   3. Edges: PVC edge band at exposed face of fixed shelves and all four edges of adjustable shelves.
      a. Provide upturned PVC lip at edges of open athletic storage shelves and laboratory shelves.
   4. Hardwood Veneer Faced Casework:
      a. Faces: Hardwood veneer both sides.
      b. Edges: Hardwood edge trim.

2.16 SHOP FINISHING

A. General: Finish architectural wood cabinets at fabrication shop as specified in this Section. Defer only final touchup, cleaning, and polishing until after installation.
B. Sand work smooth and set exposed nails and screws.
C. For opaque finishes, apply wood filler in exposed nail and screw indentations and sand smooth.
D. On items to receive transparent finishes, use wood filler matching or blending with surrounding surfaces and of types recommended for applied finishes.
E. Finish work in accordance with AWI/AWMAC/WI (AWS), Section 5 - Finishing for grade specified and as follows:
   1. Transparent:
      a. As selected by Architect.
      b. Sheen: TBD.
   2. Opaque:
      a. Color: As selected by Architect.
      b. Sheen: TBD.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify adequacy of backing and support framing.
B. Verify location and sizes of utility rough-in associated with work of this section.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions and provisions of Contract Documents.

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B. Set and secure custom cabinets in place, assuring that they are rigid, plumb, and level.
C. Use fixture attachments in concealed locations for wall mounted components.
D. Use concealed joint fasteners to align and secure adjoining cabinet units.
E. Carefully scribe casework abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim for this purpose.
F. Secure cabinets to floor using appropriate angles and anchorages.
G. Countersink anchorage devices at exposed locations. Conceal with solid wood plugs of species to match surrounding wood; finish flush with surrounding surfaces.
H. Close exposed joints, spaces, and openings to make tight hairline joints against adjacent construction to prevent papers and other materials from falling behind cabinets.
    1. Install scribes and fillers of same material and finish as casework.
    2. Secure with concealed screws.
I. Install minimum 3 inch deep by 4 inch high toe space at floor mounted casework.
J. Plastic Laminate Countertop:
    1. Install intermediate joints between corners in longest possible length for each top
    2. Maintain joint distance of minimum 24 inch clearance from sink cutout.
    3. Where joints cannot be avoided at knee spaces, install additional reinforcing without reducing knee space clearance.
    4. Apply acrylic latex adhesive at each field joint, and tighten together with 1/4 inch drawbolts set into routed bottom face as needed to make flush and hairline.
    5. Cut smooth, crack free holes and cutouts with minimum 1/4 inch diameter radiused inside corners.
    6. Seal exposed edges with waterproof sealant
    7. Install wall ledgers and counter support angles, secured to wall for support of counters spanning over 36 inch and as needed to eliminate deflection at knees pace.
K. Make cutouts using templates supplied by work of Division 22, 23 and Division 26 for mechanical and electrical fixtures and equipment installations into casework. Provide backing as required for secure attachment of fixtures and equipment.
L. Field Installed Backsplash: Fasten with concealed screws at 12 inch center into bed of acrylic resin along entire back edge of countertops.
M. Door and Drawer Hardware:
    1. Mount hardware using manufacturer’s templates, aligned, plumb, and true between adjacent doors and drawers.
    2. Mount with adjacent door and drawer reveals equally spaced, plumb, and square.
    3. Install operating hardware to act smoothly without hanging up or binding.
    4. Lubricate hardware in accordance to manufacturer's instructions.
N. Wall Shelves: Support shelves on standards and brackets at 36 inch maximum spacing.

3.3 ADJUSTING

A. Adjust installed work and test for rigidity and ability to support load.
B. Adjust moving or operating pars to function smoothly and correctly.

3.4 CLEANING

A. Clean casework, counters, shelves, hardware, fittings, and fixtures.

3.5 PROTECTION

A. Take applicable protection measures and maintain conditions in manner acceptable to manufacturer through completion of Project.
B. Protect countertops with polyethylene, kraft paper, or other protective covering.

END OF SECTION 06 41 00

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SECTION 07 31 13
ASPHALT SHINGLE ROOFING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Granule surfaced asphalt shingle roofing.

B. Moisture shedding underlayment, eaves, valley and ridge protection.

C. Associated metal flashing.

1.2 RELATED SECTIONS

A. Section 06 10 00 - Rough Carpentry.

B. Section 07 60 00 - Flashing and Sheet Metal.

1.3 REFERENCES

A. ASTM A 653/A 653M - Standard Specification for Steel Sheets, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by Hot-Dip Process

B. ASTM D 225 - Standard Specification for Asphalt Shingles (Organic Felt) Surfaced with Mineral Granules.

C. ASTM D 226 - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.

G. ASTM D 3018 - Standard Specification for Class A Shingles Surfaced with Mineral Granules.

H. ASTM D 3161 - Standard Test Method for Wind-Resistance of Asphalt Shingles (Fan-Induced Method).

I. ASTM D 3462 - Standard Specification for Asphalt Shingles Made from Glass Felt and Surfaced with Mineral Granules.

J. ASTM D 4586 - Standard Specification for Asphalt Roof Cement, Asbestos-Free.

K. ASTM D 4869 - Standard Specification for Asphalt-Saturated Organic Felt Shingle Underlayment Used in Roofing.

M. ASTM E 108 - Standard Test Methods for Fire Tests of Roof Coverings.

1.4 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Product Data: Provide manufacturer's printed product information indicating material characteristics, performance criteria, and product limitations.

C. Manufacturer's Installation Instructions: Provide published instructions that indicate preparation required and installation procedures.

1.5 QUALITY ASSURANCE

A. Maintain one copy of manufacturer's application instructions on project site.

B. Verify that manufacturer's label contains reference to specified ASTM standards.

1.6 ENVIRONMENTAL REQUIREMENTS

A. Take special care when applying shingle underlayment and shingles when ambient or wind chill temperature is below 45^0 F Tack underlayment in place if it does not adhere immediately to deck.

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1.7 WARRANTY

A. Manufacturer's Warranty: Furnish shingle manufacturer's standard warranty for product(s) of this section.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Provide products manufactured by CertainTeed Corporation, or approved.

2.2 ASPHALT FIBER GLASS SHINGLES

A. Conforming to ASTM D 3018 Type I - Self-Sealing; UL Certification of ASTM D 3462, ASTM D 3161 Class “F” (110-mph)/UL997 Wind Resistance, and UL Class A Fire Resistance; glass fiber mat base; ceramically colored/UV resistant mineral surface granules across entire face of shingle; three-layer laminated four-tab shingle.
   1. Weight: 340 pounds per square (100 square feet)
   2. Color: As selected by Architect from manufacturer's standards.

2.3 SHEET MATERIALS

A. Underlayment: ASTM D 4869, asphalt saturated felt.

2.4 FLASHING MATERIALS

A. Sheet Flashing: ASTM A 361/A 361M; 26 gage (0.45 mm) steel with minimum G115/Z350 galvanized coating.

2.5 ACCESSORIES

A. Nails: Standard round wire type roofing nails, corrosion resistant; hot dipped zinc coated steel, aluminum, or chromated steel; minimum 3/8 inch head diameter; minimum 11 or 12 gage shank diameter; shank to be of sufficient length to penetrate through roof sheathing or ¾ inch into solid wood, plywood, or non-veneer wood decking.

B. Asphalt Roofing Cement: ASTM D 4586, Type I or II.

2.6 FLASHING FABRICATION

A. Form flashing to profiles indicated on Drawings, and to protect roofing materials from physical damage and shed water.

B. Form sections square and accurate to profile, in maximum possible lengths, free from distortion or defects detrimental to appearance or performance.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify existing site conditions under provisions of Section 01 77 00.

B. Verify that roof penetrations and plumbing stacks are in place and flashed to deck surface.

C. Verify roof openings are correctly framed prior to installing work of this section.

D. Verify deck surfaces are dry and free of ridges, warps, or voids.

3.2 ROOF DECK PREPARATION

A. Follow shingle manufacturer's recommendations for acceptable roof deck materials.

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B. Broom clean deck surfaces under eave protection and underlayment prior to their application.

3.3 INSTALLATION - EAVE ICE DAM PROTECTION

A. Place eave edge and gable edge metal flashing tight with fascia boards. Weather-lap joints 2 inches (50 mm). Secure flange with nails spaced 8 inches (200 mm) on center.

B. Apply shingle underlayment as eave protection in accordance with manufacturer's instructions.

C. Extend eave protection membrane minimum 48 inches up slope beyond interior face of exterior wall.

3.4 INSTALLATION - PROTECTIVE UNDERLAYMENT

A. Apply one layer of underlayment over all areas not protected by underlayment at eaves, with ends and edges weather-lapped per application instructions. Stagger end-laps each consecutive layer. Nail in place.

B. Weather-lap and seal watertight with asphalt roofing cement items projecting through or mounted on roof. Avoid contact of solvent-based cements.

3.5 INSTALLATION - VALLEY PROTECTION

A. For "open" and “closed-cut” valleys, first place one ply of underlayment minimum 36 inches (910 mm) wide, centered over valleys. Lap joints minimum 6 inches. Follow instructions of shingle and waterproofing membrane manufacturer.

3.6 INSTALLATION - METAL FLASHING

A. Weather-lap joints minimum 2 inches (50 mm).

B. Seal work projecting through or mounted on roofing with asphalt roofing cement and make weather-tight.

3.7 INSTALLATION - ASPHALT SHINGLES

A. Install shingles in accordance with manufacturer's instructions for product type and application specified.

B. Six 1 ½” Stainless Steel Staples per Shingle.

3.8 FIELD QUALITY CONTROL

A. Field inspection will be performed under provisions of Section 01 40 00.

3.9 PROTECTION OF FINISHED WORK

A. Protect finished work under provisions of Section 01 77 00.

B. Do not permit traffic over finished roof surface.

END OF SECTION 07 31 13

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SECTION 07 60 00
FLASHING & GENERAL SHEET METAL

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Coping and miscellaneous flashings.

B. Counterflashings over miscellaneous roof penetrations.

1.2 RELATED SECTIONS

A. Section 07 61 13 - Standing Seam Metal Roofing.

1.3 QUALITY ASSURANCE

A. Fabricator Qualifications
   1. Company specializing in sheet metal fabrications, with minimum experience of five years. Provide documentation, if requested by Architect.

B. Perform work in accordance with SMACNA standard details and requirements.

1.4 REFERENCES

A. American Iron & Steel Institute - Stainless Steel Data Manual. AISI.

B. SMNACA Architectural Sheet Metal Manual.

C. American Society for Testing and Materials standards as referenced herein. ASTM.

1.5 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Shop Drawings indicating: material profiles, jointing pattern, jointing details, fastening methods, flashings, terminations, types and locations of fasteners, color sample and other pertinent installation details.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Section 01 60 00.

B. Ensure protection from incidental damage from work activities of other trades.

C. Select and handle materials and equipment to avoid damage to materials, existing construction, or applied roofing.

D. Prevent contact with materials which may cause staining or discoloration.

E. Store finished materials to prevent twisting, bending, or abrasion. Provide ventilation and slope materials to ensure drainage.

1.7 WARRANTY

A. Warrant sheet metal work for two (2) years. Warranty period commences after date of Substantial Completion. Provide written warranty at Substantial Completion.

B. Include minimum of two (2) annual inspections and necessary repairs for warranty period. Provide inspection schedule at project Close-out.

C. Repair defects occurring within warranty period. Failure to make proper repairs within warranty period shall extend period until acceptable completion of applicable repair items.

1.8 COORDINATION

A. Coordinate with other trades affecting or affected by work of this Section.

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PART 2 - PRODUCTS

2.1 SHEET MATERIALS

A. Galvanized Steel: ASTM A525, G90; 24 gauge core steel, typical

B. General sheet metal: Galvanized iron copper-bearing base metal with commercial weight zinc coating. 24 gauge or as indicated on Drawings.

C. Prefinished sheet metal: 24 gauge. Color as selected from manufacturer's standards. Match project standard sheet metal roof panel.

D. Clear anodized aluminum: .060" thick sheet.

2.2 ACCESSORIES

A. Screws and Nails: Match with connecting materials complete with neoprene washers.

B. Fasteners: Galvanized steel with soft neoprene washers.

C. Nylon Fasteners: Mushroom head, Tap-It by U.S. Expansion Bolt Company.

D. Self-Drilling Fasteners: Cadmium-plated, with 2-piece neoprene and steel sealing washer, in appropriate thickness and length for materials being fastened; Buildex Teks, or approved.

E. Cleats: Same material and thickness as sheet metal.

F. Protective Backing Paint: Zinc chromate alkyd.

G. Sealant: Products as approved by roofing system manufacturer

H. Caulking: Products as approved by roofing system manufacturer and as per Fed. Spec. FS-TT-230, non-staining and non-bleaching.

J. Protective Coating for Dissimilar Metals: Asphalt plastic cement

K. Bedding Compound: Butyl.

L. Butyl Tape: width as required

2.3 COMPONENTS

A. Flashings: Material compatible with adjacent; no dissimilar metals in direct contact creating electrolysis; separation membrane or coated material.

2.4 FABRICATION

A. Form sections true to shape, accurate in size, square, and free from distortion or defects.

B. Fabricate cleats of same material as sheet, minimum 3 inches wide, interlock with sheet.

C. Form pieces in longest possible lengths.

D. Hem exposed edges on underside 2 inch; miter and seam comers.

E. Form cap material with standing seam joints.

F. Fabricate comers from one piece with minimum 18 inch long legs; solder for rigidity, seal with sealant

G. Fabricate vertical faces with bottom edge formed outward ¼ inch; hem to form drip.

H. Fabricate flashings to allow toe to extend. Return and brake edges.

I. Lap joints 6 inch minimum, seal and pop rivet.

PART 3 - EXECUTION

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3.2 EXAMINATION

A. Verify openings, curbs, steel plates are solidly set, reglets in place, and nailing strips located.

B. Do not start work until conditions are satisfactory.

C. Verify termination and base flashings are in place, sealed, and secure.

3.3 PREPARATION

A. Install starter and edge strips, and cleats before starting installation.

3.4 FABRICATION - GENERAL

A. Fabricate new or required cap metal, edge metal, wall counterflashings with sharp and true edges and bends; reinforce as required for stiffness, free of waves and buckles. Form to dimensions and profiles duplicating existing where indicated.

B. Hem exposed edges.

C. Provide necessary anchors, anchor strips, receivers and clips as shown on drawings and as required to complete work.

3.5 INSTALLATION

A. General
   1. Secure flashings using concealed fasteners. Use exposed fasteners only where permitted.
   2. Apply plastic cement compound between metal and felt flashings
   3. Fit flashings tight in place. Make comers square, surfaces true and straight in planes, and lines accurate to profiles.
   4. Seal joints watertight.

B. General Sheet Metal
   1. Make proper allowance for expansion and contraction due to temperature variations, settlement, and shrinkage or swelling.
   2. Cope or flange intersection to fit accurately.
   3. Caulk sheet metal work at locations as required to complete watertight installation.

C. S-Lock Seams
   1. Form 1¼ inch wide shaped seam at one edge of flashing sheet for concealed fastening.

D. Miscellaneous Flashings
   1. Install flashing around openings in exterior walls in area of work, where indicated on Drawings, or where necessary to make building watertight.

3.6 FIELD QUALITY CONTROL

A. Inspection to ascertain compliance with specified requirements.

3.7 CLEANING

A. Remove residue from finished surfaces. At areas where finished surfaces are soiled by work of Section, follow instructions of manufacturer of soiled product.

B. Promptly remove scraps, debris and surplus material from job-site upon completion of work of Section

END OF SECTION 07 60 00

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SECTION 07 72 00
ROOF ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Manufactured curbs, equipment rails, access ladders, and pedestals.

B. Related Requirements:
   1. Section 07 62 00 - Sheet Metal Flashing and Trim: Roof accessory items fabricated from sheet metal.

1.2 REFERENCE STANDARDS

A. 29 CFR 1910.23 - Guarding floor and wall openings and holes; current edition.

B. Reference Standards: Current edition at date of Bid.

C. American Society for Testing and Materials (ASTM) International:
   1. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; current edition.
   2. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; current edition.
   3. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes [Metric]; current edition.

1.3 SUBMITTALS

A. See Section 01 33 00 for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used.
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.
   4. Maintenance requirements.

C. Shop Drawings: Submit detailed layout developed for this project. Show dimensioned location and number for each type of roof accessory.

D. Warranty Documentation:
   1. Submit manufacturer warranty.
   2. Ensure that forms have been completed in Owner's name and registered with manufacturer.
   3. Submit documentation that roof accessories are acceptable to roofing manufacturer, and do not limit the roofing warranty.

1.4 QUALITY ASSURANCE

A. Manufacturer:
   1. Design, fabricate, and furnish roof curbs and equipment supports to accurate dimensions, configuration, and structural rigidity to meet requirements for watertight systems.
   2. Accommodate loading capacity and connections of roof equipment, configuration of and watertight connections to roofing system, and configuration and spanning capacity between structural members at openings in roof deck.

1.5 QUALIFICATIONS

A. Manufacturer:
   1. Able to document minimum 10 years continuous experience designing, manufacturing, and supplying work of this Section.
   2. Maintain engineering and design capabilities to furnish customized curbs, expansion joints, and equipment supports.

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1.6 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store products under cover and elevated above grade.

1.7 WARRANTY

A. See Section 01 77 00 - Closeout Procedures, for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURED CURBS

A. Manufactured Curbs, Equipment Rails, and Other Roof Mounting Assemblies: Factory-assembled hollow sheet metal construction with fully mitered and welded corners, integral counterflashing, internal reinforcing, and top side and edges formed to shed water.
   1. Sheet Metal: Hot-dip zinc coated steel sheet complying with ASTM A653/A653M, SS Grade 33 ; G90 coating designation.
   2. Sheet Metal Thickness:
      a. Minimum 18 gauge, and as engineered by manufacturer.
      b. Minimum 14 gauge for curbs supporting HVAC units
      c. Minimum 20 gauge for expansion joint curbs.
   3. Insulation: Factory installed 1-1/2 inch thick three-pound density semi-rigid fiberglass blanket.
   4. Roofing Cants: Provide integral sheet metal roofing cants dimensioned to begin slope at top of roofing insulation; 1:1 slope; minimum cant height 4 inches.
   5. Manufacture curb bottom and mounting flanges for installation directly on roof deck, not on insulation; match slope and configuration of roof deck.
   6. Height Above Finished Roof Surface: 8 inches, minimum.
   7. Provide the layouts and configurations shown on the drawings.

B. Curbs Adjacent to Roof Openings: Provide curb on all sides of opening, with top of curb horizontal for equipment mounting.
   1. Provide preservative treated wood nailers along top of curb.
   2. Insulate inside curbs with 1-1/2 inch thick fiberglass insulation.
   3. Height Above Finished Roof Surface: 8 inches, minimum.
   4. Height Above Roof Deck: 14 inches, minimum.

D. Pipe, Duct, and Conduit Mounting Pedestals: Vertical posts, minimum 8 inches square unless otherwise indicated.
   1. Provide sliding channel welded along top edge with adjustable height steel bracket, manufactured to fit item supported.
   2. Height Above Finished Roof Surface: 6 inches, minimum.
   3. Height Above Roof Deck: 14 inches, minimum.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

A. General: Install in accordance with manufacturer's instructions, in manner that maintains roofing weather integrity.

B. Roof Hatches and Curbs:
   1. All curb height to be minimum 6 inches at step flashing and 8 inches at upslope cricket flashings, above finished roof system surface.
   2. Include sheet metal step flashings, apron flashings, and saddle/cricket flashings.
   3. See Section 07 62 00 for sheet metal flashing section.

3.4 CLEANING

A. Clean installed work to like-new condition.

3.5 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION 07 72 00

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SECTION 07 90 00
SEALANTS

PART 1 – GENERAL

1.1 RELATED WORK SPECIFIED IN OTHER SECTIONS

A. Section 09 20 00 – Gypsum Board.
B. Section 09 30 00 – Tiling.
C. Section 09 90 00 – Painting.
D. Section 10 21 13 – Plastic Toilet Compartments.
E. Division 22 – Plumbing.

1.2 SUBMITTALS

A. Furnish two copies of manufacturer's specifications and installation instructions and three pieces of 4-inch-long sealant samples of each color and type specified prior to application.

1.3 GUARANTEE

A. Application shall be guaranteed for water-tightness of exterior sealant, covering materials and labor, for a period of two (2) years. Repairs made at Contractor's expense. This guarantee extends one (1) year guarantee stated in General Conditions, Section 00 72 00.

1.4 PRODUCT DELIVERY, STORAGE, AND PROTECTION

A. Deliver materials in original containers with labels intact. Store and handle in a manner and at temperatures not detrimental to material and per manufacturer's instructions.

PART 2 – PRODUCTS

2.1 GENERAL

A. Verify that sealant is compatible with adjacent, contact materials.
B. Sealants, Joint Backup, and Primer shall be as approved by sealant manufacturer.
C. Select manufacturer's standard color closest to predominant surface color except where otherwise specified.

2.2 POLYURETHANE SEALANT (ONE-PART)

A. Non-sag, one-part type conforming with ASTM C920, Type S, Grade NS; recommended by manufacturer for application shown. Primer as recommended by sealant manufacturer for condition of use. PRC, "6000"; Sika, "Sikaflex 1A"; Sonneborn, "Sonolastic NP-I"; or approved.

2.3 POLYURETHANE SEALANT (TWO-PART)

A. Self-leveling, two-part type conforming with ASTM C920, Type M, Grade P; recommended by manufacturer for application shown.
Primer as recommended by sealant manufacturer for condition of use. A.C. Horn, "Daraseal"; Gibson-Homans, "Two-Part Polyurethane"; Sonneborn, "Sonolastic Paving Joint Sealant"; or approved.

2.4 POLYURETHANE SEALANT (TWO-PART)

A. Non-sag, two-part type conforming with ASTM C920, Type M, Grade NS; recommended by manufacturer for application shown. Primer as recommended by sealant manufacturer for condition of use. A.C. Horn, "Daraseal U-NS"; PRC, "270"; Sonneborn, "Sonolastic NP-II"; or approved.

2.5 SILICONE SEALANT

A. One-part, silicon type conforming to ASTM C920, Type S, Grade NS; recommended by manufacturer for application shown. Primer recommended by manufacturer for condition of use. Dow Corning, #790; General Electric, "Silpruf"; Sonneborn, "Omniseal"; or approved.

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2.6 ACRYLIC LATEX SEALANT

A. One-part, non-sag sealant. Pecora, "AC-20"; Sonneborn, "Sonolac Acrylic Latex Caulk"; or approved.

2.7 JOINT BACK-UP & COMPRESSIBLE TUBE (EXPANSION JOINT)

A. Closed cell polyethelene rod conforming to ASTM D1622 and recommended by sealant manufacturer. Size as indicated on drawings.

PART 3 – EXECUTION

3.1 PREPARATION

A. Clean and otherwise prepare joint as recommended by sealant manufacturer and in a manner to allow sealant to achieve high early bond strength, internal cohesive strength and surface durability.

3.2 INSTALLATION

A. General
   1. Comply with sealant manufacturer's printed instructions except where more stringent requirements are shown or specified.
   2. Prime or seal joint surfaces wherever shown or recommended by sealant manufacturer.
   3. Do not allow primer sealer to spill or migrate onto adjoining surfaces.
   4. Install bond breaker tape where shown and where required by manufacturer's recommendation.
   5. Install sealants to depth as shown or as recommended by sealant manufacturer, but in no instance shall depth of joint exceed width of joint.
   6. Prevent sealants or compounds from overflowing, spilling or migrating into voids of adjoining surfaces.
   7. Use masking tape or other precautionary devices to prevent staining of adjoining surfaces.

B. Interior
   1. Seal joints on interior surfaces as required for air, sound, and light seals where caulked joints specified or shown.

C. Joint Backup
   1. Install where shown, when depth of joint exceeds maximum recommended thickness of sealant, or when recommended by sealant manufacturer.

3.4 SEALANT SCHEDULE

A. Locations in Contact with Water: Silicone Sealant.

B. All Other Joints: Either One or Two-Part Polyurethane Sealant.

3.5 CLEANING

A. Remove excess and spillage of compounds as work progresses. Clean adjoining surfaces to eliminate evidence of spillage.

B. Do not damage adjoining surfaces or finish.

3.6 CURE AND PROTECTION

A. Cure sealants and caulking compounds in compliance with manufacturer's instructions and recommendations to obtain high early bond strength, internal cohesive strength and surface durability.

B. Advise Contractor of procedures required for protection of sealants and caulking compounds during construction.

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3.7 FIELD TESTS

A. After nominal cure of exterior joint sealants exposed to weather, test for water leaks. Flood joint exposure with water directed from ¾ inch water hose held perpendicular to wall face, two feet from joint. Provide minimum water pressure of 30 PSI. Move stream of water along joint at approximate rate of 20 feet per minute.

B. Conduct tests where directed by Architect.

C. Remove and replace sealant evidencing leakage or failure.

END OF SECTION 07 90 00

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STEEL DOORS & FRAMES

SECTION 08 11 00

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Steel Doors

B. Steel Frames

C. Steel Frame Reconditioning

1.2 RELATED SECTIONS

A. Section 08 71 00 – Hardware.

B. Section 08 80 00 – Glazing

C. Section 09 90 00 – Painting.

1.3 REFERENCES

A. Steel doors and frames shall comply with or exceed standards listed. Latest published edition of each reference applies.

1. ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
2. ASTM E 90 - Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions.
3. ASTM E 413 - Classification for Rating Sound Insulation.
4. ANSI/DHI A115 - Specifications for Hardware Preparations in Standard Steel Doors and Frames.
5. ANSI A156.7 - Hinge Template Dimensions.
6. ANSI A 250.3 - Test Procedure and Acceptance Criteria for Factory Applied Finish Painted Steel Surfaces for Steel Doors and Frames.
7. ANSI A250.4 – Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors and Hardware Reinforcing.
8. ANSI A 250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.
9. ANSI A 250.11 – Recommended Erection Instructions for Steel Frames.
10. SDI 105 - Recommended Erection Instructions for Steel frames.
11. SDI 112 - Zinc-Coated (Galvanized/Galvannealed) Standard Steel Doors and Frames.
12. SDI 117 - Manufacturing Tolerances for Standard Steel Doors and Frames.
13. SDI 118- Basic Fire Door Requirements
14. NFPA 80- Standard for Fire Doors and other Opening Protectives
15. NFPA 105-Standard for the Installation of Smoke Door Assemblies and other Opening Protectives
16. NFPA 252 – Standard Method of Fire Tests of Door Assemblies
17. ANSI/UL 10C- Standard for Safety for Positive Pressure Fire Tests od Door Assemblies
18. UL 1784 - Air Leakage Tests of Door Assemblies
19. UL - Building Materials Directory; Underwriters Laboratories Inc
20. WH - Certification Listings; Warnock Hersey International Inc.
21. State and Local codes including Authority Having Jurisdiction

1.4 SUBMITTALS

A. Submit for review hollow metal shop drawings covering complete identification of items required for project. Include manufacturer's names and identification of product. Include catalog cuts and/or technical data sheets and other pertinent data as required to indicate compliance with specifications.

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1. Shop Drawings: submit complete and detailed with respect to quantities, dimensions, specified performance, and design criteria, materials and similar data to enable Architect to review information as required.

B. Indicate frames' configuration, anchor types and spacing, location of cutouts for hardware, reinforcement, to ensure doors and frames are properly prepared and coordinated to receive hardware.

C. Indicate door elevations, internal reinforcement, closure method, and cutouts for glass lights and louvers.

D. Manufacturer's installation instructions.

E. Shop drawings, product data, and samples: stamp with Contractor's stamp verifying they have been coordinated and reviewed for completeness and compliance with the contract documents.

F. Shop drawings submitted without above requirements will be considered incomplete, will NOT be reviewed, and will be returned.

G. Follow same procedures for re-submittal as initial submittal with revised dates.

H. Provide evidence of manufacturer's membership in Steel Door Institute.

1.5 QUALITY ASSURANCE

A. Certification of label construction: For components exceeding Underwriters Laboratories, Inc. (UL), furnish inspection certificate stating that component construction conforms to UL rating requirements only if Architect is aware of limitation and has allowed the non-labeled unit.

B. Hollow metal supplier shall be qualified direct distributor of products to be furnished and have an A.H.C., C.D.C., or equivalently certified employee available to consult with Architect, Contractor and Owner regarding matters affecting door and frame openings.

C. Conform to applicable codes for fire ratings. Door hardware and its application shall comply or exceed standards for labeled openings. In case of conflicts in required fire protection ratings, provide fire ratings as required by NFPA and UL.

1. Affix physical label or approved marking to fire doors and fire door frames, at authorized facility as evidence of compliance with procedures of labeling agency. Labels shall be metal, paper or plastic. Stamped or die cast labels are not permitted. Labels shall not be removed, defaced or made illegible while door is in service as covered in NFPA Pamphlet 80.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver doors and frames cardboard wrapped, crated, palletized or otherwise protected during transit and site storage.

B. Inspect doors and frames upon delivery for damage. Minor damages may be repaired, provided refinished items are equal to new work and accepted by Architect. Otherwise, remove and replace damaged items.

C. Store doors and frames at building site in dry, secure location.

1. Place units on wood blocking.
2. Avoid use of non-vented plastic or canvas shelters
3. Remove wet cardboard packaging materials immediately.
4. Provide ¼ inch air circulation space between stacked doors.

1.7 SEQUENCING AND COORDINATION

A. Deliver supplies to jobsite in timely manner.

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B. Coordinate with trades affected by work.

C. Verify field dimensions prior to fabrication.

1.8 WARRANTY

A. Supply hollow metal doors with one (1) year warranty against defects in materials and workmanship.

B. Warranty commences with Substantial Completion of Project.

PART 2 - PRODUCTS

2.1 DOORS

A. Cold-rolled steel, A 1008, 16 gage cold rolled or galvannealed steel.
1. Insulated Polystyrene Core (optional Polyurethane Core)
2. 1-3/4 Inches Thick
3. Polyurethane R-Factor - 10.04 Minimum
4. 16 Gauge Top & Bottom Channels
5. Manufacturers Lite Kits sized per Hardware Schedule

B. Factory painted door.

C. Hardware reinforcements:
1. Hinge reinforcements for full continuous hinge.
2. Lock reinforcements: minimum 16 gage [0.053"].
3. Closer reinforcements: minimum 14 gage [0.067"], 20” long.
4. Galvannealed doors: include galvannealed hardware reinforcements.
5. Projection welded hinge and lock reinforcements to edge of door.
6. Provided adequate reinforcements for other hardware as required.

D. Full Flush Type doors
1. ANSI-A250.4 criteria and tested to 5,000,000 operating cycles.

E. Galvannealed door at exterior applications.

2.2 FRAMES

A. Frames:
1. 14 gage cold rolled steel.
2. Factory die-mitered corner connections with integral interlocking tabs.
3. Ratings as indicated on drawings.

B. Floor anchors: Angle clip type
1. 16 ga. Minimum
2. To receive 2 fateners per jamb.

C. Preparation for New Hardware:
1. Reinforce components for hardware installation per ANSI A250.4.
   a. Lock and closer reinforcements to be “box” or “channel” type.
   b. Channel type hinge and lock reinforcing on doors, continuous from top to bottom of door, weld to face sheets.
   c. Prep every frame for closers if specified or not.
2. Punch door frames to receive inserted type door mutes (3) per strike jamb on single doors. Adhesive-applied mutes are unacceptable
3. Factory-prepared hardware locations shall be per “Recommended locations for Builders’ Hardware for Standard Steel Door and Frames”, as adopted by SDI.

D. Galvannealed frame at exterior applications.

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2.3 ACCESSORIES

A. Hollow metal frame repair
   1. Filler: Bondo Ultimate, or approved.

PART 3 - EXECUTION

3.1 SETTINGS

A. Install doors in accordance with SDI 105 and ANSI A250-11.

B. Install label doors and frames in accordance with NFPA 80.

C. Remove temporary steel spreaders prior to installation of frames

D. Set anchors for frames as work progresses. Install anchors at hinge and strike levels.

E. Set doors accurately; plumb and aligned with frame.

F. Set frames accurately in position; plumb, align and brace until permanent anchors are set.

3.2 RECONDITIONING EXISTING FRAMES

A. Remove rust and decay completely in accordance with SSPC for “Hand-Tool” and “Power-Tool” Cleaning

B. Prepare frame to receive new work. Pre-prime newly exposed metal with Rustolem Rust Stop or Approved.

C. Repair and fill holes, depressions, abandoned fasteners, and pitted or deteriorated surfaces. Finish exposed surfaces smooth.

D. Seal open joints (do not seal weeps).

E. Prime and paint frame in accordance with section 09 90 00.

3.3 ADJUSTMENT AND CLEANING

A. Remove dirt and excess sealants, mortar or glazing compounds from exposed surfaces.

B. Adjust moving parts for smooth operation. Use shims if necessary for proper closing.

END OF SECTION 08 11 00

SECTION 08 14 16

FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Flush, solid-core wood doors

1.2 RELATED SECTIONS

A. Section 06 20 00 – Finish Carpentry

B. Section 08 71 00 - Door Hardware.

1.3 QUALITY ASSURANCE & REFERENCES

A. Company specializing in wood door fabrication.

B. Windows and Door Manufacturers Association (WDMA).

C. ANSI/NWWDA I.S. 1A SERIES, latest edition, Industry Standard for flush wood doors.

D. AWI – Architectural Woodwork Institute.

1.4 SUBMITTALS

A. Submit under provisions of Section 01 33 00

B. Provide sufficient detail to show full compliance with specification:

C. Fabrication drawings with dimensions and details for solid core doors, veneer and hardware preparation.

D. Finish samples: Two (2) 4”x4” samples indicating manufacturer’s standard stain colors for each veneer type specified.

1.5 WARRANTY

A. Provide ‘Interior Use - Life of Installation” warranty against manufacturing defects, warp, and delamination.

B. Include repair or replacement in Warranty

1.6 DELIVERY, STORAGE & HANDLING

A. Package doors with slip sheets, poly-wrapped, or in individual cartons

B. Comply with requirements of AWI section 1300-G-23 and NWWDA I.S. 1A. Protect from moisture within confined area.

PART 2 – PRODUCTS

2.1 DOORS

A. Type: Veneer-Grade solid, non-rated, 1¾ inch lumber core, AWI section 1300, PC-5, Plain sliced, Red Oak veneer, factory finished. Edge band with hardwood face material.

B. Top and bottom rails minimum of 2¼ inches before trimming.

C. Stain as selected from Manufacturer’s standards.

2.2 PREPARATION

A. Bevel door stiles 1/8 inch in 2 inches and undersize doors ¼ inch in width to allow free swing and no hinge bind.

2.3 MANUFACTURERS

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A. Oregon Door, Vancouver Door, Marshfield, or approved.

PART 3 – EXECUTION

3.1 GENERAL

A. Install in framed openings and maintain operating clearances and tolerances.

B. Verify Finish Hardware in accordance with approved hardware schedule and approved Shop Drawings.

C. Install hardware and accessories and make adjustments at completion of finish painting.

D. Make final adjustments for proper door operation, smooth and balanced door movement.

END OF SECTION 08 14 16

DOOR HARDWARE

SECTION 08 71 00

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Hardware for steel and wood doors.
B. Thresholds.
C. Weatherstripping, seals and door gaskets.

1. 2 RELATED SECTIONS

A. Section 08 11 00 –Steel Doors and Frames.
B. Section 08 14 16 – Flush Wood Doors.

1.3 REFERENCES

A. ADA - Americans with Disabilities Act, Accessibility Guidelines for Buildings and Facilities.
B. NFPA 80 - Fire Doors and Windows.
C. NWWDA Industry - Quality Standards.
D. NFPA 101 - Code for Safety to Life from Fire in Buildings and Structures.
E. NFPA 252 - Fire Tests of Door Assemblies.
F. UL lOB - Fire Tests of Door Assemblies.
G. UL 305 - Panic Hardware.

1.4 SUBMITTALS

A. Submit under provisions of Section 01 30 00.
B. Shop Drawings: Indicate locations and mounting heights of each type of hardware, and electrical characteristics and connection requirements.
C. Submit manufacturer's parts lists, and templates.

1.5 QUALITY ASSURANCE

A. Perform work in accordance with the following requirements:
   1. ANSI 117.1 2003 Accessible and Usable Buildings and Facilities.
   2. NFPA 101, 80 and 252.

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing Products specified with minimum three years documented experience.
B. Hardware Supplier: Company specializing in supplying commercial door hardware with three years documented experience.
C. Hardware Supplier Personnel: Employ an Architectural Hardware Consultant (AHC) to assist in the work of this section.

1.7 REGULATORY REQUIREMENTS

A. Conform to applicable code for requirements applicable to fire rated doors and frames.
B. Products Requiring Electrical Connection: Listed and classified by Underwriters' Laboratories, Inc., as suitable for the purpose specified and indicated.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Section 01 60 00.
B. Package hardware items individually; label and identify each package with door opening code to match hardware schedule.

1.9 COORDINATION

A. Coordinate work under provisions of Section 01 31 00.
B. Coordinate the work with other directly affected sections involving manufacture or fabrication of internal reinforcement for door hardware.

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1.10 WARRANTY

A. Provide Manufacturer's ten-year warranty for door closers under provisions of Section 01 77 00.

1.11 MAINTENANCE MATERIALS

A. Provide maintenance materials under provisions of 01 77 00.
B. Provide special wrenches and tools applicable to each different or special hardware component.
C. Provide maintenance tools and accessories supplied by hardware component manufacturer

PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Butt Hinges: Ives
B. Continuous Geared Aluminum Hinges: Ives
C. Lock Sets: Schlage L Series Mortise, 03 Lever, Sectional Trim
D. Closers: LCN
E. Panic Devices: Von Duprin
F. Stops: Ives
G. Stop/Holder: Trimco
H. Thresholds: Pemko.
I. Smoke Seal: NGP
J. Louvers: Anemostat.
K. Kick Plates: Ives.
L. Overhead Stops: Glynn Johnson
M. Door Pivot: Rixson.
N. Weather Stripping: NGP.
O. Auto. Door Bottom: NGP
P. Cylinders: Schlage Everest Primus Level 9
Q. Push-Pulls: Ives
R. Relite Frames: Anemostat, unless otherwise noted

2.2 KEYING

A. Door Locks: Grand master keyed. Keyed to Owner's instructions.
B. Supply keys in the following quantities:
    1. Two (2) grand master keys.
    2. Two (2) construction keys.
    3. Additional keys or quantities as requested by Owner.
C. Manufacturer's Installation Instructions: Indicate special procedures, and perimeter conditions requiring special attention.

2.3 FINISHES

A. Finishes: See Door and Hardware Schedules.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify site conditions under provisions of Section 01039.
B. Verify that doors and frames are ready to receive work and dimensions are as indicated on shop drawings.
C. Verify that electric power is available to power operated devices and of the correct characteristics.

3.2 INSTALLATION

A. Install hardware in accordance with manufacturer's instructions.

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B. Use templates provided by hardware item manufacturer.
C. Mounting heights for hardware from finished floor to center line of hardware item:

1. Locksets: 40-5/16 inches or match existing frame condition.
2. Push/Pulls: 45 inches.
3. Dead Locks: 48 inches.
4. Exit Devices: 40-5/16 inches or match existing frame condition.

3.3 ADJUSTING

A. Adjust work under provisions of Section 01 70 00 - Closeout.
B. Adjust hardware for smooth operation.

3.4 PROTECTION OF FINISHED WORK

A. Protect finished Work under provisions of Section 01 50 00.

END OF SECTION 08 71 00

SECTION 08 73 01
DOOR HARDWARE TYPES

MANUFACTURERS
SEL – SELECT
CAM – CAMDEN
GLY – GLYNN JOHNSON
PHI – PRECISION
LCN – LCN
SCH – SCHLAGE
PEM – PEMKO
VD – VON DUPRIN
IVE – IVES
MCK – MCKINNEY
HES – HES
ALV – AIR LOUVERS
RIX – RIXSON

HARDWARE SET 1: DOOR NRR1A

Qty	Description	Catalog Number	Finish	Mfr
3	HINGE	T4B3386 5½X4 NRP	606	MCK
1	LOCKSET	L9496	606	SCH
1	ADA THUMBTURN	09-509XL583-363	606	SCH
1	CLOSER	4111 EDA WMS	606	LCN
1	KICKPLATE	8400 10”X2”LDW B4E CS	606	IVE
1	WALL STOP	WS407CCV	606	IVE
1	SEAL	S88	GRAY	PEM

HARDWARE SET 2: CLASSROOM DOORS – N1A, N4A, N6A, N8A, N9A, N9AA

Qty	Description	Catalog Number	Finish	Mfr
3	HINGE	T4B3386 5½X4 NRP	606	MCK
1	MORTISE LOCKSET	L9070	606	SCH
1	KICKPLATE	8400 10”X2”LDW B4E CS	606	IVE
1	WALL STOP	WS407CCV	606	IVE
3	SILENCERS	SR 64	GR	IVE

HARDWARE SET 3: OFFICE DOORS – NTECHA, NLIBBA, NLIBAA, N35A

Qty	Description	Catalog Number	Finish	Mfr
3	HINGE	T4B3386 5½X4 NRP	606	MCK
1	MORTISE LOCKSET	L9050	606	SCH
1	WALL STOP	WS407CCV	606	IVE
3	SILENCERS	SR 64	GRAY	IVE

HARDWARE SET 4: DOOR NRR4A, NRR8A

Qty	Description	Catalog Number	Finish	Mfr
3	HINGE	T4B3386 5½X4 NRP	606	MCK
1	PUSH PLATE	8200	606	IVE
1	PULL BAR	8302	606	IVE
1	CLOSER	4111 EDA WMS	606	LCN
1	KICKPLATE	8400 10”X2”LDW B4E CS	606	IVE
1	WALL STOP	WS407CCV	606	IVE
1	SEAL	S88	GRAY	PEM

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HARDWARE SET 4A: DOOR NLKR1A

Qty	Description	Catalog Number	Finish	Mfr
3	HINGE	T4B3386 5½X4 NRP	606	MCK
1	PUSH PLATE	8200	606	IVE
1	PULL BAR	8302	606	IVE
1	CLOSER	4111 EDA WMS	606	LCN
1	KICKPLATE	8400 10”X2”LDW B4E CS	606	IVE
1	OVERHEAD STOP	100S ADJ	630	GLY
1	SEAL	S88	GRAY	PEM

HARDWARE SET 5: DOOR ERR5A

Qty	Description	Catalog Number	Finish	Mfr
1	LOCKSET	L9496	606	SCH
1	ADA THUMBTURN	09-509XL583-363	606	SCH

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SECTION 08 80 00

GLAZING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Glass.
B. Glazing compounds and accessories.

1.2 RELATED SECTIONS

A Section 06 20 00 – Finish Carpentry.
B. Section 07 92 00 – Sealants.
C. Section 08 71 00 – Hardware.

1.3 REFERENCES

A. ASTM C 864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers; 1999.
B. ASTM C 1036 - C85 Standard Specification for Flat Glass; 1991 (Re-approved 1997).
C. ASTM C 1048088
D. ASTM F 1300 - Standard Practice for Determining Load Resistance of Glass in Buildings; 1998.
E. ANSI Z.97.1 Safety Glazing Impact Standards.
F. FS DD-G-1403 - Glass, Plate (Float), Sheet, Figured, and Spandrel (Heat Strengthened and Fully Tempered).
G. Uniform Building Code, Standard 24-2, Category 2 for safety glazing.
H. ASTM C1172 - Specification for Laminated Architectural Flat Glass.
I. UL (Underwriters' Laboratories) 972 - Burglary Resistant Glazing.

1.4 PERFORMANCE REQUIREMENTS

A. Provide glass and glazing materials for continuity of building enclosure and air barrier
B. Select type and thickness of exterior glass to withstand dead loads and wind loads acting normal to plane of glass at design pressures calculated in accordance with Oregon Structural Specialty code.
    1. Use procedure specified in ASTM F 1300 to determine glass type and thickness.
    2. Limit glass deflection to 1/200 or flexure limit of glass, whichever is less, with full recovery of glazing materials.
    3. Design to resist seismic forces in OSSC Zone 3.
    4. Thickness shall be as per opening loading and safety requirements and safety standards, but shall be no less than 1/8 inch.

1.5 SUBMITTALS

A. Product Data on Glass Types: Provide structural, physical and environmental characteristics, size limitations, and special handling or installation requirements.
B. Product Data on Glazing Compounds: Provide chemical, functional, and environmental characteristics, limitations, special application requirements. Identify available colors.
C. Two 12”x12” samples of each glazing material.

1.6 QUALITY ASSURANCE

A. Perform Work in accordance with GANA Glazing Manual and FGMA Sealant Manual for glazing installation methods.
B. Installer Qualifications: Company specializing in performing the work of this section with minimum ten years documented experience.

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1.7 ENVIRONMENTAL REQUIREMENTS

A. Do not install glazing when ambient temperature is less than 50^{O} F.

B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.8 WARRANTY

A. See Section 01 70 00 – Contract Closeout, for additional warranty requirements.

B. Warranty: Submit manufacturer's standard warranty. Include labor and materials to repair or replace defective materials.

1. Insulating Glass: Manufacturer's 10-year warranty.

PART 2 - PRODUCTS

2.1 BASIS OF DESIGN

A. Glass product selections are based upon primary glass manufacturer below. Provide basis of design product or comparable product of listed manufacturer approved.

1. PPG Industries, Inc. Pittsburg, PA

2. Color: Match Existing.

2.2 INSULATED GLASS

A. Insulated glazing units. 1-inch nominal unit thickness with air or argon.

B. Provide hermetically sealed units with dehydrated airspace, dual sealed with primary seal of polyisobutylene (PIB), or thermo plastic spacer (TPS) and a secondary seal of silicone

C. Solar Control Low-E Insulating-Glass Units, Solarban 60, or approved.

D. Safety glazing or tempered where indicated on Drawings and Schedules.

2.3 TEMPERED GLASS

A. Tempered Glass

1. Single layer
2. Surface Finish: Fully polished.
3. Conforming to Safety Regulations: ANSI Z97.1 and 16CFR 1201 Cat. II.
4. "Tempered Glazing" logo - each lite shall bear permanent, clearly visible, and non-removable label certifying it for use.
5. Transparency: Match existing.

B. Manufacturers:

1. Oregon Glass Co., Wilsonville, OR
2. Arch Aluminum & Glass/Armalite, Portland, OR
3. Pacific Tempered Glass Corporation, Wilsonville, OR, or approved

2.4 LAMINATED GLASS

A. Laminated Glass

1. Double layer of glass panes with plastic interlayer between each pane.
2. Laminate with plastic interlayer to ASTM C1172.
3. Conforming to Safety Regulations: ANSI Z97.1 and 16CFR 1201 Cat. II.
4. Transparency: match existing.

2.5 GLAZING ACCESSORIES

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A. Setting Blocks: Neoprene, 80 to 90 Shore A durometer hardness, ASTM C 864 Option I Length of 0.1 inch for each square foot of glazing or minimum 4 inch x width of glazing rabbet space minus 1/16 inch x height to suit glazing method and pane weight and area.
B. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness, ASTM C 864 Option I. Minimum 3 inch long x one half height of glazing stop x thickness to suit application, self adhesive on one face.
C. Glazing Tape: Preformed butyl compound with integral resilient tube spacing device; 10 to 15 Shore A durometer hardness; coiled on release paper; black color.
D. Aluminum Window replacement Vinyl Snap-in Glazing Stop or Bead, Swisco or approved

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that openings for glazing are correctly sized and within tolerance.
B. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement; weeps are clear, and ready to receive glazing.
C. Schedule removal and replacement activities to complete all installations each day. Provide Secure Openings with acceptable material in lieu of daily completion, if necessitated by circumstances beyond contractor's control. Coordinate such measures with Owner.

3.2 PREPARATION

A. Remove existing glazing material
B. Clean contact surfaces completely removing sealant, gaskets, etc. down to a clean surface.
C. Seal porous glazing channels or recesses with substrate compatible primer or sealer.
D. Prime surfaces scheduled to receive sealant.
E. Install sealant in accordance with manufacturer's instructions.
F. Install new glazing material with safety identification logo at bottom of opening.
G. Replace wood glazing stops damaged by removal with new stops of same profile; set new fasteners slightly below surface of wood stops; dap fastener depressions with fill compound, prime wood in preparation for finish painting.

3.3 CLEANING

A. Remove glazing sealant materials from finish surfaces.
B. Remove commercial labels and identification markings after Work is complete.
C. Wash glass on both faces not more than four days prior to date scheduled for inspections intended to establish date of substantial completion. Wash glass by method recommended by glass manufacturer.

END OF SECTION 08 80 00

SECTION 09 21 60
GYPSUM BOARD & WALL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Description of Work: Work of this Section includes, but is not limited to, the following:
   1. Gypsum board, backer board, and accessories.
   2. Metal studs and furring.
   3. Sound-rated construction and accessories.
   4. Gypsum board finishing.
   5. Trim and accessories.

1.2 RELATED SECTIONS

A. Section 06 41 00 – Casework.

B. Section 09 22 26 – Suspended Systems.

C. Section 09 51 00 – Acoustical Ceilings.

D. Section 09 30 00 – Tiling.

E. Section 09 90 00 – Painting & Coating.

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's specifications and installation instructions with Project conditions and materials clearly identified or detailed for each required system.

1.4 SYSTEM REQUIREMENTS

A. Performance Requirements: Fabricate and install systems as indicated but not less than that required to comply with ASTM C754 under the following conditions:
   1. Gypsum board partitions:
      a. Standard systems: Maximum deflection of l/240 of partition height.
      b. Systems to receive water resistant gypsum board or backer board: Maximum deflection of l/360 of partition height.
   2. Interior suspended ceilings and soffits: Maximum deflection of l/360 of distance between supports.

B. Fire Resistance Ratings: Where fire resistance classifications are indicated, provide materials and application procedures identical to those listed by UL or tested according to ASTM E119 for type of construction shown.

C. Acoustical Ratings: Where sound ratings are indicated, provide materials and application procedures identical to those tested by manufacturer to achieve Sound Transmission Class (STC) scheduled or indicated in accordance with ASTM E90.

1.5 QUALITY ASSURANCE

A. Reference Standards:
   1. Applicable requirements of ASTM C754 for installation of steel framing.
   2. Install gypsum board in accordance with applicable requirements and recommendations of Gypsum Association GA 216, "Recommended Specifications for the Application and Finishing of Gypsum Board", except for more stringent requirements of manufacturer.
   3. Apply acoustical sealant in accordance with applicable requirements of ASTM C919.

1.6 DELIVERY, STORAGE AND HANDLING

A. Delivery:

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1. Deliver material to site promptly, without undue exposure to weather, in manufacturer's unopened containers or bundles, fully identified with name, brand, type and grade.

B. Storage:
1. Store above ground in dry, ventilated space.
2. Protect materials from soiling, rusting and damage.
3. Store board to be directly applied to masonry walls at 70° degrees F for 24 hours prior to installation.

1.7 PROJECT CONDITIONS

A. Environmental Requirements:
1. Do not install gypsum board when ambient temperature is below 40° degrees F.

1.8 CONSTRUCTION WASTE DISPOSAL

A. Recycle:
1. Separate clean waste drywall pieces from contaimants for landfilling or reuse. Working with local waste hauler and local drywall manufacturer, provide proper storage of waste for pickup and return. Protect scraps material from moisture and contamination.

PART 2 - PRODUCTS

2.1 PRODUCTS AND MANUFACTURERS

A. Gypsum Board and Accessories: Listed products establish standard of quality and are manufactured by United States Gypsum Company, or approved equal.

B. Steel Framing and Furring: Commercial grade, contractor choice**.**

2.2 BOARD MATERIALS

A. Gypsum Board:
1. ASTM C36, Type X fire-resistant.
2. Edges: Tapered.
3. Thickness: 5/8 inch, unless otherwise indicated.
4. Acceptable products:
a. Typical partitions and ceilings: Equivalent to Sheetrock Brand SW, Firecode or Firecode "C" Gypsum Panels by USG.

B. Water-Resistant Gypsum Board:
1. ASTM C630, regular type except where Type X fire-resistant type is indicated or required to meet UL assembly types.
2. Edges: Tapered.
3. Thickness: 5/8 inch, unless otherwise indicated.
4. Acceptable products:
a. Equivalent to Sheetrock Brand W/R, W/R Firecode "C" or W/R Firecode Type X Gypsum Panels by USG or equal

C. Veneer Plaster Base board:
1. ASTM C588, Type 'X' fire-resistant.
2. Thickness: 5/8 inch, unless otherwise noted.
3. Manufacturer: USG Imperial Gypsum Base, or approved.

D. Impact Resistant Gypsum Board:

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1. Surface Abrasion: Level 3, minimum, when tested in accordance with ASTM C1629/C1629M.
2. Hard Body Impact: Level 3, minimum, when tested in accordance with ASTM C1629/C1629M.
3. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
4. Paper-Faced Type: Gypsum wallboard as defined in ASTM C1396/C1396M.
5. Type: Fire resistance rated Type X, UL or WH listed.
6. Thickness: 5/8 inch.
7. Edges: Tapered.
8. Manufacturer: USG, Mold Tough VHI Firecode Core, or approved.

E. Glass-Mat Gypsum Sheathing Board:
1. ASTM C 1177, Type X, 5/8 inch thick with fiberglass mat laminated to both sides and with manufacturer's standard edges.
   a. Core: Silicone treated water-resistant gypsum.
   b. Facing: Inorganic glass mat both sides.
   c. Thickness: 5/8 inch.
   d. Manufacturer: USG, Sheetrock Brand Glass-Mat Panels Mold Tough AR Firecode X, or approved.

F. Backing Board For Wet Areas:
1. Application: Surfaces behind tile in wet areas including tub and shower surrounds and shower ceilings.
2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
3. ANSI Cement-Based Board: Non-gypsum-based; aggregated Portland cement panels with glass fiber mesh embedded in front and back surfaces complying with ANSI A118.9 or ASTM C1325.

a. Thickness: 5/8 inch.

2.3 METAL FRAMING AND FURRING MATERIALS

A. Metal Studs and Runners:
1. ASTM C645, "C" or C-H shape; gage:
   a. Provide as indicated or specified. Provide heavier gage if required.
   b. At door and other openings, provide 2 - studs at each jamb.
   c. Provide runner gage as recommended by stud manufacturer.
2. Depth of sections: As indicated.
3. Corrosion protection: G40 hot-dip galvanized coating per ASTM A525.

2.4 ACCESSORIES

A. Metal Trim for Gypsum Board:
1. Conform to profile and dimensions indicated.
2. Material for interior Work: Galvanized steel, 26 gage minimum.
3. Corner beads: Equivalent to Dur-A-Bead No. 103 by USG.
4. Casing beads: Equivalent to 701-B by USG.
5. Control joints:
   a. Roll-formed zinc with perforated flanges.
   b. Size: 1-3/4 inch wide, with ¼ inch wide center channel.
   c. Provide with removable tape strip over channel.
   d. Acceptable product: Equivalent to No. 093 by USG.

B. Backer Plates:

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1. Steel, galvanized; 6 inches wide x 20 gage minimum x lengths to suit size of items to be attached; fastened to studs for attachment of surface mounted fittings and accessories.
2. Elimination of backer plates or direct attachment of accessories or equipment to studs will not be allowed.

C. Adhesives and Joint Treatment Materials: Adhesives and Joint Treatment Materials:
1. Conform to requirements of ASTM C475.
2. Joint compounds:
   a. Drying-type (ready-mixed): Equivalent to SHEETROCK Taping Joint Compound and Topping Joint Compound, or SHEETROCK All Purpose Joint Compound by USG.
   b. Setting (chemically-hardening) type: Equivalent to SHEETROCK Setting-Type Joint Compound by USG.
   c. Primer-Surfacer, TUFF-HIDE™: Finish Level 4 (GA-214/ASTM C-840) drywall surface with vinyl acrylic latex-based coating to achieve Level 5 gypsum board finish.
   d. Laminating adhesive for direct application: Special adhesive or joint compound specifically recommended for laminating gypsum boards and for adhering gypsum boards to solid substrates.
   f. Reinforcing joint tape:
      1. ASTM C475, 2 inch nominal width.

D. Gypsum Board Screws: Self-drilling, self-tapping steel screws.
1. For steel framing less than 0.03 inch thick: Comply with ASTM C1002.
2. For steel framing from 0.033 inch thick to 0.112 inch thick: Comply with ASTM C954.
3. Provide Type S or Type S-12 screws.

E. Backer Board Accessories: Provide accessories and corrosion-resistant-coated steel screws as recommended by backer board manufacturer and required for complete installation.

F. Acoustical Sealant: Equivalent to Acoustical Sealant by USG.

G. Sound Attenuation Blankets:
1. Mineral fiber, conforming to ASTM C665, Type I.
2. Surface burning characteristics per ASTM E84:
   a. Flame spread: 15 or less.
   b. Smoke developed: 0.
3. Thicknesses: As indicated.
4. Acceptable product and manufacturer: Equivalent to Thermafiber Sound Attenuation Fire Blankets SAFB by USG.[Fire Safety FS-15 Blankets].

H. USG Tuff Hide Primer-Surfacer

I. Flush Panel Steel Access Doors:
1. Type: Milcor DW or equal.
2. Material: 16-gauge steel frame with 14-gauge door panel. Galvanized steel drywall bead.
3. Hinge: Double-acting concealed spring type, 175 degree opening.
4. Lock: Flush, screwdriver-operated with steel cam.
5. Factory Finish: Baked-on electrostatic powder.

J. Miscellaneous Accessories: Provide as required for complete installations.

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PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and adjoining construction and conditions under which Work is to be installed. Do not proceed with Work until unsatisfactory conditions are corrected.

3.2 GENERAL INSTALLATION REQUIREMENTS

A. Install in accordance with reference standards and manufacturer's instructions.

B. Tolerances:
1. Do not exceed 1/8 inch in 8'-0" variation from plumb or level in exposed lines of surface, except at joints between gypsum board units.
2. Do not exceed 1/16 inch variation between planes of abutting edges or ends.
3. Shim as required to comply with specified tolerances.

C. Install framing to comply with ASTM C754 and with ASTM C840 requirements that apply to framing installation.

D. Install supplementary framing, blocking and bracing at terminations in gypsum board assemblies to support fixtures, equipment, heavy trim, grab bars, toilet accessories, furnishings or similar construction.

3.3 BOARD INSTALLATION

A. Single Layer Gypsum Board on Metal Studs:
1. Loosely butt gypsum board joints together and neatly fit.
2. Do not place butt ends against tapered edges.
3. Maximum allowable gap at end joints: 1/8 inch.
4. Stagger joints on opposite sides of partitions.
5. Apply ceiling boards first where gypsum board ceilings and wall occur.
6. Cut openings in gypsum board to fit electrical outlets, plumbing, light fixtures and piping snugly and small enough to be covered by plates and escutcheons. Cut both face and back paper.
7. Screw board in place securely with screws spaced according to manufacturer's recommendations.

B. Single Layer Gypsum Board on Furring:
1. Apply gypsum board with long dimension at right angles to furring channel.
2. Center end joints over channel web; stagger end joints from those in adjacent rows of board.
3. Fasten boards to furring channels with screws spaced according to manufacturer's recommendations.

C. Water-Resistant Gypsum Board:
1. Complete plumbing rough-in before gypsum board panels are erected.
2. Separate gypsum panels from rough-in and fixtures by 1/4 inch space.
3. Install water-resistant board horizontally.

3.4 SOUND-RATED CONSTRUCTION

A. Insulation:
1. Install sound attenuation blankets in sound-rated partitions and ceilings where indicated.
2. Completely fill space between studs and framing to full height of partition wall or full area of ceiling.

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3. Fit carefully behind electrical outlets and other Work penetrating sound-rated construction.

B. Gypsum Board:
1. Install gypsum board same as for interior partitions and ceilings.
2. Coordinate with installation of perimeter sealants.

C. Acoustical Sealant:
1. At partition walls, provide continuous beads of acoustic sealant at juncture of both faces of runners with floor and ceiling construction, and wherever gypsum board abuts dissimilar materials, prior to installation of gypsum board.
2. At ceilings, provide continuous beads of sealant wherever gypsum board abuts dissimilar materials.
3. Provide continuous bead of sealant behind faces of control joints prior to installation of control joint accessories.
4. After installation of gypsum board base layers, cut face layer sheets ½ inch less than floor-to-ceiling height and position with 1/4 inch open space between gypsum board and floor, ceiling and dissimilar vertical construction. Fill 1/4 inch open space with continuous sealant beads after installation of face layer.
5. At openings and cutouts, fill open spaces between gypsum board and fixtures, cabinets, ducts and other flush or penetrating items, with continuous bead of sealant.
6. Seal sides and backs of electrical boxes to completely close off openings and joints.

D. Sound Flanking Paths:
1. Where sound-rated partition walls intersect non-rated gypsum board partition walls, extend sound-rated construction to completely close sound flanking paths through non-rated construction.
2. Seal joints between face layers at vertical interior angles of intersecting partitions.

3.6 ACCESSORY INSTALLATION

A. Trim:
1. Use same fasteners to anchor trim accessory flanges as required to fasten gypsum board to supports, unless otherwise recommended by trim manufacturer.
2. Install metal corner beads at external corners.
3. Install metal casing bead trim whenever edge of gypsum board would otherwise be exposed or semi-exposed.

B. Control Joints:
1. Install control joints at junction of gypsum board partitions with walls or partitions of other finish material.
2. Where gypsum board is vertically continuous, as at stairwells, provide horizontal control joints at each floor level.

3.7 FINISHING

A. Provide levels of gypsum board finish for locations as follows, in accordance with Gypsum Association GA 214, "Recommended Specification: Levels of Gypsum Board Finish".

Level 1: Ceiling plenum areas and concealed areas, except provide higher level of finish as required to comply with fire resistance ratings and acoustical ratings.

Level 2: Gypsum board substrate at tile, except remove tool marks and ridges.

Level 3: Gypsum board surfaces, where textured finishes will be used or heavy vinyl wall papering (High-build Primer required Coat primer).

Level 4: Gypsum board surfaces, except where another finish level is indicated (High-build Primer required or USG First Coat primer).

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Level 5: Gypsum board surfaces requiring extra smooth surface for critical light, where indicated using Primer-Surfacer, TUFF-HIDE. Surface Preparation: Complete gypsum board surface to Level 4 before applying Primer-Surfacer, TUFF-HIDE.
Primer-Surfacer, TUFF-HIDE Application: Machine apply with airless sprayer in conformance with USG application instructions to a wet film thickness of 15 to 20 mils (9-12 mils dry film thickness). Surfaced may be painted after overnight drying.

B. Water-Resistant Gypsum Board: Treat fastener heads and joints with setting-type joint compound.
1. Do not crown joints or leave excess compound on panels.
2. Remove tool marks and ridges.
3. For fastener heads to be covered with tile, apply one coat of joint compound.

C. Joint Compound:
1. After skim coat sets, apply finish coat of compound feathering 3 to 4 inches beyond tape edges.
2. Feather coats onto adjoining surfaces so that camber is maximum 1/32 inch.
3. Allow joint compound to completely set before applying veneer plaster finish.

D. Trim:
1. Use same fasteners to anchor trim accessory flanges as required to fasten gypsum board to supports, unless otherwise recommended by trim manufacturer.
2. Install metal corner beads at external corners.
3. Install metal casing bead trim whenever edge of gypsum base would otherwise be exposed or semi-exposed, and where gypsum base terminates against dissimilar material.

E. Control Joints: Install where indicated and specified.

F. Special Trim and Reveal Joints: Install as indicated on Drawings and in accordance with manufacturer's instructions.

3.9 PATCHING EXISTING WALLS

A. Where new or replacement wall base is scheduled on existing walls, patch existing wall to achieve uniform finish surface.

B. Where demolition occurs, patch existing wall to achieve uniform finish surface.

3.10 ADJUSTING

A. Correct damage and defects which may telegraph through finish Work.

B. Leave Work smooth and uniform.

3.11 SCHEDULE OF FINISHES

A. unseen areas above ceiling, – Level 1.

B. Walls – Match existing project standard, unless otherwise known.

END OF SECTION 09 21 60

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SECTION 09 22 26

SUSPENSION SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general conditions of Contract, including General and Supplementary Conditions and Divisions-1 Specification sections apply to work of this section.

1.2 SUMMARY

A. Section Includes:
   1. Suspension System Framing and Furring for Gypsum Board and Wood Plank Assemblies.
   2. Wire hangers, fasteners, main runners, cross tees, and wall angle moldings.

B. Related Sections:
   1. Section 06 20 00 – Finish Carpentry
   2. Section 07 62 00 – Flashing & General Sheet Metal
   3. Section 09 51 00 – Acoustical Ceilings
   4. Section 09 90 00 – Painting & Coating
   5. Division 23 – HVAC
   6. Division 26 – Electrical

1.3 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. ASTM A 641 Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
2. ASTM A 653 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.
3. ASTM A 1008 Standard Specification for Steel, Sheet, Cold Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability"
4. ASTM B 117 Standard Practice for Operating Salt Spray (Fog) Apparatus
5. ASTM C 635 Standard Specification for Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.
6. ASTM C 636 Recommended Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels.
7. ASTM C 645 Standard Specification for Nonstructural Steel Framing Members
8. ASTM C 754 Installation of Steel Framing Members to Receive Screw-Attached Gypsum Board.
9. ASTM C1002 Standard Specification for Steel Drill Screws for the Application of Gypsum Board or Metal Plaster Bases.
10. ASTM E 119 Standard Test Method for Fire Tests of Building Construction and Material (if applicable).

1.4 SUBMITTALS

A. Product Data: Submit manufacturer's technical literature.

B. Samples: 8 inch long samples of suspension system components, including main runner, cross tees and angle molding.

C. Certifications: Manufacturer's certifications that products comply with specified requirements, including laboratory reports showing compliance with specified tests and standards.

1.5 QUALITY ASSURANCE

A. Single-Source Responsibility: To ensure proper interface, all drywall furring components shall be produced or supplied by a single manufacturer.

B. All accessory components from other manufacturers shall conform to ASTM standards.

C. Fire Resistance Ratings: As indicated by reference to design designations in UL Fire Resistance Directory, for types of assemblies in which drywall ceilings function as a fire

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protective membrane and tested per ASTM E 119. Installation in accordance with the UL Design being referenced.

D. Coordination of Work:
   1. Coordinate work with installers of related work including, but not limited to finish carpentry, sheet metal, acoustical ceilings, building insulation, gypsum board, light fixtures, electrical systems, and A/V systems.
   2. All work above the ceiling line should be completed prior to installing the finish material. There should be no materials resting against or wrapped around the suspension system, hanger wires, or ties.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination, and other causes.

1.7 WARRANTY

A. Suspensions System: Submit a written limited warranty executed by the manufacturer, agreeing to repair or replace grid components that are supplied with a hot-dipped galvanized coating or aluminum base material. Failures include, but are not limited to: The occurrence of 50% red rust as defined by ASTM B 117 test procedures as a result of defects in materials or factory workmanship.

B. Warranty Period: grid: Ten years from date of installation.

C. The Warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Suspension Systems: Armstrong World Industries, Inc., or approved.

2.2 SUSPENSION SYSTEMS

A. Components:
   1. Main Beam: Shall be double-web construction (minimum 0.0179 inch prior to protective coating), hot dipped galvanized (per ASTM A653).
      a. HD8901: 1-1/2 inch web height, prefinished 15/16 inch flange with minimum G40 hot dipped galvanization.
      b. HD8906: 1-11/16 inch web height, 1-1/2 inch flange, available with G40 or G90 hot dipped galvanization.
      c. HD8906F08: 1-11/16 inch web height with pre-cut facets (8 inches on center) for radius installations, 1-1/2 inch flange.
      d. HD8906F16: 1-11/16 inch web height with pre-cut facets (8 inches from ends, then 16 inches on center) for radius installations, 1-1/2 inch flange.
   2. Primary Cross Tees: Shall be double-web steel construction (minimum 0.0179 inch prior to protective coating), hot dipped galvanized (minimum G40 or G90 per ASTM A653), web height 1-1/2 inch with rectangular bulb and prefinished 1-1/2" knurled flange.
   3. Edge molding shall be hot dipped galvanized (minimum G40 per ASTM A653):
      a. HD 7859: Hemmed angle molding
      b. 7838: Unhemmed channel molding
   4. Screws for wallboard application shall be bugle head screws in accordance with thickness of material used.
   5. Metal Trim:

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a. Corner bead: Minimum #26 gauge, zinc alloy or plastic square edge type with expanded flanges.
b. Casing bead: Minimum #24 gauge, zinc alloy or plastic square edge type with expanded flanges.
c. Control Joints: Minimum #26 gauge, roll-formed zinc alloy, extruded aluminum or plastic with expanded flanges.
d. Special Trim Shapes: As detailed on plans, extruded aluminum with acrylic coating by Fry Reglet or approved equal.
e. Metal Lath: 3.4 lbs/square yard, galvanized 3/8 inch diamond mesh or flat rib lath; security lath for applications requiring high degree of security.

B. Structural Classification:
1. Main Beam shall be heavy duty per ASTM C 635.
2. Deflection of fastening suspension system supporting light fixtures, ceiling grilles, access doors, verticals and horizontal loads shall have a maximum deflection of 1/360 of the span for both furring and lathing work.

C. Finish:
1. Finish paint suspension system flat black where supporting wood plank ceiling assembly.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install suspension system and panels in accordance with the manufacturer's instructions, in compliance with ASTM installation standard, and with applicable codes as required by the authorities having jurisdiction.
B. Fasteners/Upper Attachment: Attach hanger wire directly tied to structure, or with proper fasteners (such as galvanized steel clips) sized and spaced to carry expected ceiling load. A pigtail knot with three tight wraps shall be used at all wire supporting locations and at top and bottom fastening conditions.
C. Use additional hanger wire at all perimeter locations, as required. Take care to conceal hangers and bracing above suspended framing assembly.
D. Provide additional components, as necessary, to frame openings for light fixtures, access doors, sprinkler systems, etc. Coordinate support framing with other trades. Support cut ends of finish material as required for uniform appearance.
E. Install access doors per manufacturer's instructions.
F. Main beams shall be suspended from the overhead construction with hanger wire, spaced as required along the length of the main beams for interior applications, exterior applications, or wind load applications.
G. Install cross tees spaced as required for interior applications, exterior applications, or wind load applications.
H. Install diamond mesh or flat ribbed lath with wafer head self-drilling screws spaced as required to cross tees.
I. Install perimeter hot dipped galvanized channel molding or angle at wall/ceiling junctures to support main runners and cross tees in an isolation manner. Isolation is mandatory when installing any plaster system.
J. Isolation: Do not fasten main runners or cross tees to perimeter masonry or concrete construction. Allow clearance between such construction at the ends of main runners and cross tees.
1. Channel molding is permitted when screws are attached to main runner flange for isolation.
K. Expansion Joints: Provide expansion joints where shown on drawings.
L. Control Joints: Install as shown on drawings, provide discontinuous laps over joints. Do not bridge joints.

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M. Plaster stops, grounds, and corner pieces are attached to system with wafer head screws and/or #18 gauge tie wire.

N. Plaster mixture and thickness to be in accordance with manufacturer's recommendations and applied in the same manner as when using channel iron for suspension, per American National Standards Institute (ANSI) Specifications.

END OF SECTION 09 22 26

SECTION 09 26 05

VENEER PLASTER REPAIR

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section specifies veneer plaster patching and repair where demolition or new work may require patching to restore finish and texture of the existing veneer plaster system.

1.2 RELATED WORK

A. Section 06 10 00 – rough carpentry.

B. Section 09 20 00 – gypsum board

B. Section 09 90 00 – painting & coating.

1.3 TERMINOLOGY

A. Definitions and description of terms in accordance with ASTM C11, C843, C844, and as specified.

1.4 APPLICABLE PUBLICATIONS

A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced in the text by the basic designation only. Most current version applies.

B. American Society for Testing and Materials (ASTM):

C587-04	Gypsum veneer plaster.
C588-03	Gypsum base for veneer plasters.
C631-95	Bonding compounds for interior plastering.
C843-99	Application of gypsum veneer plaster.
C1002-04	Steel drill screws for the applications of gypsum panel products board or metal plaster bases.
C1047-05	Accessories for gypsum wallboard and gypsum veneer base.

1.5 ALTERNATES

A. Refer to Section 01 23 00 for possible effect upon Work of Section.

PART 2 - PRODUCTS

2.1 JOINT REINFORCING TAPE

A. ASTM C475.

B. Paper tape.

2.2 LAMINATING ADHESIVE

A. ASTM C475.

B. Joint compound chemical setting type or as recommended by veneer base manufacturer.

2.3 FASTENERS

A. Screws: ASTM C1002 OR C954.

2.4 BONDING COMPOUND

A. ASTM C631.

2.5 BASE GYPSUM PANELS

a. Refer to section 09 21 60.

B. Provide single or multiple base layers of such thickness that repair will be flush with existing surface.

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PART 3 - EXECUTION

3.1 INSTALLATION CRITERIA

A. Inspect area of repair for suitability for installation. Report unsatisfactory conditions to architect prior to work.

B. Commencement of work indicates acceptance of conditions.

C. Repair, mix, and apply veneer plaster in accordance with ASTM C843.

3.2 CRACK REPAIR

A. Draw-in cracked and sagging surfaces with corrosion-resistant plaster washers and screws, or equivalent, until surface is flush and level and area is made sound.

B. Rake-out wide, deep cracks and cracks with uneven adjoining surfaces. Dampen full depth and fill with setting-type compound.

C. Repair cracks using paper joint tape embedded in prepared joint compound. Cover fasteners used to refasten loose and cracked areas in similar fashion.

D. After embedding coat has set, apply additional coat of prepared joint compound to completely cover paper tape and feather out repair.

E. Incorporate repair into existing veneer plaster finish according to requirements of this Section.

3.3 HOLE REPAIR

A. Repair damaged, missing, or demolished substrates with materials suitable for repair. Provide framing, backing, and base gypsum panels as required at larger holes.

B. Coat existing plaster edges with plaster bonder.

C. Trowel plaster product suitable for repair into holes, filling flush with adjacent surfaces.

D. Reinforce edges of patched area with joint tape and prepared joint compound.

E. Incorporate repair into existing veneer plaster finish according to requirements of this Section.

3.4 VENEER PLASTER REPAIR

A. Mix and apply veneer plaster in accordance with ASTM C843.

B. Apply plaster bonder to dry surfaces in uniform fashion.

C. Joint reinforcement: ASTM C843.

C. Apply finish to match existing texture.

D. Seal and reinforce all joints and fastener heads.

E. Remove lumps, abrasions and imperfections which will telegraph through paint finishes.

F. Spot patch existing hairline cracks and other imperfections in texture to blend existing and patch work.

3.5 CLEANUP AND PATCHING

A. Remove any plaster debris from adjacent surfaces. Repair defects in veneer plaster. Plaster surfaces shall be clean, and in condition to receive finish paint materials.

END OF SECTION 09 26 05

SECTION 09 30 00
TILING

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Tile for floor applications.
   2. Tile for wall applications.
   3. Ceramic accessories.
   4. Ceramic trim.
   5. Non-ceramic trim.

B. Related Requirements:
   2. Section 09 21 60 – Gypsum Board & Wall Framing.

1.2 REFERENCE STANDARDS

A. Reference Standards: Current edition at date of Bid.

B. American National Standard:
   1. ANSI A108/A118/A136.1 - American National Standard Specifications for the Installation of Ceramic Tile - Version; 2013.1.

C. American Society for Testing and Materials (ASTM) International:
   1. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2011.
   2. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride; 2011.

D. TCNA (HB) - Handbook for Ceramic, Glass, and Stone Tile Installation - Version; 2013.1.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by all affected installers.

1.4 SUBMITTALS

A. Product Data: Provide manufacturers' data sheets on tile, mortar, grout, and accessories. Include instructions for using grouts and adhesives.

B. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

C. Maintenance Data: Include recommended cleaning methods, cleaning materials, stain removal methods, and polishes and waxes.

1.5 QUALITY ASSURANCE

A. Maintain one copy of and ANSI A108/A118/A136.1 and TCNA (HB) on site.

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B. Manufacturer Qualifications: Company specializing in manufacturing the types of products specified in this section, with minimum 5 years of documented experience.

C. Installer Qualifications: Company specializing in performing tile installation, with minimum of 5 years of documented experience.

1.6 PERFORMANCE REQUIREMENTS

A. Dynamic Coefficient of Friction: Provide flooring materials with the following values as determined by testing according to ANSI 137.1 DCOF Standard:
   1. On wet interior surface to be walked on when wet:
      a. On level surface: DCOF > 0.42.
      b. On incline surface: DCOF > 0.45.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.

1.8 FIELD CONDITIONS

A. Maintain ambient and substrate temperature of 50 degrees F during installation of mortar materials.

1.9 COORDINATION

A. Coordinate with Section 03 30 00 for sloping of concrete slab to floor drains or concrete depression for tile setting beds.

B. Coordinate with Division/Section 22 for plumbing penetrations and installations.

1.10 EXTRA MATERIALS

A. Submit extra materials to Owner. Obtain Owner's signed receipt from authorized representative.

B. Provide minimum one full carton for each tile type, color and size. Label containers to show manufacturer/product and where used.

C. Tile Penetrating Sealer: Minimum one gallon in manufacturer's container, unopened, clearly labeled with manufacturer's logo and instructions for use.

D. Maintenance Cleaning Agent: 5 gallons in manufacturer's unopened container, clearly labeled with manufacturer's logo and instructions for use.

1.11 WARRANTY

A. Systems Warranty: Manufacturer’s 10 year Systems Warranty for mortars and grouts.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from single manufacturer and each aggregate from single source or producer.
   1. Obtain setting and grouting materials, except for unmodified Portland cement and aggregate, from single manufacturer.
   2. Obtain waterproof membrane and crack isolation membrane, except for sheet products, from manufacturer of setting and grouting materials.

2.2 PRODUCT, GENERAL

A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.
   1. Provide tile complying with Standard grade requirements.

B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCNA installation methods specified in tile installation schedules, and other requirements specified.

C. Factory Blending: For tile exhibiting color variations within ranges, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.

D. Factory-Applied Temporary Protective Coating: Where indicated under tile type, protect exposed surfaces of tile against adherence of mortar and grout by precoating with continuous film of petroleum paraffin wax, applied hot. Do not coat unexposed tile surfaces.

2.3 TILE

A. CT-1 Glazed Ceramic Tile – Daltile Natural Hues, 4”x4” Color to match existing.

B. CT-2 Glazed Ceramic Tile – Daltile Natural Hues, 4”x4” Accent Color to match existing.

C. CT-3 Glazed Ceramic Tile – Daltile Natural Hues, 4”x4” Accent Color to match existing.

D. CT-4 Glazed Ceramic Tile – Daltile Natural Hues, 2”x2” Floor tile to match existing.

2.4 TRIM AND ACCESSORIES

A. Ceramic Accessories: Glazed finish, same color and finish as adjacent field tile; same manufacturer as tile.

B. Ceramic Trim: base, and cove ceramic shapes in sizes coordinated with field tile.
   1. Applications:
      a. Inside Corners: Jointed.
      b. Floor to Wall Joints: Cove base at Restrooms, match existing.
      c. Windowsill: Bullnose

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2. Manufacturers: Same as for tile.

2.5 SETTING MATERIALS

A. Provide setting materials made by the same manufacturer as grout.

B. Latex-Portland Cement Mortar Bond Coat (Thinset): ANSI A118.4.
   1. Applications: Use this type of bond coat where indicated and where no other type of bond coat is indicated.
   2. Products:
      a. Bostik Tile-Mate 760 with Hydroment 447 Flex-A-Lastic Mortar Admixture; www.bostik.com.
      b. Custom, MegaLite Modified Thin-Set Mortar; www.custombuidingproducts.com..
      c. LATICRETE International, Inc.; LATICRETE 254 Platinum: www.laticrete.com.
      d. Mapei; KERABOND Dry Set Mortar with MAPEI 300 KERALASTIC Liquid Polymer Additive, www.mapei.com.
      e. Substitutions: See Section 01 60 00 - Product Requirements.

C. Medium Bed Mortar: Pre-packaged mix of Portland cement, sand, latex additive, and water.
   1. Products:
      a. Custom Building Products, www.custombuildingproducts.com:
         1) Marble Granite, & Travertine Premium Mortar
         2) Custom Building Products - Complete Contact
      b. LATICRETE 220 Medium Bed Mortar mixed with LATICRETE 3701 Mortar Admix or LATICRETE 255 MultiMax; www.latricrete.com.
      c. MAPEI, Granirapid Mortar mixed with Granirapid Liquid or Ultraflex LFT, www.mapei.com.
      d. Substitutions: See Section 01 60 00 - Product Requirements.

D. Medium Bed Mortar for Large Format Tiles and Natural Stone:
   1. Products:
      a. Custom, Marble & Granite Fortified Premium Mortar, www.custombuildingproducts.com.
   2. Substitutions: See Section 01 60 00 - Product Requirements.

E. Mortar Bed Materials (Thickset): Pre-packaged mix of Portland cement, sand, latex additive, and water.
   1. Products:
      a. Bostik Multi-Purpose Acrylic Latex Mortar Admixture with Hydroment 425, Grout Additive; www.bostik.com.
      b. Custom-Custom Float with ThinSet Mortar Additive; www.custombuildingproducts.com.
      c. LATICRETE International, Inc.; LATICRETE 3701 Fortified Mortar Bed: www.laticrete.com.
      d. Substitutions: See Section 01 60 00 - Product Requirements.

2.6 GROUTS

A. Epoxy Grout: ANSI A118.3 chemical resistant and water-cleanable epoxy grout.
   1. Applications: Where indicated.
   2. Products:
      a. Bostik Inc.; EzPoxy 100% Solids Commercial Epoxy, Colored Epoxy Setting and Grout System: www.bostik-us.com.
      b. Custom, CEG-Lite 100% Solid Commercial Epoxy Grout (water cleanup); www.custombuildingproducts.com.

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c. LATICRETE International, Inc.; LATICRETE SPECTRALOCK PRO Premium Grout: www.laticrete.com.
d. Mapei, Heavy Commercial and Industrial, Kerapoxy IEG; www.mapei.com.
e. Substitutions: See Section 01 60 00 - Product Requirements.

C. Tile Sealant: Gunnable, silicone, siliconized acrylic, or urethane sealant; moisture and mildew resistant type.
1. Applications: Between tile and plumbing fixtures.

D. Tile and Grout Cleaner: For stained tile and grout. A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.
1. Manufacturer/Product: Aqua Mix, Heavy Duty Tile & Grout Cleaner.
2. Substitutions: See Section 01 25 00.

E. Grout Sealer: Liquid-applied, moisture and stain protection for existing or new Portland cement grout.
1. VOC Requirements: Meet the VOC requirements of South Coast Air Quality Management District, SCAQMD, Rule 1113.
2. Composition: Water-based formula.
3. Products:
a. Aqua Mix Inc., Sealer's Choice Gold, water-based penetrating sealer (47 g/l).
b. Custom Building Products, TileLab Grout & Tile Sealer (33 g/l.
c. TEC Guard All – Invisible Penetrating Sealer.
d. Substitutions: See Section 01 25 00 .

2.7 ACCESSORY MATERIALS

A. Mesh Tape: 2-inch wide self-adhesive fiberglass mesh tape.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify that sub-floor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive tile.

B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive tile.

C. Verify that sub-floor surfaces are dust-free and free of substances that could impair bonding of setting materials to sub-floor surfaces.

D. Verify that concrete sub-floor surfaces are ready for tile installation by testing for moisture emission rate and alkalinity; obtain instructions if test results are not within the following limits:
1. Moisture Emission Rate: Not greater than 3 lb per 1000 sq ft per 24 hours, test in accordance with ASTM F1869.
2. Alkalinity (pH): Verify pH range of 5 to 9, test in accordance with ASTM F710.

E. Verify that required floor-mounted utilities are in correct location.

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3.2 PREPARATION

A. Protect surrounding work from damage.

B. Vacuum clean surfaces and damp clean.

C. Seal substrate surface cracks with filler. Level existing substrate surfaces to acceptable flatness tolerances.

3.3 INSTALLATION - GENERAL

A. Install tile, thresholds, and stair treads and grout in accordance with applicable requirements of ANSI A108.1A thru A108.13, manufacturer's instructions, and TCNA (HB) recommendations.

B. Lay tile to pattern indicated. Maintain pattern continuous around corners and wall ends. Do not interrupt tile pattern through openings.

C. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly. Align floor joints.

D. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make grout joints without voids, cracks, excess mortar or excess grout, or too little grout.

E. Form internal angles coved and external angles bullnosed.

F. Install ceramic accessories rigidly in prepared openings.

G. Install non-ceramic trim in accordance with manufacturer's instructions.

H. Sound tile after setting. Replace hollow sounding units.

I. Keep control and expansion joints free of mortar, grout, and adhesive.

J. Keep expansion joints free of adhesive or grout. Apply sealant to joints.

K. Prior to grouting, allow installation to completely cure; minimum of 48 hours.

L. Grout tile joints unless otherwise indicated. Use standard grout unless otherwise indicated.

M. At changes in plane and tile-to-tile control joints, use tile sealant instead of grout, with either bond breaker tape or backer rod as appropriate to prevent three-sided bonding.

N. Apply sealant to junction of tile and dissimilar materials and junction of dissimilar planes.

O. Apply grout sealer to grout after approval by Owner.

3.4 INSTALLATION –THIN-SET METHODS

A. Over interior floor slabs, install in accordance with TCNA Method F131 (current edition), epoxy mortar & grout.

B. Match existing cement mortar bed assembly where patching occurs.

3.5 INSTALLATION - WALL TILE

A. Over cementitious backer units install in accordance with TCNA Method W244C (current edition), cementitious backer unit.

B. Match existing cement mortar bed assembly where patching occurs.

3.6 EXPANSION JOINTS AND JOINT SEALANTS

A. Conform to TCNA EJ171 for expansion joint, isolation joint, perimeter joint construction joint, contraction joint, and generic movement joint systems, and provisions of Contract Documents.

B. Install joint sealant and backer rod or bond breaker tape conforming to TCNA EJ171 guidelines.

C. Install continuous control joint around floor perimeters between tile at floor and wall and where tilework abuts other restraining surfaces as necessary to allow independent differential expansion and contraction between floor and wall planes.

D. Install continuous control joint at inside corners of tile faced abutting walls to allow independent differential movement between wall planes.

E. Install sealant at joints at built-in plumbing fixture perimeters of meeting tile.

F. Seal around pipes and other penetrations through tile.

G. Provide expansion/control joints where indicated on Drawings, and as follows:
   1. Interior: 20 feet to 25 feet in each direction.
   2. Exterior: 8 feet to 12 feet in each direction.
   3. Interior tilework exposed to direct sunlight or moisture: 8 feet to 12 feet in each direction.

3.7 CLEANING

A. Clean tile and grout surfaces.

3.8 PROTECTION

A. Do not permit traffic over finished floor surface for 4 days after installation.

END OF SECTION 09 30 00

SECTION 09 51 00

ACOUSTICAL CEILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general conditions of Contract, including General and Supplementary Conditions

B. Section 09 21 60 – Gypsum Board & Wall Framing.

C. Section 09 22 26 – Suspension System.

1.2 SUMMARY

A. Section Includes:
   1. Suspended acoustical ceiling panels.
   2. Exposed grid suspension system.
   3. Wire hangers, fasteners, main runners, cross tees, and wall angle moldings.

1.3 REFERENCES

A. American Society for Testing and Materials (ASTM):

B. ASTM A 1008 Standard Specification for Steel, Sheet, Cold Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.

C. ASTM A 641 Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire. ASTM A 653 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.

D. ASTM C 423 Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.

E. ASTM C 635 Standard Specification for Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.

F. ASTM C 636 Recommended Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels.

G. ASTM E 84 Standard Test Method for Surface Burning Characteristics of Building Materials.

H. ASTM E 1414 Standard Test Method for Airborne Sound Attenuation Between Rooms Sharing Ceiling Plenum.

J. ASTM E 1264 Classification for Acoustical Ceiling Products.

K. ASTM E 1477 Standard Test Method for Luminous Reflectance Factor of Acoustical materials by use of Integrating-Sphere Reflectometers.

L. ASTM D 3273 Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.

M. ASTM E 119 Standard Test Methods for Fire Tests of Building Construction and Material.

N. ASHRAE Standard 62.1-2004, "Ventilation for Acceptable Indoor Air Quality"

1.4 SUBMITTALS

A. Product Data: Submit manufacturer's technical data for each type of acoustical ceiling unit and suspension system required.

B. Samples: Minimum 6 x 6 inch samples of specified acoustical panel; 8 inch long samples of exposed wall molding and suspension system, including main runner and cross tees.

C. Certifications: Manufacturer's certifications that products comply with specified requirements.

1.5 QUALITY ASSURANCE

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A. Handle acoustical ceiling units carefully to avoid chipping or damage.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical ceiling units to project site in original, unopened packages and store in fully enclosed space where protected against damage from moisture, direct sunlight, and surface contamination. Permit material to reach room temperature and stabilized moisture content prior to installation.

1.7 WARRANTY

A. Acoustical Panel: Submit manufacturer's warranty agreeing to repair or replace acoustical panels that fail within warranty period. Failures include, but are not limited to:
   1. Acoustical Panels: Sagging and warping as a result of defects in materials or factory workmanship.
   2. Grid System: Rusting and manufacturer's defects

1.8 MAINTENANCE

A. Provide one box of extra panels of each type to Owner. Package with protective covering for storage and identified with appropriate labels.

1.9 ALTERNATES

A. Refer to Section 01 23 00 for possible effect upon Work of Section.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Ceiling Panels: Armstrong World Industries, Inc., or approved

2.2. ACOUSTICAL CEILING UNITS

A. ACT-1: Lay-In Acoustical Panels, Armstrong Cortega 769 or approved

B. ACT-2: Glue On 12” x 12” Acoustical Panels, Armstrong 741 Fine Fissure, or approved

2.3 GRID

A. Armstrong World Industries, 15/16 inch, White, lay-in system Prelude XL, or approved.

2.4 SUSPENSION SYSTEMS

A. Provide seismic bracing as required by IBC/OSSC.

B. Provide materials and main beams and cross tees in accordance with IBC/OSSC:
   1. Attachment Devices, Hanger and Tie Wire, and Wall Moldings: In accordance with International Building Code, OSSC for Category D, E, and F.
   2. Accessories: BERC2 - 2 inch Beam End Retaining Clip, 0.034 inch thick, hot-dipped galvanized cold-rolled steel per ASTM A568 - used to join main beam or cross tee to wall molding.; SJCG - Seismic Joint Clip, 5 inches x 1½ inches, hot-dipped galvanized cold-rolled steel per ASTM A568.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Begin installation after completion of work which may damage quality of installation.

B. Inspect conditions affecting installation of work and report unsatisfactory areas to General Contractor. Commencement of work constitutes acceptance of conditions.

3.2 PREPARATION

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A. Conform to layout shown on reflected ceiling plan. Coordinate layout, incorporating fire sprinkler and alarm devices, HVAC mechanical registers and electrical fixtures and devices.

B. If requested, furnish concrete inserts and similar devices to other trades for installation well in advance of time needed for coordination of other work.

3.3 ADJUSTING AND CLEANING

A. Replace damaged and broken panels prior to Substantial Completion.

B. Thoroughly clean exposed surfaces of existing runners, trim, edge moldings, and suspension members. Comply with manufacturer's instructions for cleaning and touch up of minor finish damage.

C. Remove and replace work that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

3.4 COMPLETION

A. Provide two boxes of tiles for attic stock materials to designated Owner's representative. Obtain written, signature receipt of transfer and furnish to General Contractor.

END OF SECTION 09 51 00

SECTION 09 65 00

RESILIENT FLOORING AND BASE

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Resilient tile flooring.
   2. Resilient base.
   3. Installation accessories.

B. Related Requirements:
   1. Section 03 30 00 - Cast-In-Place Concrete: Restrictions on curing compounds for concrete slabs and floors.
   2. Section 03 54 00 - Cast Underlayment.

1.2 REFERENCE STANDARDS

A. Reference Standards: Current edition at date of Bid.

B. American Society for Testing and Materials (ASTM) International:
   1. ASTM F1066 - Standard Specification for Vinyl Composition Floor Tile; 2004 (Reapproved 2010) e1.
   2. ASTM F1861 - Standard Specification for Resilient Wall Base; 2008 (Reapproved 2012)e1.

1.3 SUBMITTALS

A. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.

B. Shop Drawings: Indicate seaming plan.

C. Selection Samples: Submit two (2) each 12”x12” color samples of each color selected.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Store all materials off the floor in an acclimatized, weather-tight space.

B. Maintain temperature in storage area between 55 degrees F and 90 degrees F.

C. Protect roll materials from damage by storing on end.

1.5 FIELD CONDITIONS

A. Store materials for not less than 48 hours prior to installation in area of installation at a temperature of 70 degrees F to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F.

B. Owner will remove portions of base to ensure proper installation. Contractor to advise at early install so issues are discovered prior to completion of entire project.

1.6 WARRANTY

A. Manufacturer’s standard 5 year defect and wear warranty including labor costs for first 3 years and material costs for full 5 years.

1.7 EXTRA STOCK

A. Maintenance Materials: Obtain written receipt when delivered to Owner’s Representative. Vinyl Composition Tile: Furnish one carton for each color specified plus one additional carton for each additional 5,000 sf of each color.

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PART 2 – PRODUCTS

2.1 TILE FLOORING

A. Vinyl Composition Tile: Homogeneous, with color extending throughout thickness.
   1. Minimum Requirements: Comply with ASTM F1066, of Class corresponding to type specified.
   2. Size: 12 by 12 inch.
   3. Thickness: 0.125 inch.
   4. Manufacturer: Armstrong World Industries: www.armstrong.com.
      a. VCT-1: Armstrong Standard Excelon, or approved.
      b. Substitutions: See Section 01 60 00 - Product Requirements.
   5. Color: As selected from manufacturer's standard.

2.2 RESILIENT BASE

A. Resilient Base: Cove, Type TV Vinyl.
   1. Height: 4 inch unless otherwise noted.
   2. Length: Roll.
   3. Color: As selected.
   4. Manufacturers:
      a. Flexco; www.flexcofloors.com
      b. Substitutions: See Section 01 60 00 - Product Requirements.

2.3 FLOOR REDUCER AND TRANSITION ADAPTER STRIPS

A. Suitable for purpose, ADA compliant rolling type as instructed by manufacturer and as accepted by Architect.

2.4 ACCESSORIES

A. Subfloor Filler: White premix latex; type recommended by adhesive material manufacturer.

B. Primers, Adhesives, and Seaming Materials: Waterproof; types recommended by flooring manufacturer.
   1. Provide only products having lower volatile organic compound (VOC) content than required by the more stringent of the South Coast Air Quality Management District Rule No.1168 and the Bay Area Air Quality Management District Regulation 8, Rule 51.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.

B. Verify that floor surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive resilient base.

C. Cementitious Sub-floor Surfaces: Verify that substrates are dry enough and ready for resilient flooring installation by testing for moisture and pH.

   1. Verify that concrete slabs comply with ASTM F710 and substrates are dry and free of curing compounds, sealers, hardeners and other materials that are incompatible with adhesives bond.

D. Verify that required floor-mounted utilities are in correct location.

3.2 PREPARATION

A. Remove sub-floor ridges and bumps. Fill minor low spots, cracks, joints, holes, and other defects with sub-floor filler to achieve smooth, flat, hard surface.

B. Prohibit traffic until filler is cured.

3.3 INSTALLATION

A. Starting installation constitutes acceptance of sub-floor conditions.

B. Install in accordance with manufacturer's instructions.

C. Spread only enough adhesive to permit installation of materials before initial set.

D. Fit joints tightly.

E. Set flooring in place, press with heavy roller to attain full adhesion.

F. Where type of floor finish, pattern, or color are different on opposite sides of door, terminate flooring under centerline of door.

G. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated.

H. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.

3.4 TILE FLOORING

A. Mix tile from container to ensure shade variations are consistent when tile is placed, unless manufacturer's instructions say otherwise.

3.5 RESILIENT BASE

A. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches between joints.

B. Miter internal corners. At external corners, use premolded units. At exposed ends, use premolded units.

C. Install base on solid backing. Bond tightly to wall and floor surfaces.

3.6 CLEANING

A. Remove excess adhesive from floor, base, and wall surfaces without damage.

B. Clean in accordance with manufacturer's instructions.

3.7 PROTECTION

A. Prohibit traffic on resilient flooring for 48 hours after installation.

END OF SECTION 09 65 00

SECTION 09 68 00
CARPETING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Carpet.
   2. Accessories.

B. Related Requirements:
   1. Section 03 54 00 - Cast Underlayment.

1.2 REFERENCE STANDARDS

A. Reference Standards: Current edition at date of Bid.

B. CRI (CIS) - Carpet Installation Standard; Carpet and Rug Institute; 2009.

C. CRI (GLA) - Green Label Testing Program - Approved Adhesive Products; Carpet and Rug Institute; Current Edition.

1.3 SUBMITTALS

A. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns, colors available, and method of installation.

B. Two 12”x12” samples of each material.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing specified carpet with minimum three years documented experience.

B. Installer Qualifications: Company specializing In installing carpet with minimum three years experience.

1.5 FIELD CONDITIONS

A. Store materials in area of installation for minimum period of 24 hours prior to installation.

B. Maintain minimum 70 degrees F ambient temperature 24 hours prior to, during and 24 hours after installation.

1.6 WARRANTY

A. Manufacturer: Standard Warranty against edge ravel, delamination of secondary back adhesion, not less than 11 pound tuft bind, and no more than 10 percent face yarn loss by weight of carpet.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Carpet: Broadloom.
   1. Basis of Design: Tandus Flooring, www.tandus.com.
      a. Product: Antron Legacy Nylon, 18 oz/sy. Face Weight with ER3 Backing.
      b. Format: 24” x 24” Tile.
      c. Style: Runway II.
      d. Color: Blue Velvet.
   2. Substitution: See Section 01 60 00.

2.2 ACCESSORIES

A. Edge Binding: Roppe Carpet Edging. Profile #39. Color as selected from manufacturers standard.

B. Sub-Floor Filler: Type recommended by carpet manufacturer.

C. Tackless Strip: Carpet gripper, of type recommended by carpet manufacturer to suit application, with attachment devices.

D. Carpet Reducer: See Section 09 65 00.

E. Adhesives - General: Compatible with materials being adhered; maximum VOC content of 50 g/L; CRI Green Label certified; in lieu of labeled product, independent test report showing compliance is acceptable.

F. Seam Adhesive: As recommended by manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.

B. Verify that floor surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive carpet.

C. Cementitious Sub-floor Surfaces: Verify that substrates are dry enough and ready for carpet flooring installation by testing for moisture and pH.
   1. Verify that concrete slabs comply with ASTM F710 and the following:
      a. Substrates are dry and free of curing compounds, sealers, hardeners and other materials that are incompatible with adhesives bond,
      b. Adhesion Tests: Perform testing by Owner’s special inspector to verity acceptable substrate conditions, conforming to manufacturer’s Warranty provisions, prior to installing work of this Section.
         1) Alkalinity and Adhesion Testing: Perform tests recommended by floor tile manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9 pH.
         2) Moisture Testing: Proceed with installation only after substrates pass testing according to floor tile manufacturer's written recommendations, but not less stringent than the following:

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(a) Perform anhydrous calcium chloride test according to ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
(b) Perform relative humidity test using in situ probes according to ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level.

2. Obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.

D. Verify that required floor-mounted utilities are in correct location.

3.2 PREPARATION

A. Remove debris and clean floor in conformance with manufacturer's instructions

B. Repair subfloor ridges and bumps.
1. Fill minor holes and cracks over 1/8 inch thick with polymer-modified cementitious underlayment.
2. Fill depressions and low spots where floor is not level using cementitious underlayment specified Section 03 54 16 or subfloor filler.
3. Grind ridges or rough areas that may telegraph through carpet.

C. Feather substrate with cementitious underlayment or do such work as necessary for carpet to carpet transition alignment at top surface.

D. Clear debris and deposits from surfaces. Remove adhesives and contaminants from existing concrete floors. Vacuum substrate immediately prior to carpet installation.

E. Apply floor adhesive as instructed by manufacturer to seal concrete surface and make suitable for carpet adhesion.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions, CRI 104, and provisions of Contract Documents.

3.4 CARPET LAYOUT AND FITTING

A. Install carpet tile from same dye lot within each continuous carpet floor area. Remove and replace carpet within continuous areas differing in appearance.

B. Lay out and fit to maintain pattern, texture, and direction of pile within each floor area prior to installation.

C. Extend carpet to cover complete flooring area of each room, including alcoves and closets, unless otherwise indicated.
1. Install under open-bottomed obstructions, removable flanges, and furnishings.
2. Center broadloom edges and seams under doors at door jambs.

D. Make cutouts and terminations as needed for complete and finished appearance.

E. Measure area, snap chalk lines, and determine starting point for uniform layout of carpet tile to reduce cutting and eliminate piece less than 1/4 size of full carpet tile width where possible.

F. Cut carpet evenly and accurately to fit neatly at walls, columns, and projections.

G. Cut and join carpet ends in serpentine pattern as necessary to conceal carpet pattern.

H. Do not bridge building expansion joints with continuous carpeting.

3.5 CARPET REDUCER STRIPS

A. Carpet Reducer Strips: Install at carpet edges transitioning to hard flooring surfaces.

3.6 FIELD QUALITY CONTROL

A. Adhesion Tests: Perform testing by Owner's special inspector to verify acceptable substrate conditions, conforming to manufacturer's Warranty provisions, prior to installing work of this Section.
   1. Moisture Emissions of Concrete Substrate: Verify moisture emissions within range as specified in Section 03 30 00 and as acceptable to manufacturer.
   2. Alkalinity of Concrete Substrate: Verify pH factor within range as specified Section 03 30 00 and as acceptable to manufacturer.
   3. Notify Owner and Architect in the event of moisture emissions and alkalinity levels exceed the range acceptable to manufacturer.

3.7 ADJUSTING

A. Remove mismatched, non-uniform, and damaged carpet tile and replace with new matching adjacent carpet tile.

B. Remove spots, soiling, and stains or replace with new carpet tile where carpet cannot be put back into new condition.

C. Remove protruding face yarn using sharp scissors.

3.8 CLEANING

A. Remove and dispose of debris and unusable scraps.

B. Vacuum carpet using HEPA filter vacuum cleaner. Replace and dispose of vacuum bags when bag is half full.

3.9 PROTECTION

A. Take measures to protect carpet from soiling and damage prior to Owner occupation.

B. Replace permanently soiled or damaged carpet.

END OF SECTION 09 68 00

PAINTING AND COATING

SECTION 09 90 00

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Paint and coatings systems.

1.2 REFERENCES

A. SSPC-SP 1 - Solvent Cleaning.

B. SSPC-SP 2 - Hand Tool Cleaning.

C. SSPC-SP 3 - Power Tool Cleaning.

D. EPA-Method 24.

E. GS-11, GC-03.

1.3 SUBMITTALS

A. Submit under provisions of Section 01 33 00, Submittal Procedures.

B. Product Data: Manufacturer's data sheets on each paint and coating product shall include:
1. Product characteristics
2. Surface preparation instructions and recommendations
3. Primer requirements and finish specification
4. Storage and handling requirements and recommendations
5. Application methods

C. Drawdowns: Submit (4) four painted samples of each color and sheen specified on card stock paper 8 x 10 inches for approval. For wood stains, provide samples of wood species specified with various finishes for comparison and selection by Architect.
1. Final coats must match approved samples.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver manufacturer's unopened containers to the work site. Packaging shall . bear manufacturer’s name, label

B. Storage: Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction. Store materials in an area that is within the acceptable temperature range, per manufacturer’s instructions. Protect from freezing.

C. Handling: Maintain clean, dry storage area, to prevent contamination or damage to coatings.

1.5 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not apply coatings under environmental conditions outside manufacturer's absolute limits.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers: - Sherwin-Williams Company or approved.

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2.2 PAINT SYSTEMS

A. PS-1: Ferrous Metal

1. Primer Coat: Kem Bond HS Metal Primer
2. 1st Coat: DTM Acrylic, Semi-Gloss
3. 2nd Coat: DTM Acrylic, Semi-Gloss
4. Typical film thickness: 8 mils wet, 3.2 mils dry, per coat
5. Color: As selected.

PS-2: Gypsum Wallboard – Low Odor, Zero VOC, Match Existing Sheen.

1. 1st Coat: S-W Harmony Interior Latex Primer, B11 (4 mils wet, 1.3 mils dry).
2. 2nd Coat: S-W Harmony Interior Latex Egg-Shell, B9 Series(4 mils wet, 1.6 mils dry per coat).
3. 3rd Coat: S-W Harmony Interior Latex Egg-Shell, B9 Series(4 mils wet, 1.6 mils dry per coat).
4. Color: As selected.

PS-3 - Gypsum Wallboard – Epoxy paint system, Semi-gloss finish.

1. Two-part component epoxy - Benjamin Moore Super Spec HP, Polyamide Epoxy P36, or approved. (3.3 mils wet, 2.0 mils dry).
2. Color: As selected.

PS-4: Painted Wood, Wood Trim, and Finish Plywood, Semi-gloss finish.

1. 1ST Coat: Acrylic primer sealer.
2. 2nd & 3rd Coats: Exterior acrylic latex enamel. (4 mils wet, 1.5 mils dry per coat)
   a. Match existing color and sheen, unless otherwise noted.

2.3 ACCESSORIES

A. Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials required, per manufacturer's specifications.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Apply coatings after substrates have been properly prepared.

B. If substrate preparation is responsibility of another installer, notify General Contractor of unsatisfactory preparation before proceeding.

C. Proceed with work only after conditions have been corrected. Commencement of work means acceptance of surface conditions.

3.2 SURFACE PREPARATION

A. Remove oil, dust, grease, dirt, loose rust, peeling paint or other contamination to ensure adequate adhesion.

B. Lightly sand or Scotch Brite existing surfaces.

C. Spot prime with galvanized metal primer.

3.3 INSTALLATION

A. Apply coatings and materials according to manufacturer's specifications. Mix and thin coatings according to manufacturer's recommendations.

B. Do not apply to wet or damp surfaces.

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C. Apply coatings using methods recommended by manufacturer.

D. Uniformly apply coatings without runs, drips, or sags, without brush marks, and with consistent sheen.

E. Apply coatings at spreading rate required to achieve the manufacturer's recommended dry film thickness.

3.4 PROTECTION

A. Protect finished work from damage until completion of project.

END OF SECTION 09 90 00

SECTION 10 21 13

PLASTIC TOILET COMPARTMENTS

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Phenolic toilet compartments.
   2. Urinal screens.

B. Related Requirements:
   1. Section 06 10 00 – Rough Carpentry.
   2. Section 10 28 00 – Toilet, Bath and Laundry Accessories.

1.2 REFERENCE STANDARDS

A. Reference Standards: Current edition at date of Bid.

B. American Society for Testing and Materials (ASTM) International:
   1. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2015.
   2. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

C. American National Standards (ANSI): ICC/ANSI A117.1 - Accessible and Usable Buildings and Facilities.

D. National Electrical Manufacturer's Association (NE MA): NEMA LD3 - High Pressure Decorative Laminate

1.3 SUBMITTALS

A. See Section 01 33 00 - Administrative Requirements, for submittal procedures.

B. Manufacturer's product data and installation instructions.

D. Shop drawings indicating location, dimension, and details for each condition.

E. Material samples: Two (2) each minimum 3"x3" square samples for each color from manufacturer's standard options.

1.4 QUALIFICATIONS

A. Manufacturer and Installer: Company specializing in work of this Section with minimum 5 years documented experience performing commercial work.

1.5 REGULATORY REQUIREMENTS

A. ADA Requirements: Conform to IBC Chapter 11, ICC/ANSI A117.1, and provisions of regulatory authority having jurisdiction.

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B. Fire Rating: IBC Section 803.1 Class B, tested to ASTM E84.
   1. Flame Spread Index: Less than 75.
   2. Smoke Developed: Less than 450.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver in manufacturer's original unopened protective packaging clearly labeled as to brand name, contents, color, stock number, and order number on each package.

B. Verify undamaged condition before acceptance at Site

C. Store products in original packaging, flat, dry, well ventilated, under protective cover.

1.7 COORDINATION

A. Conform to Section 01 31 00 for coordination with work of other Sections.

B. Section 01 61 00 for solid lumber backing and Section 09 22 16 for solid framing for support of work of this Section.

C. Section 10 28 13 for sanitary napkin dispenser cutouts, toilet paper holders, grab bars, and other accessories mounted to toilet partitions.

1.8 WARRANTY

A Manufacturer: Minimum 25 year Warranty against defects in materials and workmanship, including warping and delamination of partition panels.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Phenolic Toilet Compartments:
   1. Bobrick, www.bobrick.com.
   2. Substitutions: See Section 01 60 00.

2.2 PHENOLIC TOILET COMPARTMENTS

A. Toilet Compartments: Factory fabricated doors, pilasters, and divider panels made of solid phenolic core panels with integral melamine finish, floor-mounted headrail-braced.

B. Doors:
   1. Thickness: 3/4 inch.
   2. Width: 24 inch, in-swing.
   3. Width for Handicapped Use: 36 inch, out-swinging.
   4. Height: Match existing.

C. Panels:
   1. Thickness: 1/2 inch.

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2. Height: Match existing.

D. Pilasters:
1. Thickness: 1 inch.
2. Width: As required to fit space; minimum 3 inch.

E. Screens: Without doors; to match compartments; mounted to wall with two panel brackets.

F. Color: Match existing.

2.3 ACCESSORIES

A. Pilaster Shoes: Formed ASTM A666, Type 304 stainless steel with No. 4 finish, 4 in high, concealing floor fastenings.
1. Provide adjustment for floor variations with screw jack through steel saddles integral with pilaster.

B. Head Rails: Hollow anodized aluminum, 1 x 1-1/2 inch size, with anti-grip profile and cast socket wall brackets.

C. Pilaster Brackets: Polished stainless steel.

D. Wall Brackets: Continuous type, polished stainless steel.

E. Attachments, Screws, and Bolts: Stainless steel, tamper proof type.

F. Hardware: Polished stainless steel:
1. Pivot hinges, gravity type, adjustable for door close positioning; two per door. Minimum 8 inch tall.
2. Door Latch: Slide type with exterior emergency access feature.
3. Door strike and keeper with rubber bumper; mounted on pilaster in alignment with door latch.
4. Coat hook with rubber bumper; one per compartment, mounted on door.
5. Provide door pull for outswinging doors.

2.4 FABRICATION

A. Conform to following and ICC/ANSI A117.1for ambulatory accessible and wheelchair accessible compartments.

B. Type: Floor mounted, overhead braced.

C. Toilet Compartment Dimensions:
1. Bottom of Panel: Match existing height.
2. Top of Panel: Match existing height.
3. Compartment Width: As shown on Drawings, except no less than 34 inches on center.

D. Toilet Compartment Doors: Minimum 24 inch wide, swing-in, except minimum 36 inch wide swing out doors at accessible compartments. Doors to stand slightly open when not in use.

E. Stabilizer Bars: 3 inch wide by 1 inch phenolic panel lateral bracing between compartments, mounted continuously across front of toilet compartments and fastened into pilasters.

F. Pilasters: Cover floor mounted anchoring devices with pilaster shoe. Make maximum width to suit installation clearances. 8 to 12 inches preferred.

2.5 URINAL SCREEN FABRICATION

A. Flush Type Screens: 18 inch wide by 42 inch high panels, wall mounted with specified mounting brackets and fasteners with security heads.

2.6 FINISHES

A. Toilet Partitions: Bobrick

B. Color: As selected from manufacturer's standards.

C. Partition edge: Black or brown phenolic core, polished smooth, eased.

D. Stainless Steel: No. 4 Satin finish.

E. Aluminum: Clear Anodized.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify correct spacing of and between plumbing fixtures.

C. Verify correct location of built-in framing, anchorage, and bracing.

3.2 INSTALLATION

A. Install partitions secure, rigid, plumb, and level in accordance with manufacturer's instructions.

B. Maintain 3/8 to 1/2 inch space between wall and panels and between wall and end pilasters.

C. Attach panel brackets securely to walls using anchor devices.

D. Attach panels and pilasters to brackets. Locate head rail joints at pilaster center lines.

E. Field touch-up of scratches or damaged finish will not be permitted. Replace damaged or scratched materials with new materials.

3.3 TOLERANCES

A. Maximum Variation From True Position: 1/4 inch.

B. Maximum Variation From Plumb: 1/8 inch.

3.4 ADJUSTING

A. Adjust and align hardware to uniform clearance at vertical edge of doors, not exceeding 3/16 inch.

B. Adjust hinges to position doors in partial opening position when unlatched. Return out-swinging doors to closed position.

C. Adjust adjacent components for consistency of line or plane.

END OF SECTION 10 21 13

TOILET ACCESSORIES

SECTION 10 28 13

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Toilet accessories and their associated fasteners and hardware.

B. Shower Enclosures

1.2 QUALITY ASSURANCE

A. Furnish inserts and anchoring devices which must be set in concrete or built into masonry. Coordinate delivery with other Work to avoid delay.

B. Coordinate accessory locations with other Work to avoid interference and to assure proper operation and servicing of accessory units.

C. Provide all accessories manufactured by the same company.

1.3 SUBMITTALS

A. Submit the following in accordance with Section 01 33 00, Submittal Procedures:
   1. Catalog data.
   2. Manufacturer's installation instructions.

PART 2 – PRODUCTS

2.1 PRODUCT OPTIONS AND SUBSTITUTIONS

A. Alternate products may be accepted; follow Section 01 25 00, Substitution Procedures.

2.2 MATERIALS, GENERAL

A. Use stainless steel complying with ANSI Type 302/304, with polished No. 4 finish, 22 gage (0.34 inch) minimum, unless otherwise indicated.

B. Use leaded and unleaded brass, flat products, complying with FS QQ-B-613; rods, shapes, forgings and flat products with finished edges, FS QQ-B-62.

C. Use commercial quality, cold rolled, sheet steel complying with ASTM A366, 20 gage (0.040 inch) minimum, unless otherwise indicated. Provide surface preparation and metal pretreatment as required for applied finish.

D. Use galvanized steel sheet complying with ASTM A527, G60.

E. Use base metal with nickel and chromium electrodeposited in compliance with ASTM B456, Type SC2.

F. Use galvanized steel mounting devices complying with ASTM A153, hot dip galvanized after fabrication.

G. Use screws, bolts, and other devices of same materials as accessory unit or of galvanized steel where concealed.

F. Shower Enclosure: Fiber reinforced composite, two layers, polyester core.

2.3 MANUFACTURERS

A. Bradley Corporation, Bobrick Washroom Equipment Co., AJ Washroom Accessories. American Specialties Inc. (ASII), Georgia Pacific, Trubro. Products specified are referenced to Bobrick model numbers unless noted otherwise.

b. Trubro Lavatory Guard Insulation Kits

2.4 PRODUCTS

KMS

A. Owner-Furnished, Contractor-Installed Items:

1. Soap Dispensers
2. Paper Towel Dispensers
3. Toilet Paper Dispensers
4. Electric Hand Dryers.
5. Slim-Jim Trash Cans (Resin Type).

B. Trubro Lav Guard 2 Insulation Kit for undersink pipes, stops, and traps.

C. Mirrors: Stainless Steel Framed.
1. See Drawings for dimensions.

D. Grab Bars: Stainless steel 1-1/4" diameter peened tubing, type 304 satin finish.
1. Concealed mounting anchors with snap-on concealed mounting flange.
2. Bobrick, or approved.

2.5 FABRICATION

A. Only an unobtrusive stamped logo of the manufacturer is permitted on exposed faces of the units. In an unexposed location, place the manufacturer's name and product model number.

B. Fabricate units with welded and ground joints and edges rolled. Hang doors with continuous stainless steel piano hinges. Provide for concealed anchorage wherever possible.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install accessories in accordance with approved manufacturer's installation instructions. Securely attach each accessory, level and plumb, at locations shown on the Drawings and at heights, spacing, and load resistance required by ADAAG (Americans with Disabilities Act Accessibility Guidelines.

B. Use fasteners that are appropriate for surfaces where accessories are to be mounted.

C. Use concealed fasteners wherever possible.

3.2 CLEANING

A. Clean surfaces in compliance with manufacturer's instructions.

END OF SECTION 10 28 13

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SECTION 12 21 13
METAL HORIZONTAL LOUVER BLINDS

PART 1 – GENERAL

1.1 SUMMARY

A. Provide aluminum horizontal louver blinds at interior face of exterior windows.

1.2 SUBMITTALS

A. Product Data: Submit manufacturer's product data and installation instructions for each material and product used.

B. Samples: Submit two representative samples of each material specified indicating visual characteristics and finish. Include samples range if variation of finish is anticipated.

1.3 QUALITY ASSURANCE

A. Comply with governing codes and regulations. Provide products of acceptable manufacturers, which have been in satisfactory use in similar service for three years. Deliver, handle, and store materials in accordance with manufacturer's instructions.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Manufacturers: Bali, Levelor, Graber, Hunter Douglas or approved.

B. Horizontal Blinds:
   1. Operation: Tilting and lifting mechanisms. Full height wands
   2. Slats: Aluminum.
   3. Slat Width: 1 inch
   4. Color: From manufacturer's standard, non-premium colors.

C. Controls Side: verify with Architect prior to ordering

PART 3 – EXECUTION

3.1 INSTALLATION

A. Install materials and systems in accordance with manufacturer's instructions and approved submittals. Install materials and systems in proper relation with adjacent construction and with uniform appearance. Coordinate with work of other sections.

B. Restore damaged finishes and test for proper operation. Clean and protect work from damage.

END OF SECTION 12 21 13

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SECTION 12 93 00
SITE FURNISHINGS

PART 1 – GENERAL

1.1 WORK INCLUDED

A. Benches.

1.2 COORDINATION

A. Coordinate with other trades affected by and affecting work of this Section.

1.3 REVIEWS AND OBSERVATIONS

A. Request visit by Owner's Representative 72 hours in advance of the following:

B. Contractor to mark locations on paving for all furnishings in this section for approval prior to installation.

1.4 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Manufacturer's specifications and installation instructions.

1.5 DELIVERY, STORAGE AND HANDLING

A. Delivery and Storage: The contractor is responsible for delivery of materials to the project site at time of use. Materials to be stored in a protected location and in a manner that protects them from damage.

1.6 ENVIRONMENTAL/SITE WORKING CONDITIONS

A. Weather: Do no work when inclement weather may cause surfaces to be wet or cold beyond application parameters or where damage may occur.

PART 2 - PRODUCTS

2.1 BENCHES

A. Manufacturer: DuMor, Inc., or approved.

B. Model: 57-60 PL; 6 foot length.

C. Color and Finish: Black Powder Coat; Recycled Plastic, Cedar.

PART 3 - EXECUTION

3.1 GENERAL

A. Layout: Identify required lines, levels, grades, finish elevations, equipment heights, vertical and horizontal clearances, alignments, intersecting lines. Layout all work if this Section including required layout inspections prior to commencing work.

B. Inspection and Verification: Prior to commencing work of this Section, inspect site and ensure site and existing and surrounding conditions are as indicated in documents and are ready to receive work of this Section.

C. Discrepancies: Do not commence work until all unsatisfactory conditions have been corrected. Commencing work of this Section denotes acceptance of existing conditions.

D. Tolerances: Perform work true to location and alignment. All vertical elements plumb and square with adjacent construction. All horizontal elements in alignment and parallel, 90 degrees, or specific shown angle to adjacent construction.

E. Notice: Notify Owner's Representative 72 hours in advance prior to installing work.

3.2 ASSEMBLY AND INSTALLATION

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A. Benches and Bicycle Racks:

B. Permanently affix to the concrete paving by surface mount installation according to manufacturer's instructions, local codes and regulations. Contractor is to provide all required hardware needed for installation.

3.3 CLEANING

A. Remove scraps and debris and clean all surfaces, including other work. Clean, repair and touch-up or replace products or finishes which have been soiled, discolored or damaged by work of this section.

END OF SECTION 12 93 00

SECTION 21 05 00

COMMON WORK RESULTS FOR FIRE SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

A. The intent of Division 21, Fire Suppression Specifications, and the accompanying Drawings is to be a reference for preliminary locations and routing of fire protection system components. Not all components required for a complete system are shown, including but not limited to standpipes, hose connections, sprinkler heads, fire protection zones, air compressors, dry valves, piping, appurtenances, connections, etc.

B. Provide a complete and workable facility with complete systems that comply with the requirements of the state codes, local codes, fire marshal, owner's insurance underwriter, and any other authority having jurisdiction.

C. Division 21, Fire Suppression Specifications and the accompanying Drawings are complimentary and what is called for by one as binding as if called for by both. Items shown on the Drawings are not necessarily included in the Specifications and vice versa.

D. Imperative language is frequently used in Division 21, Fire Suppression Specifications. Except as otherwise specified, requirements expressed imperatively are to be performed by the Contractor.

E. Piping and sprinkler head locations meet the Architectural design intent for the building in addition to applicable code. The right is reserved to make any reasonable changes in sprinkler head location prior to roughing-in, without cost impact. Deviation from the general routing piping mains, standpipes, or other routing shown must be approved by the architect prior to installation. If additional space is required for fire protection system components, Architect to make a formal request.

F. Heat, heat trace, and associated power required for fire protection system components are the responsibility of the design-build contractor. Request approval from the electrical engineer to use spaces in electrical panels provided at no additional cost.

G. Furnish piping, pipe fittings, valves, gauges, and incidental related items as required for complete systems. Identify valves, piping and equipment components to indicate their function and system served.

H. The General and Supplemental Conditions apply to this Division, including but not limited to:
   1. Drawings and specifications.
   2. Public ordinances, permits.
   3. Include payments and fees required by governing authorities for work of this Division.

I. Division 01, General Requirements, applies to this Division.

1.2 RELATED SECTIONS

A. Division 01, General Requirements

B. Division 21, Fire Suppression

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C. Section 21 10 00, Water Based Fire Suppression Systems

D. QUALITY ASSURANCE

E. Regulatory Requirements:
1. Products and equipment prohibited from containing pentabrominated, octabrominated and decabrominated diphenyl ethers. Where products or equipment's within this specification contain these banned substances, provide complying products and equipment's from approved manufacturers with equal performance characteristics.
2. General:
   a. Conform Work and materials to requirements of the local and State codes, fire marshal, the owner's insurance underwriter, and any other authority having jurisdiction; and Federal, State and other applicable laws and regulations.
3. Contractor responsible for obtaining and payment for permits, licenses, and inspection certificates required in accordance with provisions of Contract Documents.
4. Fire protection system designs must bear the stamp and seal of the registered Professional Engineer who prepared the documents. The Engineer's stamp certifies that the work was done under the Engineer's supervision and control. Certification from NICET technicians, or other contractors, cannot replace the certification by the Engineer. Verify/coordinate with local building department for their specific requirements.

F. New materials and Equipment:
1. Good work quality, free of faults and defects and in conformance with the Contract Documents.

G. Apparatus: Build and install to deliver full rated capacity at the efficiency for which it was designed.

H. The entire system and apparatus operate at full capacity without objectionable noise or vibration.

I. For remodel projects, the existing system must remain fully operational, or provisions made to provide coverage while the new system is being installed. New installation switchover requires minimal down time. Provide method to maintain fire protection or fire watch during any system down time. Include any related cost for materials or labor that is needed for providing continuous coverage.

J. Install equipment level and true equipment. Housekeeping pads and curbs account for floor or roof slope.

K. Materials and Equipment:
1. Each piece of equipment furnished meet detailed requirements of the Drawings and Specifications and suitable for the installation shown. Equipment not meeting requirements will not be acceptable, even though specified by name along with other manufacturers.
2. Where two or more units of the same class of equipment are furnished, use products of the same manufacturer. Component parts of the entire system need not be products of same manufacturer.
3. Furnish materials and equipment of size, make, type, and quality herein specified.
4. Equipment scheduled by performance or model number considered the basis of the design. If other specified manufacturer's equipment is provided in lieu of the basis of design equipment the contractor is responsible for changes and costs which may be necessary to accommodate this equipment, including different sizes and locations for connections, different electrical characteristics, different dimensions, different access requirements, or any other differences which impact the project.

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L. Workmanship:
1. General: Install materials in a neat and professional manner.
2. Manufacturer's Instructions:
   a. Follow manufacturer's directions where they cover points not specifically indicated. If they are in conflict with the Drawings and Division 21, Fire Suppression Specifications, obtain clarification before starting work.

M. Cutting and Patching:
1. Cutting, patching, and repairing for the proper installation and completion of the work specified in this Division including plastering, masonry work, concrete work, carpentry work, and painting performed by skilled craftsmen of each respective trade in conformance with the appropriate Division of Work.
2. Make additional openings required in building construction by drilling or cutting. Use of jackhammer is specifically prohibited.
3. Fill holes which are cut oversize so that a tight fit is obtained around the sleeves passing through.
4. Do not pierce beams or columns without permission of Architect and then only as directed.
5. New or existing work cut or damaged restored to its original condition. Where alterations disturb lawns, paving, walks, etc., the surfaces repaired, refinished, and left in condition existing prior to commencement of work.

1.3 SUBMITTALS

A. Certified Shop Drawings:
1. Drawings indicate the general layout of the piping and various items of equipment. Coordination with other trades and with field conditions will be required. For this purpose, prepare fire protection system layout Drawings showing locations and types of head or outlets, alarm valves and devices, pipe sizes and cutting lengths, test tees and valves, drain valves, and other related items. New drawings prepared by Contractor and not reproductions or tracings of Architect's Drawings. Overlay drawings with shop drawings of other trades and check for conflicts. Drawings the same size as Architect's Drawings with title block similar to the Drawings and identifying Architect's Drawing number or any reference drawings. Drawings fully dimensioned including both plan and elevation dimensions. Shop drawings cannot be used to make scope changes.
2. Shop Drawings:
   a. Prepare in two-dimensional format.
   b. Include but are not limited to:
      1) Sprinkler head layout drawings overlaid with ceiling and floor plans.
      2) Sprinkler floor plans, including piping, equipment, and heads to a minimum of 1/4-inch equals 1-foot scale or same as plans, whichever is greater.
3. Submit shop drawings for review prior to beginning fabrication. Additional shop drawings may be requested when it appears that coordination issues are not being resolved in the field or when there is a question as to whether contract documents are being complied with or the design intent is being met.

B. Product Data:
1. Submit product data for review on scheduled pieces of equipment, on equipment requiring electrical connections or connections by other trades, and as required by each specification section or by Drawing notes. Include manufacturer's detailed shop drawings, specifications, and data sheets. Data sheets include capacities, RPM, BHP, pressure drop, design and operating pressures, temperatures, and similar data. Manufacturer's abbreviations or codes are not acceptable
2. Provide sample of each type of sprinkler head.

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3. Indicate equipment operating weights including bases and weight distribution at support points.
4. In the case of equipment such as wiring devices, time switches, valves, etc., specified by specific catalog number, a statement of conformance will suffice.

C. Hydraulic Calculations:
1. Submit hydraulic calculations specific to the installation.

D. Test Reports:
1. Submit certificates of completion of tests and inspections.

E. Submission Requirements:
1. Refer to Division 01, General Requirements for additional requirements related to submittals.
2. Shop Drawings:
   a. Provide three sets of Drawings showing sprinkler head locations and layout coordinated with architectural ceiling details to the Architect for review prior to submitting Drawings to insurance underwriter and Fire Marshal.
   b. Provide six sets of Drawings and calculations to the Architect to be sent to the Owner's insurance underwriter for approval.
   c. Then submit six sets of approved Drawings to Architect for final review.
3. Product Data:
   a. Submit electronic copies of shop drawings and product data for Work of Division 21 in PDF format with each item filed under a folder and labeled with its respective specification section number, article, paragraph, and mark, if applicable.
   b. Include a complete index in the original submittal. Indicate both original items submitted and note stragglers that will be submitted at a later date to avoid delay in submitting.
   c. Submit shop product data in a single submittal. Partial submittals will not be accepted. Re-submittals submitted after return of the original binder includes a tab similar to that originally submitted. Upon receipt of the returned re-submittals, insert them in the previously submitted binder.

F. Contractor Responsibilities:
1. See that submittals are submitted at one time and are in proper order.
2. Obtain approvals and permits from the AHJ.
3. Ensure that equipment will fit in the space provided.
4. Assure that deviations from Drawings and Specifications are specifically noted in the submittals. Failure to comply will void review automatically.

1.4 OPERATING AND MAINTENANCE MANUAL, PARTS LISTS, AND OWNERS INSTRUCTIONS

A. Refer to Division 01, General Requirements for additional requirements.

B. Submit three bound copies of manufacturer's operation and maintenance instruction manuals and parts lists for each piece of equipment or item requiring servicing. Literature on 8-1/2-inch by 11-inch sheets or catalogs suitable for side binding. Submit data when the work is substantially complete, packaged separately, and clearly identified in durable 3-ring binder. Include name and contact information for location of source parts and service for each piece of equipment. Clearly mark and label in each submittal, the piece of equipment provided with the proper nameplate and model number identified. Provide wiring diagrams for electrically powered equipment.

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C. Instruct Owner thoroughly in proper operation of equipment and systems, in accordance with manufacturer's instruction manuals. Operating instructions cover phases of control.

1.5 AS-BUILT DRAWINGS

A. Provide record drawings in hard copy and PDF format.
   1. Drawings include the following:
      a. Project specific title block.
      b. Notations reflecting the as built conditions of any additions to or variations from the construction documents provided as part of the BIM coordination, RFIs, ASIs, Owner Changes, and Field Coordination.

1.6 PROJECT CONDITIONS

A. Existing Conditions: Prior to bidding, verify and become familiar with existing conditions by visiting the site, and include factors which may affect the execution of this Work. Include related costs in the initial bid proposal.

B. Coordinate exact requirements governed by actual job conditions. Check information and report any discrepancies before fabricating work. Report changes in time to avoid unnecessary work.

C. Coordinate shutdown and start-up of existing, temporary, and new systems and utilities. Notify Owner, City, and Utility Company.

1.7 WARRANTY

A. Provide a written guaranty covering the work of this Division (for a period of one calendar year from the date of acceptance by the Owner) as required by the General Conditions.

B. Provide manufacturer's written warranties for material and equipment furnished under this Division insuring parts and labor for a period of one year from the date of Owner acceptance of Work of this Division.

C. Correct warranty items promptly upon notification.

1.8 TEST REPORTS AND CERTIFICATES

A. Submit one copy of test reports and certificates specified herein to the Architect.

1.9 SUBSTITUTIONS

A. Submit any requests for product substitutions in accordance with the Instructions to Bidders and the General and Supplemental Conditions.

PART 2 PRODUCTS

2.1 ACCESS PANELS

A. Furnish under this Division as specified in another Division of work.

2.2 PIPE SLEEVES

A. Interior Wall and Floor Sleeves:
   1. 18 gauge galvanized steel or another pre-approved water tight system.

B. Interior Wall and Floor Sleeves (fire rated):
   1. Fire rated and water tight system approved by Authority Having Jurisdiction and Owners Insurance underwriter, with rating equal to floor or wall penetration, and designed specifically for the floor or wall construction, piping material, size and service.

2.3 FLOOR, WALL AND CEILING PLATES

A. Furnish stamped split type plates as follows:
   1. Floor Plates:
      a. Cast brass, chromium plated.
   2. Wall and Ceiling Plates:
      a. Spun aluminum.

PART 3 EXECUTION

3.1 COORDINATION

A. Coordinate fire protection piping and appurtenances with ducts, other piping, electrical conduit, and other equipment.

B. Conceal fire protection piping and equipment be concealed except in area without ceilings and as noted on the Drawings.

C. Locate piping, heads, and equipment where shown on Drawings.

3.2 GENERAL

A. Install fire protection systems to serve the entire building.

B. The drawings indicate approximate locations of piping, sprinkler zones, and types of systems. The drawings do not indicate the locations of sprinkler heads in ceiling areas. Locate sprinklers in the center of ceiling panels and symmetrically within rooms and down corridors, coordinated with and in pattern with lights and grilles. Deviations must be approved.

C. Locations of sprinkler heads, outlets, piping, and appurtenances are not shown in areas and therefore are to be installed in accord with code requirements.

D. Location of heads shown in ceiling areas may be changed if required by code requirements, but only after review by the Architect for new head locations for each specific instance.

3.3 SLEEVES

A. Interior Floor and Wall Sleeves:
   1. Provide sleeves large enough to provide clearances around pipe outside diameter as required by NFPA. Penetrations through mechanical room and fan room floors made watertight by packing with safing insulation and sealing with Tremco Dymeric Sealant or approved water tight system.

B. Sleeves through Rated Floors and Walls:
   1. Similar to interior sleeves except install fire-rated system approved by Authority Having Jurisdiction and Owner's Insurance Underwriter, with rating equal to floor or wall penetration, and designed specifically for the floor or wall construction, piping material, size and service.

C. Floor sleeves maintain a water barrier by providing a water tight seal or extend 1-inch above finished floor except through mechanical equipment room floors and shafts where sleeves extend 2-inches above finished floor level. Sleeves through roof extend 8-inches above roof. Wall sleeves flush with face of wall unless otherwise indicated. Sleeves through planters extend 8-inches above planter base.

D. Do not support pipes by resting pipe clamps on floor sleeves. Provide supplementary members so pipes are floor supported.

E. Special sleeves detailed on the Drawings take precedence over this section.

3.4 FLOOR, WALL AND CEILING PLATES

A. Install on piping passing through finished walls, floors, ceilings, partitions, and plaster furrings. Plates completely cover opening around pipe and duct.

B. Secure wall and ceiling plates to pipe or structure.

C. Plates not required in mechanical rooms or unfinished spaces.

3.5 CLEANING

A. General:
   1. Clean equipment and piping of stampings and markings (except those required by codes), iron cuttings, and other refuse.

B. Painted Surfaces:
   1. Clean scratched or marred painted surfaces of rust or other foreign matter and paint with matching color industrial enamel, except as otherwise noted.

C. Additional requirements are specified under specific Sections of this Division.

3.6 EQUIPMENT PROTECTION

A. Keep pipe and conduit openings closed by means of plugs or caps to prevent the entrance of foreign matter. Protect piping, conduit, equipment, and apparatus against dirty water, chemical or mechanical damage both before and after installation. Restore damaged or contaminated equipment, or apparatus to original conditions or replace at no cost to the Owner.

B. Protect bright finished shafts, bearing housings, and similar items until in service. No rust will be permitted.

C. Cover or otherwise suitably protect equipment and materials stored on the job site.

3.7 ACCESSIBILITY

A. General:
1. Locate valves, indicating equipment or specialties requiring frequent reading, adjustments, inspection, repairs, and removal or replacement conveniently and accessibly with reference to the finished building.

B. Gauges:
1. Install gauges so as to be easily read from the floors, platforms, and walkways.

3.8 PAINTING

A. General:
1. Coordinate painting of fire suppression equipment and items with products and methods in conformance with the appropriate Division of Work, Painting.

B. Equipment Rooms and Finished Areas:
1. Hangers
2. Miscellaneous Iron Work
3. Structural Steel Stands
4. Tanks
5. Equipment Bases:
   a. Paint one coat of black enamel.
6. Steel Valve Bodies and Bonnets:
   a. One coat of black enamel.
7. Equipment:
   a. One coat of red machinery enamel. Do not paint nameplates.
8. Sprinkler Heads:
   a. Not painted.

C. Concealed Spaces (above ceilings, not visible):
1. Hangers, Miscellaneous Iron Work, Valve Bodies, and Bonnets: Not painted.

D. Sprinkler Piping:
1. Concealed from View: Not painted.
2. Exposed to View: Paint pipe and hangers exposed to view, including in equipment spaces, with one coat approved rust inhibiting primer. Final finish coat as specified in conformance with the appropriate Division of Work, Painting.
3. Exterior: Wire brush and apply two coats of rust-inhibiting primer and one coat of grey exterior machinery enamel. Final finish coat as specified in conformance with the appropriate Division of Work, Painting.
4. Alarm Bell: Factory paint with two coats of red enamel.

3.9 ADJUSTING AND CLEANING

A. General:
   1. Before operating any equipment or systems, make thorough check to determine that systems have been flushed and cleaned as required and equipment has been properly installed, lubricated, and serviced. Check factory instructions to see that installations have been made accordingly and that recommended lubricants have been used.
   2. Use particular care in lubricating bearings to avoid damage by over-lubrication and blowing out seals. Check equipment for damage that may have occurred during shipment, after delivery, or during installation. Repair damaged equipment as approved or replace with new equipment.

B. Piping:
   1. Clean interior of piping before installation.
   2. Flush sediment out of piping systems.

3.10 ELECTRICAL EQUIPMENT

A. Do not install fire suppression systems in switchgear rooms, transformer vaults, telephone rooms, or electric closets except as indicated.

B. Fire Suppression systems not to pass over switchboards or electrical panelboards. Where conflicts exist, bring to attention of Architect.

END OF SECTION

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SECTION 21 10 00

WATER BASED FIRE SUPRESSION SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes Design-Build work and the following:
   1. Sprinkler Heads
   2. Valves
   3. Black Steel Pipe
   4. Flanged Joints
   5. Mechanical Pipe Couplings and Fittings
   6. Valve Identification
   7. Piping Markers
   8. Equipment Identification

1.2 RELATED SECTIONS
   1. Division 01, General Requirements
   2. Division 21, Fire Suppression

1.3 QUALITY ASSURANCE

A. Provide a complete automatic fire sprinkler/combination standpipe system.
   1. Grooved joint couplings, fittings, valves, and specialties products of a single manufacturer. Grooving tools of the same manufacturer as the grooved components.
   2. Castings used for coupling housings, fittings, valve bodies, etc., date stamped for quality assurance and traceability.

B. Regulatory Requirements:
   1. Sprinkler system to comply with NFPA 13 and local Fire Marshal requirements.
   2. Refer to Section 21 05 00, Common Work Results for Fire Suppression for additional requirements.

C. Hydraulically Calculated Sprinkler System: Sprinkler system to be hydraulically calculated grid system designed to provide:
   1. Light Hazard Occupancies: 0.10 GPM/Ft2 density at most remote 1500 SF for public areas, living spaces, or designated by the local fire marshal with an excess of 10 psi additional pressure requirements incorporated into the design over specified pressure requirements.

D. NFPA 13 (without the use of exceptions found in NFPA 13 systems minimum guideline) used for the location, sizing, and installation of piping and sprinkler systems unless local fire marshal or owner's insurance underwriter requirements are more stringent. Exceptions must be approved by the Engineer prior to usage.

E. Water Service Pressure Basis of Design:
   1. Coordination was done to determine fire service water pressure used to develop the fire sprinkler system design information included herein.
   2. Fire Protection contractor to obtain current flow test information prior to starting their design of the fire sprinkler system.

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1.4 SUBMITTALS

A. Provide submittal in accordance with Section 21 05 00, Common Work Results for Fire Suppression.

B. Sprinklers referred to on shop drawings and identified by the listed manufacturer's style or series designation. Trade names and abbreviations are not permitted.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Sprinkler Heads:
1. Viking
2. Victaulic
3. Reliable Automatic Sprinkler
4. Tyco Fire Products

B. Valves:
1. Where only one manufacturer's model is listed, equivalent products by those specified below, or equal, are acceptable.
2. Use only one manufacturer.
3. Gate, Swing Check:
   a. Jenkins
   b. Victaulic
   c. Crane
   d. Hammond
   e. NIBCO
   f. Kennedy
4. Silent Check:
   a. Jenkins
   b. Victaulic
   c. Mueller
   d. Metraflex
   e. Gustin-Bacon
5. Butterfly:
   a. Jenkins
   b. NIBCO
   c. Keystone
   d. Victaulic
   e. Gustin-Bacon
6. Specialty:
   a. NIBCO
   b. Conbraco
   c. Victaulic

C. Mechanical Pipe Couplings and Fittings:
1. Victaulic
2. Gruvlok

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D. Piping Markers:
   1. W.H. Brady
   2. Seton
   3. Marking Systems, Inc. (MSI).

2.2 SPRINKLER HEADS

A. General:
   1. One manufacturer throughout building. Mixing of sprinkler brands is not permitted.
   2. Brass frame construction with a coated metal-to-metal seating mechanism. Sprinklers utilizing non-metal parts in the sealing portion of the sprinkler are strictly prohibited.
   3. Quick response frangible bulb type fusible element with a temperature rating of 155 degrees or 200 degrees F or a fast response metal type fusible element with a temperature rating of 165 degrees or 212 degrees F.
   4. 1/2-inch NPT, a standard orifice, and a 5.6 nominal K Factor.
   5. UL listed and FM Approved for working water pressures up to 175 psi. Sprinkler heads in dry and pre-action type systems installed per NFPA 13.
   6. Heads, UL approved for application and installation.

B. Provide high temperature, 212 degrees F heads for mechanical rooms, areas below skylights, dishwashing and other areas which have high heat producing equipment to prevent accidental trip page.

C. Sprinklers Installed in Finished Ceilings:

D. Sprinklers Installed in Finished Ceilings:
   1. Quick response, concealed pendant with white drop-off cover plate, rough bronze finish, 155 degrees F unless required otherwise.

E. Sprinklers Installed in Unfinished Ceiling Areas (or Above Finished Ceilings Where Required):
   1. Pendant or up-right fusible solder type, rough bronze finish, and adequate temperature for the hazard.

F. Flexible Stainless Steel Hose:
   1. UL rated, FM approved stainless steel hose assembly for individual sprinkler connections, Victaulic Vic-Flex.
   2. Drop includes a UL approved braided hose with a bend radius to 2-inch to allow for proper installation in confined spaces.
   3. Provide union joints for ease of installation.
   4. Attach flexible drop to the ceiling grid using a one-piece open gate bracket. The bracket allows installation before the ceiling tile is in place.
   5. The braided drop system is UL listed and FM Approved for sprinkler services to 175 psi (1206 kPa).

2.3 VALVES

A. Gate, butterfly, and check valves meet current MSS standards.

B. Bronze gate and check valves made with dezincification-resistant materials. Bronze valves made with copper alloy (brass) containing more than 15 percent zinc are not permitted.

C. Full lug and grooved butterfly valves suitable for bi-directional dead end service at full rated pressure without use or need of a downstream flange.

D. Valves in Insulated Piping: Valves have 2-inch stem extensions and the following features:

E. Gate Valves: Rising stem type.

F. Butterfly Valves: Extended necks.

G. Valve ends may be threaded, flanged, soldered, or grooved as applicable to piping system.

H. Provide ball drip drains, test orifices, and other related items as required to provide a complete fire protection system.

I. Gate Valves:
   1. Bronze Gate: Bronze body, bronze screwed bonnet, bronze solid wedge, OS&Y pattern, rising stem, pre-grooved stem for supervisory switch mounting, 175 psi CWP, UL listed, FM approved; NIBCO T-104.
   2. Iron Gate: Iron body, bronze trim, OS&Y pattern, solid wedge, pre-grooved stem for supervisory switch mounting, 175 psi CWP, UL listed, FM approved; NIBCO F-607-OTS.
   3. Iron Gate, High Pressure: Iron body, bronze trim, flanged OS&Y pattern, solid wedge, FM approved for 300 psi, UL listed 350 psi; NIBCO F-697-0.

J. Check Valves:
   1. Horizontal Bronze Swing Check:
      a. Bronze body, bronze-mounted, TFE disc, 150 psi SWP, 300 psi CWP; NIBCO T-443-Y, NIBCO S-433-Y.
      b. Check valves in main riser path FM approved.
   2. Horizontal Bronze Swing Check, High Pressure:
      a. Bronze body, bronze-mounted, regrinding bronze disc, 300 psi SWP, 1000 psi CWP; NIBCO T473-B.
      b. Check valves in main riser path FM approved.
   3. Horizontal Iron Swing Check:
      a. Iron body, bronze-mounted, regrinding bronze disc and seat ring, 200 psi CWP; NIBCO F-918-B.
      b. Check valves in main riser path FM approved.
   4. Vertical and Silent Check Valves:
      a. Iron body, stainless steel spring, wafer type, globe style, 200 psi CWP; NIBCO 910-B.
      b. Check valves in main riser path, FM approved.
   5. Vertical and Silent Check Valves, High Pressure:
      a. Iron body, stainless steel spring, wafer type, globe style, 400 psi CWP; NIBCO W-960-B, NIBCO F-960-B.
      b. Check valves in main riser path, FM approved.

K. Butterfly Valves:
   1. Iron Butterfly:
      a. Ductile iron body, aluminum-bronze disc and one-piece stainless steel shaft, copper bushing, fasteners and pins not used to attach stem to disc, gear operator, stem neck length to accommodate insulation where applicable, EPDM liner or disc, 200 psi CWP; NIBCO LD 2000 (lug style), NIBCO GD-4765 (grooved ends).
      b. Butterfly valves in main riser path, FM approved.

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2. Iron Butterfly, High Pressure: Ductile iron body, ductile iron disc and one-piece stainless steel shaft, copper bushings, fasteners and pins not used to attach stem to disc, with lever handle and locking feature on valves 6-inches and smaller, gear operator, EPDM liner or disc, 300 psi CWP, integral supervisory switch, UL listed, FM approved; NIBCO GD-4765.

L. Specialty Valves:
1. Drain Valves: Bronze ball valve, garden hose end, cap and chain 3/4-inch size, bronze cast body, chrome-plated full port ball, with handle, Teflon seat, threaded body packnut design (no threaded stem designs allowed) with adjustable stem packing, 600 psi CWP; NIBCO T-585-70-HC.
2. Gauge Cocks: Brass, tee handle, male to female, 200 psi working pressure, 1/4-inch; Conbraco 41 series, or equal.

2.4 BLACK STEEL PIPE

A. General:
1. UL listed and FM approved for fire protection use.
2. Fittings and joints must be UL listed with pipe chosen for use.
3. Listing restrictions and installation procedures per NFPA 13 and state and local authorities for fire protection use.
4. Pipe/fittings must be hot-dipped galvanized in accordance with ASTM A53 for dry pipe sprinkler systems.

B. Pipe: ASTM A135 or A53.
1. Fire Protection:
a. Schedule 10 or Schedule 40 in sizes up to 5 inches.
b. 0.134-inch wall thickness for 6-inch.
c. 0.188-inch wall thickness for 8-inch and 10-inch.
d. 0.330-inch wall thickness for 12-inch.

C. Fittings: Roll grooved ends with mechanical couplings as specified.

D. Service Above Grade: Fire protection system only for sizes listed, as approved by NFPA 13.

2.5 FLANGED JOINTS

A. Flanged Joints:
1. Cast iron or steel for screwed piping and forged steel welding neck for welded line sizes.
2. Pressure rating and drilling matches the apparatus, valve, or fitting to which they are attached.
3. Flanges in accordance with ANSI B16.1; 150 lb. for system pressures to 150 psig; 300 pounds for system pressures 150 psig to 400 psig.
4. Gaskets 1/16-inch thick, Cranite, or equal, ring type, coated with graphite and oil to facilitate making a tight joint.
5. Make joint using American Standard hexagon head bolts, lock washers, and nuts (per ASTM A307 GR.B) for service pressures to 150 psig; alloy steel stud bolts, lock washer, and American Standard hexagon head nuts (per ASTM A307 GR.B) for service pressures 150 psig to 400 psig. Use length of bolt required for full nut engagement.
6. Provide electro-cad plated bolts and nuts.

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2.6 MECHANICAL PIPE COUPLINGS AND FITTINGS

A. Couplings and Fittings:
1. Coupling housing to be zero flex rigid type coupling with angled bolt pad design. Couplings fully installed at visual pad-to-pad offset contact. Couplings that require gapping of bolt pads or specific torque ratings for proper installation are not permitted. Installation-Ready, for direct stab installation without field disassembly. Similar to Victaulic Type 009N.
2. Flexible couplings to be used only when expansion contraction, deflection or noise and vibration is to be dampened. Flexible Coupling to be similar to Victaulic Installation-Ready Type 005.Coupling gasket similar to Victaulic's Grade E molded synthetic rubber per ASTM D-2000.
3. Coupling bolts oval neck track head type with hexagonal heavy nuts per ASTM A-449 and A-183.

2.7 VALVE IDENTIFICATION

A. Valve Tags:
1. General:
a. Identify valves with metal tags or plastic signs, legends to be stamped or embossed.
b. Indicate the function of the valve and its normal operating position, and area served; i.e.

3RD FL	(Area Served)
ISOLATION	(Valve Function)
NO	(Normal Operation Position)

2. Size: Valve tags 2-inch diameter with 1/4-inch high letters.
3. Material: Use 0.050 or 0.064-inch brass tags.
4. Control Valves:
a. Use 1/16-inch thick laminated 3-ply plastic, center ply white, outer ply red, lamicoid, or equal.
b. Form letters by exposing center ply.

B. Valve Tag Directory: Include the following:
1. Tag Number
2. Location
3. Exposed or Concealed
4. Area Served
5. Valve Size
6. Valve Manufacturer
7. Valve Model Number
8. Normal Operating Position of Valve

2.8 PIPING MARKERS

A. Label pipes with all-vinyl, self-sticking labels or letters.

B. Pipe covering sizes up to and including 3/4-inch outside diameter, select labels with 1/2-inch letters. For sizes from 3/4 to 2-inch outside diameter, 3/4-inch letters; above 2-inches outside diameter, 2-inch letters.

C. Identify and color code as follows with white directional arrows.

SERVICE	PIPE MARKER	BACKGROUND COLOR
SPRINKLER WATER	FIRE PROTECTION WATER	RED
AIR, COMPRESSED	*COMPRESSED AIR*	GREEN

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2.9 EQUIPMENT IDENTIFICATION

A. Nameplates:
1. Tag pumps, and miscellaneous equipment with engraved nameplates.
2. 1/16-inch thick, 3-inch by 5-inch laminated 3-ply plastic, center ply white, outer ply black.
3. Form letters by exposing center ply.
4. Identify unit with code number as shown on Drawings and area served.

B. Equipment Nameplate Directory:
1. List pumps, compressors and other equipment nameplates.
2. Include Owner and Contractor furnished equipment.
3. List nameplate designation, manufacturer's model number, location of equipment, area served or function, disconnect location, and normal position of HOA switch.

PART 3 EXECUTION

3.1 INSTALLATION

A. General:
1. Provide seismic hangers as required by code.
2. Provide tamper switches on sprinkler system isolation valves. Provide flow switches for sprinkler zones.
3. A corrosion-resistant metal placard provided on riser indicating location number of sprinklers, design criteria, water demand, and date of installation.
4. Provide fire sprinkler guards on exposed sprinklers in areas subject to damage.
5. Quick response sprinklers listed for installation in an Ordinary Hazard occupancy when installed in an Ordinary Hazard occupancy.

B. Flexible Sprinkler Wet and Dry Head Drop:
1. Install per manufacturer's installation requirements.
2. Coordinate head location with other trades to assure space is available to maintain proper radius requirements.
3. Provide flexible sprinkler drops of appropriate length as conditions require.
4. Provide flexible sprinkler drops at sprinkler heads located in suspended, dropped, or acoustical ceilings. In hard lid ceiling areas, provide flexible heads at Contractor's option.

C. Sprinklers above finished ceilings: Include heads above finished ceilings if structure is combustible, or if steel beams are not provided with spray-on fire proofing.

D. Electrical: Electrical work to comply with Division 26, Electrical.

E. Hangers and Supports:
1. Install sprinkler system and service main piping, hangers, and supports in accordance with NFPA 13.
2. Install standpipe piping, hangers, and supports in accordance with NFPA 14.
3. Connections to structural framing not to introduce twisting, torsion, or lateral bending in the framing members. Provide supplementary steel as required.

F. Valves:
1. Provide valves at connections to equipment where shown or required for equipment isolation.
2. Install valves accessible and same size as connected piping.

3. Provide separate support for valves where necessary.
4. Provide drain valves in low points in the piping system, and at equipment, as required by code, and as indicated.
5. Fire Suppression Service:
    a. In piping 2-inches and smaller; bronze gate valve, bronze swing check valve, vertical check valve.
    b. In piping 2-1/2-inches and larger; iron gate valve, iron swing check valve, vertical check valve.
    c. UL approved butterfly valves.
    d. Silent check valves on pump discharge.
6. Provide gauge cocks for pressure gauges.

G. Piping Preparation:
1. Measurements, Lines and Levels:
    a. Check dimension at the building site and establish lines and levels for work specified in this Section.
    b. Establish inverts, slopes, and elevations by instrument, working from an established datum point. Provide elevation markers for use in determining slopes and elevations in accordance with Drawings and Specifications.
    c. Use established grid and area lines for locating trenches in relation to building and boundaries.

H. Piping:
1. Hold piping as tight to structure as possible. In general, run piping in areas without ceilings parallel to building elements in a neat, professional manner.
2. Pipe inspector test connections to exterior and discharge as approved by local applicable governing authorities.
3. Provide test tees as required.
4. Install unions in non-flanged piping connections to apparatus and adjacent to screwed control valves, and appurtenances requiring removal for servicing so located that piping may be disconnected without disturbing the general system.
5. Mechanical Couplings:
    a. On systems using galvanized pipe and fittings, galvanize fittings at factory.
    b. Before assembly of couplings, lightly coat pipe ends and outside of gaskets with approved lubricant.
    c. Pipe grooving in accordance with manufacturer's specifications contained in latest published literature.
6. Install piping as to drain per NFPA 13.
7. Support piping independently at apparatus so that its weight not carried by the equipment.

I. Drain Piping:
1. Pitch drain piping 1/2-inch per 10-feet minimum; no traps allowed.
2. Discharge drain piping to outside with suitable splash plate to a location as approved by the architect.

J. Piping Joints:
1. Join pipe and fittings using methods and materials recommended by manufacturer in conformance with standard practice and applicable codes. Cleaning, cutting, reaming, grooving, etc. done with proper tools and equipment. Hacksaw pipe cutting prohibited. Peening of welds to stop leaks not permitted.
2. Grooved Joints:
    a. Install in accordance with the manufacturer's latest published installation instructions.
    b. Clean pipe ends free from indentations, projections and roll marks in the area from pipe end to (and including) groove.

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c. Gasket manufactured by the coupling manufacturer and verified as suitable for the intended service.
d. Factory trained representative (direct employee) of the coupling manufacturer to provide on-site training for contractor's field personnel in the use of grooving tools, application of groove, and product installation.
e. Periodically visit the job site and review installation to ensure best practices in grooved joint installation are being followed.
f. Remove and replace any improperly installed products.

3. No couplings installed in floor or wall sleeves.
4. Steel Piping:
   a. Screwed Joints:
      1) Pipes cut evenly with pipe cutter reamed to full inside diameter with burrs and cuttings removed.
      2) Joints made up with suitable lubricant or Teflon tape applied to male threads only, leaving two threads bare.
      3) Joints tightened so that not more than two threads are left showing.
      4) Junctions between galvanized steel waste pipe and bell of cast iron pipe made with tapped spigot or half coupling on steel pipe to form spigot end and caulked.
   b. Flanged Joints:
      1) Pressure rating of flanges match valve or fitting joined.
      2) Coat joint gaskets with graphite and oil.
5. Welded Joints:
   a. Preparation for Welding: Bevel piping on both ends before welding:
      1) Use following weld spacing on buttwelds:

NOMINAL PIPE WALL THICKNESS	SPACING	BEVEL
1/4-inch or less	1/8-inch	37-1/2
Over 1/4-inch, less than 3/4-inch	3/16-inch	27-1/2

      2) Before welding, remove corrosion products and foreign material from surfaces.
   b. Welded Joints:
      1) Use arc-welding process using certified welders. Port openings of fittings must match the inside diameter of the pipe to which they are welded. Use full radius welding elbows for turns, use welding tees for tees. Use reducing fittings for size reduction. Weldolets may be used for branches up through one-half the pipe size of the main to which they are attached. Nipples are not allowed.
   c. Welding Operation:
      1) After deposition, clean each layer of weld metal to remove slag and scale by wire brushing or grinding. Chip where necessary to prepare for proper deposition of next layer.
      2) Weld reinforcement no less than 1/16-inch not more than 1/8-inch above normal surface of jointed sections. Reinforcement crowned at center and taper on each side to surfaces being joined. Exposed surface of weld present professional appearance and be free of depressions below surface of jointed members.
      3) Do not weld when temperature of base metal is lower than 0 degrees F. Material to be welded during freezing temperatures made warm and dry before welding is started. Metal warm to the hand or approximately 60 degrees F.

K. Pipe Wrap:
   1. Apply per manufacturer's written instructions.
   2. Apply wrapping to fittings in field after installation.

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3.2 IDENTIFICATION

A. Valve Identification:
   1. Valve Tags:
      a. Attach to valve with a brass chain.
      b. Valve tag numbers continuous throughout the building for each system. Obtain a list for each system involved from the Owner.
   2. Valve Tag Directory:
      a. Post final copy in Operation and Maintenance Manual.

B. Piping Markers:
   1. Unless recommendations of ANSI A13.1 are more stringent, apply labels or letters after completion of pipe cleaning, painting, or other similar work, as follows:
      a. Every 20-feet along continuous exposed lines.
      b. Every 10-feet along continuous concealed lines.
      c. Adjacent to each valve and stub out for future.
      d. Where pipe passes through a wall, into and out of concealed spaces.
      e. On each riser.
      f. On each leg of a T.
      g. Locate conspicuously where visible.
   2. Apply labels or letters to lower quarters of the pipe on horizontal runs where view is not obstructed or on the upper quarters when pipe is normally viewed from above. Apply arrow labels indicating direction of flow. Arrows to be the same color and sizes as identification labels.

C. Equipment Identification:
   1. Nameplates:
      a. Attach to prominent area of equipment, either with sheet metal screws, brass chain, or contact cement as applicable.
   2. Nameplate Directory:
      a. Post final copy in Operation and Maintenance Manual.

3.3 EXTRA STOCK

A. Provide additional number of heads of each type and temperature rating installed as required to meet NFPA 13 requirements.

B. Provide storage cabinet or cabinets as required to receive reserve sprinkler heads and special installation tools required.

C. Provide index label for each head indicating manufacturer, model, orifice size of K-factor, and temperature rating.

D. Provide, inside cabinet a list of heads stored within and brief description of where installed.

E. Locate cabinet near sprinkler control station as approved.

3.4 FIELD QUALITY CONTROL

A. Tests and Inspections:
   1. Perform tests and arrange for required inspections of installed system as required.

2. Notify the Architect 48 hours prior to any test or inspection.
3. Provide final test and certification in the presence of an Owner representative. Coordinate hereunder.

B. Inspection Service:
1. At start of warranty year, execute inspection agreement.
2. Without additional charge to Owner, make quarterly inspection of system during year.
   a. Check and operate control valves.
   b. Lubricate valve parts.

C. Report each inspection to Owner.

END OF SECTION

SECTION 22 05 00

COMMON WORK RESULTS FOR PLUMBING

PART 1 GENERAL

1.1 SUMMARY

A. The intent of Division 22, Plumbing and the accompanying Drawings is to provide a complete and workable facility with complete systems as shown, specified and required by applicable codes. Include all work specified in Division 22, Plumbing and shown on the accompanying Drawings, including appurtenances, connections, etc., in the finished job.

B. Division 22, Plumbing and the accompanying Drawings are complementary and as binding as if called for by both. Items shown on the Drawings are not necessarily included in the Specifications and vice versa. Specifications supersede drawings in case of conflict.

C. The Drawings that accompany the Division 22, Plumbing, are diagrammatic. They do not show every offset, bend, tee, or elbow which may be required to install work in the space provided and avoid conflicts. Offsets and transitions assumed at a minimum at each duct crossing, structural penetrations through shear walls or beams, structural grids where ceiling heights are restricted, and at piping mains. Follow the Drawing as closely as is practical to do so and install additional bends, offsets and elbows where required by local conditions from measurements taken at the Building, subject to approval, and without additional cost to the Owner. The right is reserved to make any reasonable changes in fixture location prior to roughing-in, without cost impact.

D. The General and Supplemental Conditions apply to this Division, including but not limited to:
   1. Drawings and specifications.
   2. Public ordinances, permits.
   3. Include payments and fees required by governing authorities for work of this Division.

1.2 RELATED SECTION

A. Division 01, General Requirements

B. Division 22, Plumbing

1.3 QUALITY ASSURANCE

A. Regulatory Requirements:
   1. Products and equipment prohibited from containing pentabrominated, octabrominated and decabrominated diphenyl ethers. Where products or equipment within this specification contain these banned substances, provide complying products and equipment from approved manufacturers with equal performance characteristics.
   2. General:
      a. Conform work and materials to local and State codes, and Federal, State and other applicable laws and regulations.
   3. Responsible for obtaining and payment for permits, licenses, and inspection certificates required in accordance with provisions of Contract Documents.

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B. New materials and equipment. Work of good quality, free of faults and defects and in conformance with the Contract Documents.

C. Build and install apparatus to deliver its full rated capacity at the efficiency for which it was designed.

D. Operate the entire plumbing system and apparatus at full capacity without objectionable noise or vibration.

E. Install equipment level and true. Use housekeeping pads and curbs to account for floor or roof slope.

F. Materials and Equipment:
1. Meet detailed requirements of the Drawings and Specifications and suitable for the installation shown. Equipment not meeting requirements will not be acceptable, even though specified by name along with other manufacturers.
2. Where two or more units of the same class of equipment are furnished, use products of the same manufacturer. Component parts of the entire system need not be products of same manufacturer.
3. Furnish materials and equipment of size, make, type, and quality herein specified.
4. Equipment scheduled by performance or model number considered the basis of the design. If other specified manufacturer's equipment is provided in lieu of the basis of design equipment the contractor is responsible for changes and costs which may be necessary to accommodate this equipment, including different sizes and locations for connections, different electrical characteristics, different dimensions, different access requirements or any other differences which impact the project.

G. Workmanship:
1. General:
   a. Install materials in a neat and professional manner.
2. Manufacturer’s Instructions:
   a. Follow manufacturer’s directions where they cover points not specifically indicated.
   b. If in conflict with the Drawings and Division 22, Plumbing, obtain clarification before starting work.

H. Cutting and Patching:
1. Cutting, patching, and repairing for the proper installation and completion of the work specified in this Division including plastering, masonry work, concrete work, carpentry work, and painting performed by skilled craftsmen of each respective trade in conformance with the appropriate Division of Work.
2. Additional openings required in building construction made by drilling or cutting. Use of jackhammer is specifically prohibited.
3. Fill holes which are cut oversize so that a tight fit is obtained around the sleeves passing through.
4. Do not pierce beams or columns without permission of Architect and then only as directed.
5. Restore new or existing work cut or damaged to its original condition. Where there are alterations disturb lawns, paving, walks, etc., repair, refinish, and leave in condition existing prior to commencement of work.

1.4 SUBMITTALS

A. Shop Drawings:
1. Contract Drawings indicate the general layout of the piping, and various items of equipment.
2. Coordinate with other trades and field conditions.
3. Prepare Shop Drawings of piping, and equipment installations.

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4. Prepare new Shop Drawings by Contractor and not reproductions or tracings of Architect's Drawings.
5. Overlay drawings with shop drawings of other trades and check for conflicts.
6. Drawings same size as Architect's Drawings with title block similar to Contract Drawings and identifying Architect's Drawing number or any reference drawings.
7. Fully dimensioned including both plan and elevation dimensions.
8. Shop drawings cannot be used to make scope changes.
9. Prepare in two-dimensional format.
10. Shop drawings include but are not limited to:
    a. Plumbing site plan drawn to same scale as site plan.
    b. Complete floor plans with plumbing to a minimum of 1/4-inch equals 1-foot scale.
    c. Sections of congested areas to a minimum of 1/2-inch equals 1-foot scale.
    d. Fabricated Equipment: Scale and drawing sizes to suit contractor except equipment not less than 1/2-inch equals 1-foot scale.
    e. Beam penetration drawings indicating beam penetrations meeting the requirements indicated on the floor plans and on the structural drawings to a minimum of 1/4-inch equals 1-foot scale.
    f. Slab penetration drawings of HVAC, plumbing, sprinklers, lighting and electrical to a minimum of 1/4-inch equals 1-foot scale.
11. Submit shop drawings for review prior to beginning fabrication. Additional shop drawings may be requested when it appears that coordination issues are not being resolved in the field or when there is a question as to whether contract documents are being complied with or the design intent is being met.

B. Product Data:
1. Submit product data for review on scheduled pieces of equipment, on equipment requiring electrical connections or connections by other trades, and as required by each specification section or by Drawing notes. Include manufacturer's detailed shop drawings, specifications and data sheets. Data includes the following:
    a. Capacities
    b. RPM
    c. BHP
    d. Pressure Drop
    e. Design and Operating Pressures
    f. Temperatures
2. Manufacturer's abbreviations or codes are not acceptable.
3. List the name of the motor manufacturer and service factor for each piece of equipment.
4. Indicate equipment operating weights including bases and weight distribution at support points.
5. In the case of equipment such as wiring devices, time switches, valves, etc., specified by specific catalog number, a statement of conformance will suffice.

C. Submission Requirements:
1. Shop Drawings and Product Data:
    a. Refer to Division 01, General Requirements for additional requirements related to submittals.
    b. Submit electronic copies of shop drawings and product data for Work of Division 22, Plumbing in PDF format with each item filed under a folder and labeled with its respective specification section number, article, and paragraph and mark, if applicable.
    c. Include a complete index in the original submittal. Indicate both original items submitted and note stragglers that will be submitted at a later date to avoid delay in submitting.
    d. The bulk of the shop drawings and product data, excepting Controls and Instrumentation, included with the original submittal. Controls and Instrumentation submittals may lag but still complete when submitted. Partial submittals will not be accepted. Other stragglers submitted

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after return of the original binder includes a tab similar to that originally submitted. Upon receipt of the returned late submittal, insert them in the previously submitted binder.

D. Contractor Responsibilities:
   1. Submit submittals at one time and are in proper order.
   2. Ensure equipment will fit in the space provided.
   3. Assure that deviations from Drawings and Specifications are specifically noted in the submittals. Failure to comply will void review automatically.

1.5 AS-BUILT DRAWINGS

A. Provide record drawings in hard copy and pdf format. Drawings include the following:
   1. Project specific titleblock.
   2. Notations reflecting the as built conditions of any additions to or variations from the construction documents provided as part of the BIM coordination, RFIs, ASIs, Owner Changes, and Field Coordination.

1.6 OPERATING AND MAINTENANCE MANUAL, PARTS LISTS, AND OWNER'S INSTRUCTIONS

A. Refer to Division 01, General Requirements for additional requirements.

B. Submit three bound copies of manufacturer's operation and maintenance instruction manuals and parts lists for each piece of equipment or item requiring servicing. Show literature on 8-1/2-inches by 11-inches sheets or catalogs suitable for side binding.

C. Submit data when the work is substantially complete, packaged separately, and clearly identified in durable 3-ring binder. Include name and contact information for location of source parts and service for each piece of equipment.

D. Clearly mark and label in each submittal, the piece of equipment provided with the proper nameplate and model number identified. Provide wiring diagrams for electrically powered equipment.

E. Instruct Owner thoroughly in proper operation of equipment and systems, in accordance with manufacturer's instruction manuals. Operating instructions cover all phases of control.

1.7 PROJECT CONDITIONS

A. Existing Conditions:
   1. Prior to bidding, verify and become familiar with existing conditions by visiting the site, and include factors which may affect the execution of this Work.
   2. Include related costs in the initial bid proposal.

B. Coordinate exact requirements governed by actual job conditions. Check information and report any discrepancies before fabricating work. Report changes in time to avoid unnecessary work.

C. Coordinate shutdown and start-up of existing, temporary, and new systems and utilities. Notify Owner, City, and Utility Company.

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1.8 WARRANTY

A. Provide a written guaranty covering the work of this Division (for a period of one calendar year from the date of acceptance by the Owner) as required by the General Conditions.

B. Provide manufacturer's written warranties for material and equipment furnished under this Division insuring parts and labor for a period of one year from the date of Owner acceptance of Work of this Division.

C. Correct warranty items promptly upon notification.

1.9 TEST REPORTS AND CERTIFICATES

A. Submit one copy of test reports and certificates specified herein to the Architect.

1.10 SUBSTITUTIONS

A. Submit requests for product substitutions in accordance with the Instructions to Bidders and the General and Supplemental Conditions.

PART 2 PRODUCTS

2.1 ACCESS PANELS

A. Furnish under this Division as specified in another Division of work.

2.2 PIPE SLEEVES

A. Interior Wall and Floor Sleeves: 18 gauge galvanized steel, or another pre-approved system.

B. Interior Wall and Floor Sleeves, Fire Rated: Fire rated and water tight system approved by Authority Having Jurisdiction and Owners Insurance underwriter, with rating equal to floor or wall penetration, and designed specifically for the floor or wall construction, piping material, size and service.

C. Exterior Wall Sleeves: Cast iron.

D. On Grade Floor Sleeves: Same as exterior wall sleeves.

E. Water Tight Sleeves: Combination steel pipe sleeves with water stop and anchor plate; Link Seal Model WS, mated with synthetic rubber links interlocked with bolts and nuts; Link Seal Model LS.

2.3 FLOOR, WALL AND CEILING PLATES

A. Furnish stamped split type plates as follows:
   1. Floor Plates: Cast brass, chromium plated
   2. Wall and Ceiling Plates: Spun aluminum

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2.4 ELECTRICAL EQUIPMENT

A. General:
   1. Equipment and installed work as specified under Division 26, Electrical.

B. Coordinate with the electrical Drawings and electrical contractor for minimum electrical equipment bracing requirements based on the available interrupting current (AIC) rating at the bus of the panelboard or switchboard serving the piece of equipment. Provide equipment that meets the bracing requirement.

C. Codes: Electrical equipment and products bear the Underwriters label as required by governing codes and ordinances.

PART 3 EXECUTION

3.1 ACCESS PANELS

A. Install in accord with manufacturer's recommendations, coordinated with architectural features.

B. Provide 2-hour fire rated doors where required bearing the UL label.

C. Furnish 18-inch by 18-inch panels for ceilings and for access to equipment in soffits and shafts, and 12-inch by 12-inch for walls unless indicated otherwise.

D. Furnish where indicated and where required to access valves, trap primers, shock arresters, and other appurtenances requiring operation, service, or maintenance. Submit proposed locations for review prior to installation.

3.2 SLEEVES

A. Interior Floor and Wall Sleeves:
   1. Provide sleeves large enough to provide 3/4-inch clearances around pipe.
   2. Where pipe is insulated, provide sleeves large enough to provide 3/4-inch clearance around insulation. Maintain continuous insulation as it passes through sleeve.
   3. Penetrations through mechanical room and fan room floors made watertight by packing with safing insulation and sealing with Tremco Dymeric Sealant or approved system.

B. Sleeves Through Rated Floors and Walls:
   1. Similar to interior sleeves except install fire rated system approved by Authority Having Jurisdiction and Owners insurance underwriter
   2. Rating equal to floor or wall penetration, and designed specifically for the floor or wall construction, piping material, size and service.

C. Exterior Wall Sleeves Below Grade:
   1. Provide water tight sleeves. Install at pipes entering building below grade and where shown. Adjust to provide positive hydrostatic seal.
   2. Responsible for following manufacturer's procedure for installing and tightening seal. Secure sleeves against displacement.

D. On Grade Floor Sleeves: Same as below grade exterior wall sleeves, caulked from inside.

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E. Exterior Wall Sleeves Above Grade: Similar to interior wall sleeves except caulk outside with Tremco Dymeric Sealant.

F. Layout work prior to concrete forming. Do cutting and patching required. Reinforce sleeves to prevent collapse during forming and pouring.

G. Floor sleeves maintain a water barrier by providing a water tight seal or they extend 1-inch above finished floor except through mechanical equipment room floors and shafts where sleeves extend 2-inches above finished floor level. Sleeves through roof extend 8-inches above roof. Wall sleeves flush with face of wall unless otherwise indicated. Waste stacks using carriers have sleeves flush with floor and sealed. Sleeves through planters extend 8-inches above planter base.

H. Do not support pipes by resting pipe clamps on floor sleeves. Provide supplementary members so pipes are floor supported.

I. Special sleeves detailed on drawings take precedence over this Section.

3.3 CLEANING

A. General: Clean plumbing equipment, fixtures and piping of stampings and markings (except those required by codes), iron cuttings, and other refuse.

B. Painted Surfaces: Clean scratched or marred painted surfaces of rust or other foreign matter and paint with matching color industrial enamel, except as otherwise noted.

C. Additional requirements are specified under specific Sections of this Division.

3.4 EQUIPMENT PROTECTION

A. Keep pipe and conduit openings closed by means of plugs or caps to prevent the entrance of foreign matter. Protect piping, conduit, fixtures, equipment, and apparatus against dirty water, chemical or mechanical damage both before and after installation. Restore damaged or contaminated fixtures, equipment, or apparatus to original conditions or replace at no cost to the Owner.

B. Protect bright finished shafts, bearing housings, and similar items until in service. No rust will be permitted.

C. Cover or otherwise suitably protect equipment and materials stored on the job site.

3.5 ACCESSIBILITY

A. General: Locate valves, thermometers, cleanout fittings and other indicating equipment or specialties requiring frequent reading, adjustments, inspection, repairs, and removal or replacement conveniently and accessibly with reference to the finished building.

B. Thermometers and Gauges: Install thermometers and gauges so as to be easily read from the floors, platforms, and walkways.

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3.6 FLOOR, WALL AND CEILING PLATES

A. Install on piping passing through finished walls, floors, ceilings, partitions, and plaster furrings. Plates completely cover opening around pipe.

B. Secure wall and ceiling plates to pipe, insulation, or structure.

C. Plates not to penetrate insulation vapor barriers.

D. Plates not required in mechanical rooms or unfinished spaces.

3.7 PAINTING

A. General:
1. Coordinate painting of mechanical equipment and items with products and methods in conformance with the appropriate Division of Work, Painting.
2. Exposed work under this division receives either a factory painted finish or a field prime coat finish, except:
3. Exposed copper piping.
4. Aluminum jacketed outdoor insulated piping.

B. Equipment Rooms and Finished Areas:
1. Insulation: Not painted.
2. Hangers, Uninsulated Piping, Miscellaneous Iron Work, Structural Steel Stands, Uninsulated Tanks, and Equipment Bases: Paint one coat of black enamel.
3. Steel Valve Bodies and Bonnets: One coat of black enamel.
4. Brass Valve Bodies: Not painted.
5. Equipment:
   a. One coat of grey machinery enamel.
   b. Do not paint nameplates.

C. Concealed Spaces (above ceilings, not visible):
1. Insulation: Not painted.
2. Hangers, Uninsulated Piping, Miscellaneous Iron Work, Valve Bodies and Bonnets: Not painted.

D. Exterior Steel: Wire brush and apply two coats of rust-inhibiting primer and one coat of grey exterior machinery enamel.

E. Exterior Black Steel Pipe: Wire brush and apply two coats of rust-inhibiting primer and one coat of exterior enamel. Painting schemes comply with ANSI A13.1.

3.8 ADJUSTING AND CLEANING

A. Before operating any equipment or systems, make thorough check to determine that systems have been flushed and cleaned as required and equipment has been properly installed, lubricated, and serviced. Check factory instructions to see that installations made accordingly and that recommended lubricants have been used.

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B. Use particular care in lubricating bearings to avoid damage by overlubrication and blowing out seals. Check equipment for damage that may have occurred during shipment, after delivery, or during installation. Repair damaged equipment as approved or replace with new equipment.

3.9 ELECTRICAL EQUIPMENT

A. Do not install piping for plumbing systems not serving electrical space in switchgear room, transformer vault, telephone room, or electric closet except as indicated.

B. Piping for plumbing systems not to pass over switchboards or electrical panelboards. Where conflicts exist, bring to attention of Architect.

3.10 EQUIPMENT CONNECTIONS

A. Make final connections to equipment specified in sections other than Division 22, Plumbing of the specifications and Owner furnished equipment in accordance with manufacturer's instructions and shop drawings furnished and as indicated.

B. Piping:
1. Connections include hot and cold water, deionized water, distilled water, natural gas, medical gases, medical air, and vacuum, dental air and vacuum, lab air and vacuum, sanitary waste and vent, lab waste and vent and fuel oil.
2. Provide valves and specialties as specified and as detailed on the Drawings. Provide increasers, reducers, and any other fittings required for complete installation.
3. Independently support piping connections to prevent undue strain on equipment.

END OF SECTION

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SECTION 22 05 23

GENERAL DUTY VALVES AND SPECIALTIES FOR PLUMBING

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes:
   1. Ball Valves
   2. System Specialties

1.2 RELATED SECTIONS

A. Division 01, General Requirements

B. Division 22, Plumbing

1.3 SUBMITTALS

A. Submit product data.

1.4 DEFINITIONS

A. CWP Cold working pressure

B. EPDM Ethylene propylene copolymer rubber

C. NBR Acrylonitrile-butadiene, Buna-N, or nitrile rubber

D. NRS Nonrising stem

E. OS&Y Outside screw and yoke

F. RS Rising stem

G. PTFE Polytetrafluoroethylene plastic

H. SWP Steam working pressure

I. Lead Free Section 1417 of the Safe Drinking Water Act (SDWA) establishes the definition for lead free as a weighted average of 0.25 percent lead calculated across the wetted surfaces of a pipe, pipe fitting, plumbing fitting, and fixture and 0.2 percent lead for solder and flux. The Act provides a methodology for calculating the weighted average of wetted surfaces.

1.5 QUALITY ASSURANCE

A. ASME Compliance:
   1. ASME B16.10 for ferrous valve dimensions.

2. ASME B31.9 for building services piping valves.

B. NSF Compliance: NSF/ANSI 61 and/or NSF/ANSI 372 for valve materials for potable-water service. ANSI/NSF-359

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. General: Where only NIBCO figure numbers are listed, equivalent products by those specified below are acceptable.
   1. Valves:
      a. Ball:
         1) Gruvlok
         2) Apollo
         3) Crane
         4) Hammond
         5) Milwaukee
         6) Victaulic

B. Other Manufacturers: Submit substitution request.

C. Use only one manufacturer.

D. Valve ends may be threaded, flanged, soldered, or grooved, as applicable to piping system. Refer to Section 22 21 13, Pipe and Pipe Fittings Plumbing for allowable fittings.

2.2 BALL VALVES

A. Lead Free Bronze Ball: Two piece, full port, lead free silicon bronze body, Stainless steel or silicon bronze trim, Reinforced PTFE or TFE seats, 600 psi CWP NIBCO T/S-585-80-LF or T/S-585-66-LF.

PART 3 EXECUTION

3.1 INSTALLATION

A. Provide valves at connections to equipment where shown or required for equipment isolation.

B. Provide separate support for valves where necessary.

C. Provide drain valves in low points in the piping system, at coils and equipment, and as indicated.

D. Install in accordance with manufacturer’s recommendations.

3.2 APPLIED LOCATIONS PLUMBING VALVES

A. In piping 2-inches and smaller:

System	Valve Types				
	Gate	Globe	Swing Check	Ball	Butterfly
Domestic Hot	Lead Free Bronze	Lead Free Bronze	Lead Free Bronze	Lead Free Bronze	Not Allowed
Domestic Cold	Lead Free Bronze	Lead Free Bronze	Lead Free Bronze	Lead Free Bronze	Not Allowed

3.3 VALVE IDENTIFICATION

A. General: Identify valves to indicate their function and system served.

B. Refer to Section 22 05 53, Identification for Plumbing Piping and Equipment.

3.4 INSTALLATION

A. Manual Air Vents:
   1. Install at high points where automatic air vents are not used, where noted, and where required for proper venting of system.
   2. Install in accordance with manufacturer's recommendations.

B. Test Plugs: Install where indicated and in accordance with the manufacturer's recommendations.

END OF SECTION

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SECTION 22 05 29

HANGERS SUPPORTS AND ANCHORS FOR PLUMBING

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes:
   1. Supports, Anchorage and Restraint
   2. Pipe Attachments
   3. Pipe Rollers, Insulation Protection Shields and Insulation Protection Saddles
   4. Building Attachments

1.2 RELATED SECTIONS

A. Division 01, General Requirements

B. Division 22, Plumbing

C. Section 22 07 00, Insulation for Plumbing

D. Section 22 21 13, Pipe and Pipe Fittings Plumbing

1.3 SUBMITTALS

A. Submit the following:
   1. Shop Drawings of contractor fabricated piping support structures.
   2. No other submittals required under this section.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Supports, Anchorage and Restraint:
   1. Unistrut
   2. Superstrut
   3. Powerstrut and Kinline
   4. B-Line Systems
   5. AnvilStrut

B. Pipe Attachments:
   1. Anvil
   2. Superstrut
   3. B-Line Systems
   4. Tolco
   5. ERICO

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C. Pipe Rollers, Insulation Protection Shields and Insulation Protection Saddles:
   1. Anvil or equivalent
   2. Super Strut
   3. B-Line Systems
   4. Tolco
   5. ERICO

D. Building Attachments:
   1. Anvil as listed or equivalent products
   2. Elcen
   3. Superstrut
   4. B-Line Systems
   5. Tolco
   6. ERICO

2.2 SUPPORTS, ANCHORAGE AND RESTRAINT

A. General:
   1. Provide pipe and equipment hangers and supports in accordance with the following:
      a. Equipment, supports, and seismic restraints for conduit, piping, and ductwork are not shown on the Drawings, the contractor responsible for their design.
      b. Resist seismic forces as specified in the latest edition of the International Building Code for the seismic zone in which the project is constructed.
      c. Seismic restraint not to introduce excessive stresses in the piping caused by thermal expansion or contraction.
      d. Connections to structural framing not to introduce twisting, torsion, or lateral bending in the framing members. Provide supplementary steel as required.
      e. In accordance with the latest edition of the SMACNA Seismic Restraint Manual - Guidelines for Mechanical Systems for the Seismic Hazard Level corresponding to the seismic zone in which the project is constructed.
      f. In accordance with the applicable code.
      g. Follow provisions described in Section 22 05 48, Vibration and Seismic Controls for Plumbing Piping and Equipment.

B. Engineered Support Systems: Design, detail, and bear the seal of a professional engineer registered in the State having jurisdiction.
   1. Supports and seismic restraints for suspended piping and equipment.
   2. Support frames such as pipe racks or stanchions for piping and equipment which provide support from below.
   3. Equipment and piping support frame anchorage to supporting slab or structure.

C. Fabricate support members from welded standard structural shapes, pipe, and plate to carry the necessary rollers, hangers, and accessories as required.

D. Support piping less than 4-inch pipe size from or by prefabricated roll-formed channels with necessary accessories to adequately support piping system.

E. Supports and Accessories: Preformed roll-formed channels and accessories with matching compatible accessories as shown, as specified, and as required.

F. Dissimilar Metal Protection: Hydra-Zorb cushions or Cush-a-strip.

G. Clamps: Super Strut Series 700 through 702 or AnvilStrut Series 1000 through 1200.

2.3 PIPE ATTACHMENTS

A. Uninsulated Horizontal Copper Piping:
   1. 2-inch and Smaller: Anvil CT-65, CT-69, CT-99C.
   2. Larger than 2-inch:
      a. Anvil 260 field or factory copper plated, plastic coated or other recognized industry methods.
      b. Electricians' tape is unacceptable.

B. Insulated Horizontal Copper Pipe with Hangers Inside of Insulation: Same as Uninsulated Horizontal Copper Pipe.

C. Insulated Horizontal Copper Pipe with Hangers Outside of Insulation:
   1. 2-inch and Smaller: Anvil 65, 70, 104 or 260.
   2. Larger than 2-inch: Anvil 260.

D. Other Uninsulated Horizontal Pipe:
   1. 2-inch and Smaller: Anvil 65, 70, 104 or 260.
   2. Larger than 2-inch: Anvil 260.

E. Other Insulated Horizontal Pipe With Hangers Inside of Insulation:
   1. 2-inch and Smaller: Anvil 65, 70, 104, 260 or 300.
   2. Larger than 2-inch: Anvil 260.

F. Other Insulated Horizontal Pipe with Hangers Outside of Insulation:
   1. 2-inch and Smaller: Anvil 65, 70, 104 or 260.
   2. Larger than 2-inch: Anvil 260.

G. Riser Clamps Copper Pipe:
   1. 4-inch and Smaller: Anvil CT-121, CT-121C or 261C.
   2. Larger than 4-inch: Anvil 261C.

H. Riser Clamps Other Piping: Anvil 261.

2.4 BUILDING ATTACHMENTS

A. Beam Hangers:
   1. On piping 6-inch and smaller: Anvil 86 with retaining clip Figure 89.
   2. On piping larger than 6-inch: Anvil 228, or 292.

B. Inserts:
   1. Anvil 152 malleable iron or 281 steel inserts.
   2. Inserts sized for required rod to support load being carried.

C. Expansion Plugs: Similar and equal to Phillips red-head self-drilling flush shell selected for safety factor of 4.

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D. Powder actuated fasteners with silencers as approved by Architect.

PART 3 EXECUTION

3.1 HANGERS AND SUPPORTS

A. General:
1. Install support systems as detailed and in accordance with manufacturer's recommendations. Provide pipe racks, pipe stands, trapeze hangers, etc., as required, and as detailed on the Drawings.
2. Provide adjustable hangers for pipes complete with inserts, adjusters, bolts, nuts, swivels, all-thread rods, etc., except where specified otherwise.
3. Arrange for grouping of parallel runs of horizontal piping to be supported together on trapeze type hangers where possible. Where piping of various sizes is to be supported together by trapeze hangers, space hangers for smallest pipe size or install intermediate supports for smaller diameter pipe. Do not use wire or perforated metal to support piping and do not support piping from other piping.
4. Except as otherwise indicated for exposed continuous pipe runs, install hangers, and supports of same type and style as installed for adjacent similar piping.
5. Install cast iron piping in accordance with Cast Iron Soil Pipe Industry (CISPI) Standards.
6. Support piping within 2-feet of each change of direction on both sides of fitting.

B. Insulated Piping Systems:
1. Refer to Section 22 07 00, Insulation for Plumbing for insulation requirements.
2. Insulated Piping Systems with Vapor Barrier Insulation:
   a. Install hangers outside of insulation.
   b. On piping 1-1/2-inch and larger, provide insulation protection shields at each support location.
3. Insulated Piping Systems with Non-Vapor Barrier Insulation:
   a. At the contractor's option, hangers may be installed inside or outside of insulation for piping 2-inch and smaller.
   b. If hangers are installed outside of insulation, provide insulation protection shields at support locations on piping 1-1/2-inch and larger.
   c. On piping larger than 2-inch, provide insulation saddles at each support location.
4. Insulation Protection:
   a. Band insulation protection shields firmly to insulation to prevent slippage.
   b. Tack weld insulation protection saddles to steel pipe. Braze saddles to copper pipe.

C. Vertical Piping:
1. Support with U-clamps fastened to wall to hold piping away from wall unless otherwise approved.
2. Riser clamps on steel pipe to be directly welded to pipe. Riser clamps on copper pipe to be installed directly under fitting.
3. Risers that are not subject to thermal change to be supported at each floor of penetration.
4. Risers that are subject to thermal change require engineered supports. Size supports to carry forces exerted by piping system when in operation. Riser supports follow provisions described in Section 22 05 48, Vibration and Seismic Controls for Plumbing Piping and Equipment.
5. Horizontal Piping:
6. Trapeze Hangers:
   a. Multiple pipe runs where indicated supported on channels with rust resistant finish.
   b. Provide necessary rods and supporting steel.

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7. Support Spacing:
   a. Provide support at minimum spacing per MSS SP-69-1996 Pipe Hangers and Supports - Selection and Application:
      1) Support piping within 2-feet of each change in direction.
      2) Steel Pipe, Copper Tubing:

Minimum Pipe Size	Maximum Span Steel	Maximum Span Copper	Maximum Span Pex A pipe with Pex a Pipe Channel	Rod Size
1-inch and smaller	7-feet	5-feet	6-feet	1/4-inch
1-1/4-inch to 2-inch	8-feet	8-feet	8-feet	3/8-inch
2-1/2-inch to 3-inch	11-feet	9-feet	8-feet	1/2-inch
4-inch to 5-inch	14-feet	12-feet	-	1/2-inch

D. Building Attachments:
1. Fastening or attaching to steel deck (without concrete fill) is prohibited. It will be necessary to support piping from structural members, beams, joists, or provide intermediate angle iron supporting members between joists. Supports may be attached to concrete filled steel deck with load limitations shown on the structural drawings or otherwise obtained from the structural engineer.
2. Provide horizontal bracing on horizontal runs 1-1/2 inch and larger and exceeding 50-feet in length at 75-foot intervals and as required to provide stabilized piping systems.
3. Provide additional structural steel angles, channels, or other members required to support piping where structures do not occur as required for proper support.
4. Arrange supports to prevent eccentric loading of joists and joist girders. Locate supports at joist panel points.

END OF SECTION

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SECTION 22 05 53

IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes:
   1. Valve Identification
   2. Piping Markers
   3. Equipment Identification

1.2 RELATED SECTIONS

A. Division 01, General Requirements

B. Division 22, Plumbing

1.3 SUBMITTALS

A. Submit the following:
   1. Valve Tag Directory: Submit for approval prior to fabrication of valve tags.
   2. Equipment Nameplate Directory: Submit for approval prior to fabrication.
   3. Operating and Maintenance Data: Include a copy of valve tag and equipment nameplate directories in each set of Operating and Maintenance manuals.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Piping Markers:
   1. W.H. Brady
   2. Seton
   3. Marking Systems, Inc. (MSI)
   4. Other Manufacturers: Submit substitution request.

2.2 VALVE IDENTIFICATION

A. Valve Tags:
   1. General: Identify valves with metal tags, legends to be stamped or embossed. Indicate function of the valve and its normal operating position.

56 HW	(NUMBER AND CONTENT OF PIPE)
ISOLATION	(VALVE FUNCTION)
NO	(NORMAL OPERATION POSITION)

   2. Size: Valve tags 2-inch diameter with 1/4-inch high letters.
   3. Material: Use 0.04-inch brass tags.
   4. Automatic Valves and Regulating Valves: Use 1/16-inch thick laminated 3-ply plastic, center ply white, outer ply red, lamicoid, or equal. Form letters by exposing center ply.

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5. Buildings Systems: Contact the Owner for coordination with existing building tagging system and supplementary information required for specific systems before valve tagging begins.

B. Valve Tag Directory: Include tag number, location, exposed or concealed, service, valve size, valve manufacturer, valve model number, and normal operating position of valve.

2.3 PIPING MARKERS

A. Label pipes with all-vinyl, semi-rigid plastic or strap-on labels.

B. For pipes O.D. smaller than 3/4-inch and for valve and fitting identification, use valve tag.

C. For sizes from 3/4 to 1-1/4-inch outside diameter, 1/2-inch letters, 8-inch marker width.

D. For sizes from 1-1/2 to 2-inch outside diameter, 3/4-inch letters, 8-inch marker width.

E. For sizes from 2-1/2 to 6-inch outside diameter, 1-1/4-inch letters, 12-inch marker width.

F. Identify and color-code pipe markers as follows with directional arrows.

PLUMBING SERVICE	PIPE MARKER*	BACKGROUND/TEXT COLOR
COLD WATER	DOMESTIC COLD WATER	GREEN/WHITE
HOT WATER	DOMESTIC HOT WATER SUPPLY	GREEN/WHITE
	DOM. HOT WATER RECIRC	GREEN/WHITE
SANITARY WASTE	SANITARY WASTE	GREEN/WHITE
VENT	VENT	GREEN/WHITE
* Directional arrow applied adjacent to pipe marker indicating direction of flow.		
** Provide custom marker labels for piping for which no standard manufactured marker is available. Submit sample for approval.		

2.4 EQUIPMENT IDENTIFICATION

A. Nameplates:
1. 1/16-inch thick, 3-inch by 5-inch laminated 3-ply plastic, center ply white, outer ply black. Form letters by exposing center ply.
2. Identify unit with code number as shown on Drawings and area served.

B. Equipment Nameplate Directory:
1. List pumps and other equipment nameplates.
2. Include Owner and Contractor furnished equipment.
3. List nameplate designation, manufacturer's model number, location of equipment, area served or function, disconnect location, and normal position of HOA switch.

PART 3 EXECUTION

3.1 VALVE IDENTIFICATION

A. Valve Tags:
1. Attach to valve with a brass chain.

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2. Continuous valve tag numbers throughout the building for each system. Obtain a list for each system involved from the Owner.

B. Valve Tag Directory: Post final copy in Operation and Maintenance Manual.

3.2 PIPING MARKERS

A. Unless recommendations of ANSI A13.1 are more stringent, apply labels or letters after completion of pipe cleaning, insulation, painting, or other similar work, as follows:
1. Every 20-feet along continuous exposed lines.
2. Every 10-feet along continuous concealed lines.
3. Adjacent to each valve, flange, and stub-out for future.
4. On pipe before and after wall, floor, and ceiling penetrations.
5. On pipe into and out of concealed spaces.
6. Adjacent to changes in pipe direction.
7. On each riser.
8. Adjacent to each leg of a T.
9. Locate conspicuously where visible. Position pipe labels on pipe to achieve the best visibility.
10. Provide pipe identification (over insulation) for reclaimed water systems in accordance with current local codes and rulings.
11. Apply labels or letters to lower quarters of the pipe on horizontal runs where view is not obstructed or on the upper quarters when pipe is normally viewed from above.

B. Apply arrow labels indicating direction of flow.

3.3 EQUIPMENT IDENTIFICATION

A. Nameplates: Attach to prominent area of equipment, either with sheet metal screws, brass chain, or contact cement as applicable.

B. Nameplate Directory: Post final copy in Operation and Maintenance Manual.

END OF SECTION

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SECTION 22 07 00

INSULATION FOR PLUMBING

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes:
   1. Pipe Insulation
   2. Pipe Acoustical Wrap
   3. Accessories Piping

1.2 RELATED SECTIONS

A. Division 01, General Requirements

B. Division 22, Plumbing

C. Section 22 05 29, Hangers, Supports and Anchors for Plumbing

1.3 QUALITY ASSURANCE

A. Regulatory Requirements:
   1. Insulating products prohibited from containing pentabrominated, octabrominated and decabrominated diphenyl ethers. Where products within this specification contain these banned substances, provide complying products from approved manufacturers with equal performance characteristics.
   2. Flame and Smoke Ratings: Installed composite flame spread not to exceed 25 and smoke developed not to exceed 50 as tested by UL 723 or ASTM E84.
   3. Energy Codes: Local Building and Energy Codes govern where insulation performance requirements for thickness exceeds thickness specified.

B. Protection: Protect against dirt, water, chemical, or mechanical damage before, during, and after installation. Repair or replace damaged insulation at no additional cost.

C. Source Quality Control:
   1. Service: Use insulation specifically manufactured for service specified.
   2. Labeling: Insulation labeled or stamped with brand name and number.
   3. Insulation and accessories not to provide nutritional or bodily use to fungi, bacteria, insects, rats, mice, or other vermin. Asbestos free and no interaction with corrosively with equipment, piping, or ductwork.

1.4 SUBMITTALS

A. Submit the following.
   1. Product Data: For each type including density, conductivity, thickness, jacket, vapor barrier, and flame spread and smoke developed indices.

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PART 2 PRODUCTS

2.1 MANUFACTURERS

A. General:
1. Johns Manville
2. Knauf
3. Owens Corning
4. CertainTeed
5. Such insulation by one manufacturer.
6. Other Manufacturers: Submit substitution request.

B. Pipe Insulation:
1. Fiberglass:
a. Johns Manville Microlok HP

2.2 PIPE INSULATION

A. Fiberglass: Split sectional or Snap-On type with 0.23 per inch maximum thermal conductivity (K-factor) at 75 degrees F mean temperature, 850 degrees F maximum service rating and white, vapor barrier jacket with pressure sensitive closure system.

2.3 ACCESSORIES PIPING

A. Adhesives:
1. General: Maximum Flame Spread/Smoke Developed Rating of 25/50, SCAQMD Rule 1168 compliant.
2. Fiberglass: Integral closure system.
3. Cements:
4. Insulating: Ryder.
5. Heat Transfer: Chemax Tracit-300.

B. Wire Mesh: 1-inch mesh with 20 gauge annealed steel wire.

C. Pipe Fitting Covers:
1. One piece PVC insulated pipe fitting covers.
2. Zeston, Ceel-Co.

D. Metal Pipe Jacket: 0.016-inch thick aluminum jacket with formed fitting covers, aluminum snap straps and sealant.

E. Cloth Facing: Presized fiberglass cloth.

F. Tapes:
1. Pressure sensitive, weather resistant, and for temperatures up to 150 degrees F.
2. Zeston Z-tape.

G. Paint: Ultraviolet resistant latex paint with special adherence capabilities to the PVC fitting covers, elastomeric, aluminum facing, Kraft paper, tapes, and adhesives.

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PART 3 EXECUTION

3.1 GENERAL

A. Workmanship:
1. Installation: Insulation installed in first class, neat professional manner.
2. Applicators: Employed by firm that specializes in insulation work.

B. Preparation: Surfaces of piping and equipment clean, free of oil or dirt, and dry before insulation is applied.

C. Stamps: ASME stamps, UL labels, and similar stamps and labels are not covered.

3.2 PLUMBING PIPE AND EQUIPMENT INSULATION APPLIED LOCATIONS

A. Insulation Applied Locations – Plumbing Piping:

System	Pipe Size	Insulation Type	Insulation Thickness
Domestic Cold Water, Above Grade	1-1/4-inch and smaller	Fiberglass, all-purpose jacket	1-inch
Domestic Cold Water, Above Grade	Above 1-1/4-inch	Fiberglass, all-purpose jacket	1 1/2-inch
Domestic Hot Water Supply/Return, Above Grade	1-1/2-inch and smaller	Fiberglass, all-purpose jacket	1 1/2-inch
Domestic Hot Water Supply/Return, Above Grade	Above 1-1/2-inch	Fiberglass, all-purpose jacket	2-inch

B. The following piping is not insulated:
1. Waste and vent.
2. Domestic cold water runouts to single fixture less than 12-inch long and exposed supplies.
3. Priming lines except where heat traced.

C. Insulation include the following:
1. Fittings
2. Valve Bodies
3. Insulate valves and irregular fittings with section of pipe insulation and insulating cement, securely fastened, and finished with 6 oz. canvas and Foster 30-36 lagging adhesive.

D. Flanges, valves, strainers, not requiring a vapor barrier to insulate with removable replaceable pads fabricated of 1-inch layer of Pittsburgh Corning Temp Mat sandwiched between inner and outer layer of 8 oz. glass cloth held together with stainless staples with sufficient stainless lacing hooks to hold pad firmly to flange or valve with minimum 3-inch overlap onto adjacent pipe insulation using 18 gauge SS lacing wire.

3.3 PIPING INSTALLATION

A. General:
1. Joints: Coat both sides of complete joining area with applicable adhesive.
a. Longitudinal Joints: Make joints on top or back of pipe to minimize visibility. Except foam plastic, seal with closure system or 3-inch wide tape.

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b. Butt Joints: Butt lightly together and, except for foam plastic, seal with 3-inch wide tape or butt straps.
c. Multiple Layered Insulation: Joints staggered.

2. Access: Strainer and other items requiring service or maintenance with easily removable and replaceable section of insulation to provide access.
3. Voids:
   a. Fill voids, chipped corners and other openings with insulating cement or material compatible with insulating material.
   b. In insulation with heat tracing where piping is shown or specified to be heat traced, bed heat tape into heat transfer cement with insulation over heat tape and cement.
4. Seal joints, seams, and fittings of metal watertight jackets at exterior locations.

B. Fiberglass Insulation: Exterior insulation encased in metal jacket.

C. Fittings: Insulation specified with continuous vapor barrier, the vapor barrier must not be violated.
1. On Elastomeric Insulation: Fittings covered with covers made up of mitered sections of insulation or with formed pipe fitting covers.
2. In Other Insulation: Fittings covered with insulation to the same level of the adjoining insulation or fill with insulating cement. Finish with pipe fitting covers or cloth facing and tape.

D. Unions, Mechanical Joints, Valves, Etc.:
1. General:
   a. As specified for fittings.
   b. Minimum thickness same as specified for piping.
2. Unions: Build up insulation at least 1/2-inch beyond adjoining insulation.
3. Flanges: With square corners. Where flanges are not insulated, terminate adjacent insulation so flange bolts can be removed.
4. Flanged Valves: Insulation with square corners.

E. Vapor Barrier Insulation:
1. Refer to Section 22 05 29, Hangers, Supports, and Anchors for Plumbing for support requirements.
2. Piping which requires vapor barrier protection of continuous vapor barrier, which may not be pierced or broken. The following piping systems require vapor barrier protection:
   a. Domestic cold water.
   b. Other piping systems with a nominal operating temperature below 65 degrees F.
3. Vapor Barrier Insulation:
   a. Insulation for pipe requiring vapor barrier protection 1-1/4-inch or smaller, insulation continuous through pipe hangers and rollers.
   b. For pipe 1-1/2-inch and larger, 18-inch section of calcium silicate, same thickness as pipe insulation with continuous vapor barrier jacket at each hanger or roller. Provide pipe shield specified in Section 22 05 29, Hangers, Supports, and Anchors for Plumbing.

F. Non-Vapor Barrier Insulation:
1. Refer to Section 22 05 29, Hangers, Supports, and Anchors for Plumbing for support requirements.
2. At contractor's option, insulation may be interrupted at supports. Butt insulation tight to support.
3. If contractor elects to continue insulation at supports, installation as specified for piping systems with vapor barrier installation.
4. Void between saddle and pipe filled with insulation.

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G. Acoustical Wrap:
   1. Install in accordance with the manufacturer's instructions.
   2. Applied locations for piping systems where specified or indicated on drawings.

3.4 EQUIPMENT INSTALLATION

A. General: Install true and smooth. Insulation over curved surfaces conform to curves of surface.
   1. Access:
      a. Insulated removable heads, water boxes, pump casings, access, etc., that require service, inspection or maintenance provided with covers or section that are easily removable and replaceable.
      b. Reinforce openings in adjacent insulation with metal beading. In vapor barriered insulation, coat joints with vapor barrier mastic.
   2. Voids, Depressions and Cavities: Fill voids, chipped corners, and other openings with insulating cement or material compatible with insulating material.
   3. Vapor Barrier Insulation: Barrier not to be pierced or broken.
      a. Coat defects with vapor barrier mastic and patched with insulation facing or tape.
      b. Staples brush coated with vapor barrier coating.
      c. Cover raw edges coated with vapor barrier mastic sealed to equipment surface.
   4. Non-Vapor Barriered Insulation:
      a. Patch tears with insulation facing or tape.
      b. Cover and neatly bevel raw edges to equipment surface.
   5. Multilayered Insulation: With staggered joints.

3.5 FIELD QUALITY CONTROL

A. Field Test: Test and approve systems prior to installation of insulation.

B. Existing Insulation:
   1. Repair existing insulation damaged during construction.
   2. Make neat connections where new and existing insulation meet.
   3. Where existing piping, or equipment is removed, cover existing surfaces neatly to match existing.

END OF SECTION

SECTION 22 21 13

PIPE AND PIPE FITTINGS PLUMBING

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes:
   1. Cast Iron Soil Pipe, Service Weight (No-Hub)
   2. Copper Pipe
   3. Unions
   4. Solder and Brazing
   5. Related Sections

B. Division 01, General Requirements

C. Division 22, Plumbing

D. Section 22 05 29, Hangers, Supports, and Anchors for Plumbing

E. Section 22 05 23, General Duty Valves for Plumbing

1.2 QUALITY ASSURANCE

A. Regulatory Requirements:
   1. Piping material and installation to meet requirements of the local plumbing, fire, and building codes and serving utility requirements.
   2. Provide chlorination of domestic cold and hot water piping in accordance with County and State health requirements.

B. Pipe Cleaning: If pipe gets plugged or should foaming of water systems occur, disconnect piping, reclean, and reconnect without additional expense to the Owner.

C. Correct damages to the building or systems resulting from failure to properly clean the system without additional expense to the Owner.

D. Products with a wetted surface installed in potable water systems UL classified in accordance with ANSI / NSF-61 for Drinking Water System components, ANSI/NSF-14 for Plastic Piping System Components and certified to the low lead requirements of NSF-372.

1.3 SUBMITTALS

A. Submit the following:
   1. List of piping materials indicating the service it is being used for. (Do not submit piping product data).
   2. Product data on mechanical couplings and related components, double wall fuel oil pipe and fittings, and polypropylene waste and vent pipe.

B. Test Reports and Certificates: Submit certificates of inspections and pipe tests to Owner.

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C. Other: Make certified welders' certificates available.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. As indicated.

2.2 CAST IRON SOIL PIPE, SERVICE WEIGHT (NO-HUB)

A. General: A code approved hubless system conforming to Cast Iron Soil Pipe Institute Standard 301.

B. Pipe and Fittings:
1. Service weight hubless cast iron conforming to ASTM A 888, marked with the collective trademark of the Cast Iron Soil Pipe Institute (CISPI) and listed by NSF International.
2. Manufacturers:
   a. Tyler
   b. AB&I
   c. Charlotte

C. Gaskets: Compression type conforming to ASTM C 564.

D. Above Grade Couplings: Band type coupling in conformance with Cast Iron Soil Pipe Institute (CISPI) 310-90, consisting of stainless steel clamp, and corrugated shield assemblies with a neoprene sealing sleeve ANSI A21.6, ANSI A21.10 Fittings.
1. Buried: Husky 28 gauge 304 stainless steel hubless type clamp and orange corrugated shield assemblies (80-inch pound torque) with neoprene sealing gaskets (ASTM-C-564), or Clamp-All (125-inch pound torque), 24 gauge 304 stainless steel hubless type clamp, and shield assemblies with neoprene sealing gaskets (ASTM-C-564).
2. Service:
   a. Sanitary, storm, and overflow drain.
   b. Vent piping 2 inches and above.

2.3 COPPER PIPE

A. Pipe: Hard drawn copper tubing, Class L or K, ASTM B 88.

B. Fittings:
1. Wrought copper, 150 psi; ANSI B16.22 for soldered joints, ANSI B16.50 for brazed joints; Chase, Revere, Mueller or approved equal.
2. System using mechanically extracted collars in main with branch line inserted to not obstruct flow may be used on domestic water piping above ground, similar to T-drill.

C. Service:
1. Domestic hot and cold water piping above ground (Type L, hard drawn) on piping 4 inches and smaller.
2. Trap priming lines (Type L, annealed).
3. Miscellaneous drains and overflows.

2.4 UNIONS

A. 150 psi malleable iron, brass to iron seat, ground joint, black or galvanized to match pipe. 200 psi WOG bronze, ground joint, solder type for copper tubing.
   1. Unions or flanges for servicing or disconnect are not required in installations using grooved mechanical joint couplings. Couplings serve as disconnect points.

B. Dielectric fittings nationally listed, have a dielectric thermoplastic interior lining, and meet requirements of ASTM F1545. Fittings suitable for the pressure and temperature to be encountered.

2.5 SOLDER AND BRAZING

A. Brazed Joints:
   1. Wrought Copper Piping Fittings: Westinghouse Phos-Copper or Dyna-Flow by J.W. Harris Co., Inc.
   2. Applied locations:
      a. Above grade piping larger than 2-inches for the following services: Domestic hot and cold water.
      b. Joints in Domestic Hot and Cold Water Piping: Use mechanically extracted collars. Braze in accordance with Copper Development Association Copper Tube Handbook using BCUP series filler material.
      c. Soldered Joints:
   3. Wrought Copper Pipe Fittings: All-State 430 with Duzall Flux, Engelhard Silvabrite with Engelhard General Purpose Flux or J.W. Harris Co.
   4. Valves, Cast Fittings or Bronze Fittings: Harris Stay-Silv-15 or Handy & Harmon Sil-Fos.
   5. Applied locations: Above grade piping 2-inch and smaller for the following services: Industrial cold water, domestic hot and cold water, pumped waste, trap priming lines.

PART 3 EXECUTION

3.1 PREPARATION

A. Measurements, Lines and Levels:
   1. Check dimension at the building site and establish lines and levels for work specified in this Section.
   2. Establish inverts, slopes, and manhole elevations by instrument, working from an established datum point. Provide elevation markers for use in determining slopes and elevations in accordance with Drawings and Specifications.
   3. Use established grid and area lines for locating trenches in relation to building and boundaries.

3.2 EXCAVATION AND BACKFILL

A. General:
   1. Perform necessary excavation and backfill required for the installation of mechanical work in accord with Division 02, Existing Conditions
   2. Repair pipelines or other work damaged during excavation and backfilling.

B. Excavation:
   1. Excavate trenches to the necessary depth and width, removing rocks, roots, and stumps.
   2. Include additional excavation to facilitate utility crossovers, additional offsets, etc.
   3. Excavation material is unclassified. Width of trench adequate for proper installation of piping.
   4. Widen trench if not wide enough for a proper installation.

C. Bedding:
   1. Cast iron, steel, and copper piping full bedded on sand.
   2. Place a minimum 4-inch deep layer on the leveled trench bottom for this purpose.
   3. Remove the sand to the necessary depth for piping bells and couplings to maintain contact of the pipe on the sand for its entire length.
   4. Lay other piping on a smooth level trench bottom so that contact is made for its entire length.

D. Backfill:
   1. Place in layers not exceeding 8 inches deep, and compact to 95 percent of standard proctor maximum density at optimum moisture content.
   2. Earth backfill free of rocks over 2 inches in diameter and foreign matter.
   3. Disposal of excess material as directed.
      a. Interior: Backfill under interior slabs bank sand or pea gravel.
      b. Exterior:
         1) Excavated material may be used outside of buildings at the Contractor's option.
         2) First 4-inches sand, and final 12-inch layer course soil.

3.3 PIPING INSTALLATION

A. Install unions in non-flanged piping connections to apparatus and adjacent to screwed control valves, traps, and appurtenances requiring removal for servicing so located that piping may be disconnected without disturbing the general system.

B. Install piping as to vent and drain. Install according to manufacturer's recommendations.

C. Support piping independently at apparatus so that its weight not carried by the equipment.

D. Run piping clear of tube cleaning or removal/replacement access area on heat exchangers, water heaters, etc.

E. Dielectric Fittings:
   1. Provide dielectric couplings, unions, or flanges between dissimilar metals.
   2. Provide dielectric couplings as required to isolate cathodically protected piping and equipment.

F. No-Hub Couplings: Install per manufacturer's instructions.

3.4 PIPING JOINTS

A. Pipe and fittings joined using methods and materials recommended by manufacturer in conformance with standard practice and applicable codes. Cleaning, cutting, reaming, grooving, etc. done with proper tools and equipment. Hacksaw pipe cutting prohibited. Peening of welds to stop leaks not permitted.

B. Copper Piping:
   1. Pipe cut evenly with cutter, ream to full inside diameter; end of pipe and inside of fitting thoroughly cleaned and polished.
   2. Joints uniformly heated, and capillary space completely filled with solder or braze material, leaving full bead around entire circumference.

C. No couplings installed in floor or wall sleeves.

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D. Above Grade No-Hub Couplings: Install in accordance with manufacturer recommendations.

3.5 ADJUSTING AND CLEANING

A. General:
1. Clean interior of piping before installation.
2. Flush sediment out of piping systems after installation before connecting plumbing fixtures to the piping.
3. Clean strainers prior to placing in service.

END OF SECTION

SECTION 22 40 00

PLUMBING FIXTURES

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes:
   1. Fixture Trim
   2. Plumbing Fixtures
   3. Drainage Products
   4. related sections

B. Division 01, General Requirements

C. Division 22, Plumbing

1.2 QUALITY ASSURANCE

A. Water Closets: Maximum Performance (MaP) score of no less than 800

B. Faucets: Certify to NSF/ANSI 61 and California AB1953

C. Electric Water Coolers and Drinking Fountains: Certified to NSF/ANSI 61 and California AB1953

D. SUBMITTALS

E. Submit the following:
   1. Product data for each item specified.
   2. Operating and Maintenance Data:
      a. Mounting heights for fixtures.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers are stated for each fixture specified. The following manufacturers are also acceptable, except when indicated only.

B. Fixture Trim:
   1. Supply Stops:
      a. Chicago
      b. NPT McGuire (LK series)
      c. Brasscraft (SCR series)
   2. Traps:
      a. McGuire
      b. Kenney
      c. Brasscraft

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3. Support Rims:
    a. Hudee
4. Vacuum Breakers:
    a. Chicago Faucet
    b. A.W. Cash
    c. Febco, chrome plated

C. Drainage Products and Carrier Products:
1. J.R. Smith
2. Josam
3. Sioux Chief
4. Zurn
5. Wade
6. Watts Drainage
7. Woodford
8. Mifab

D. Fixtures:
1. American Standard
2. Kohler
3. Sloan
4. Toto

E. Seats:
1. Olsonite
2. Church
3. Beneke
4. Bemis

F. Mixing Valves:
1. Powers
2. Leonard
3. Symmons
4. Chicago

G. Faucets:
1. Chicago
2. Delta Commercial
3. Kohler
4. Symmons
5. Moen Commercial

H. Flush Valves:
1. Sloan
2. Zurn

I. Shock Arrestors:
1. PPP
2. J.R. Smith

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J. Trap Primer Stations:
   1. PPP

K. Exposed Waste and Supply Piping Insulation Kits:
   1. Truebro
   2. McGuire

L. Other Manufacturers: Submit substitution request.

2.2 FIXTURE TRIM

A. Supply Stops: Chicago cast brass rigid riser supplies with loose key angle stops, wall flanges, NPT female inlet, chrome plate finish; equivalent NPT McGuire (LK series), Brasscraft (SCR series), or NPT stops by fixture supplier.

B. Traps:
   1. For floor drains, provide coated cast iron P-trap; recessed, screw jointed or bell and spigot.
   2. For other fixtures, provide 17 gauge, chrome plated cast brass P-Traps with solder bushings, and clean-out.

C. Support Rims: Hudee stainless steel rims, if sink not furnished with integral rim.

D. Vacuum Breakers:
   1. Chicago Faucet
   2. A.W. Cash
   3. Febco, chrome plated

2.3 PLUMBING FIXTURES

A. WC-1 Water Closet:
   1. Kohler Kingston, vitreous china, wall hung, elongated bowl, siphon jet action, 1-1/2-inch top spud, white color finish.
   2. Complete with Sloan Royal manual flush valve with dual filtered fixed bypass diaphragm. (1.28 GPF).
   3. Bemis 1600 series white open-front seat, less cover with external check hinge including 300 series stainless steel post and pintles to stop seat at 11 degrees beyond vertical.
   4. J.R. Smith Series 200 chair carrier.

B. WC-2 Water Closet (ADA): Same at WC-1, except mounted at ADA mounting height.

C. U-1 Urinal:
   1. Kohler Bardon, vitreous china, wall mounted wash down urinal with ¾-inch top spud, white color finish.
   2. Complete with Sloan Royal manual flush valve with dual filtered fixed bypass diaphragm. (0.5 GPF)
   3. J. R. Smith Series 600 floor mounted urinal support.

D. U-2 Urinal: Same as U-1, except mounted with rim at ADA mounting height.

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E. L-1 Lavatory (Commercial - ADA):
   1. Kohler Kingston 21-1/4-inch by 18-1/8-inch, vitreous china, self-draining deck, backsplash, 4-inch centers, wall hung, concealed arm support, grid drain, white color finish. Holes as required for faucet.
   2. Chicago 802-V665ABCP faucet with polished chrome plated solid brass body construction, 4-inch spout, vandal proof metering push handles, 2.2 gpm pressure compensating aerator, adjustable cycle time closure cartridge, vandal resistant complete.

F. WS-1 Wash Station (ADA):
   1. Bradley, Model MG series, 2 station, wall-hung, equipped with Chicago 802-V665ABCP faucets with polished chrome plated solid brass body construction, 4-inch spout, vandal proof metering push handles, 2.2 gpm pressure compensating aerator, adjustable cycle time closure cartridge, vandal resistant complete.
   2. Mixing Valve (Point-of-Use):
   3. Leonard 270 series thermostatic point-of-use mixing valve.
   4. ASSE 1070 certified.
   5. Bronze body.
   6. Locked temperature adjustment cap (vandal resistant).
   7. Integral check valves on hot and cold inlets.
   8. Minimum flow 0.5 GPM.
   9. Maximum flow 3.5 GPM at 5 PSI loss.

G. Exposed Waste and Supply Piping Insulation Kits: McGuire Prowrap insulation kit for exposed supplies and waste piping below ADA lavatories and ADA sinks.

2.4 DRAINAGE PRODUCTS

A. FD-1 Floor Drain: J.R. Smith 2005 Series, round nickel bronze vandal resistant grate, cast iron body with flashing collar and adjustable strainer head and no-hub outlet.

B. WCO Wall Cleanout: J.R. Smith 4530 Series, round stainless steel vandal resistant cover and screw.

C. FCO Floor Cleanout: J.R. Smith 4020 Series, round vandal resistant, nickel bronze top.

D. Trap Priming Valves:
   1. Precision Plumbing Products Prime-time electronic trap priming manifold including but not limited to: atmospheric vacuum breaker, pre-set 24 hour clock, manual over ride, 120V slow closing solenoid valve, calibrated manifold for equal water distribution.
   2. Components pre-installed in recessed steel cabinet with SS access door.

E. Water Hammer Arrester: Precision Plumbing Products Model SC (Maintenance-Free).

PART 3 EXECUTION

3.1 FIXTURE TRIM

A. Provide plumbing fixture trim where applicable on fixtures, including but not limited to supply stops, traps, support rims, flush valve, and vacuum breakers.

B. Provide rough-in and final piping connection to fixtures. Carefully review all construction documents to assure that all fixtures are provided with necessary services for a complete operating system.

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C. Rigidly secure rough-in piping, carriers and supports, and other service piping to structure.

3.2 PLUMBING FIXTURES

A. Americans with Disabilities Act:
   1. Those fixtures indicated by ADA complies with and be installed in accordance with Americans with Disabilities Act Guidelines (ADAAG). Where applicable building code requirements are more stringent than ADAAG guidelines, building code requirements followed.
   2. Water Closets:
      a. Mounting height of ADA water closet 17-inches to 19-inches from floor to top of the toilet seat.
      b. Mount flush valve for ADA water closets on wide side of enclosure.
   3. Lavatories:
      a. Mounting height of ADA lavatories at a maximum height of 34 inches from floor to rim.
      b. Provide insulation kits on exposed hot water and waste piping beneath ADA lavatories.
   4. Urinals: Mounting height of ADA water closet at a maximum height of 17-inches from floor to top rim.

B. Fixture Mounting Heights: Fixtures standard rough-in catalogued heights unless shown otherwise on the Architectural Drawings.

C. Water Supplies: When both hot and cold water to a fixture is required, connect the hot on the left and the cold on the right.

D. Floor Mounted Supports and Chair Carriers:
   1. Secure floor mounted supports and chair carriers to slab with a minimum of 1/2-inch bolts.
   2. Install supports and carriers per manufacturer's installation instructions.

E. Lavatories:
   1. Public Toilet Room: Grid strainers.
   2. Private Toilet Room: Pop-up waste assemblies.
   3. Those lavatories indicated as ADA are ADA compatible. Coordinate with Architect to verify if all wall hung lavatories are to be installed at ADA height.

F. Floor Drain and Floor Sinks:
   1. Set top flush with finished floor.
   2. Provide flashing clamp for all drain bodies installed in floors provided with waterproof membranes.

G. Cleanout:
   1. Where shown or required.
   2. Cover set flush with finished surface.

H. Water Hammer Arresters: Provide where shown and where recommended by Plumbing Drainage Institute (PDI).

I. Mixing Valves: Provide piping connections per manufacturer's installation instructions.

J. Wall hung lavatories with pop-up waste assemblies: Verify there is no vertical pull rod assembly conflict with lavatory backsplash prior to submitting product data.

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3.3 PRIMING VALVES

A. All floor drains, floor sinks, and similar traps primed. Use minimum 3/8-inch type K annealed copper tubing. Primer line to be continuous and without joints.

B. Where priming valves are installed in finished rooms, conceal in wall and provide access panel.

C. Coordinate locations of electronic trap primer stations with electrical contractor for 120V service.

END OF SECTION

SECTION 23 05 00

COMMON WORK RESULTS FOR HVAC

PART 1 GENERAL

1.1 SUMMARY

A. The intent of Division 23, HVAC Specifications and the accompanying Drawings is to provide a complete and workable facility with complete systems as shown, specified and required by applicable codes. Include work specified in Division 23, HVAC and shown on the accompanying Drawings, including appurtenances, connections, etc., in the finished job.

B. The Drawings that accompany the Division 23, HVAC Specifications are diagrammatic. They do not show every offset, bend, tee, or elbow which may be required to install work in the space provided and avoid conflicts. Offsets and transitions assumed at a minimum at each duct crossing, structural penetrations through shear walls or beams, structural grids where ceiling heights are restricted, and at piping mains. Follow the Drawing as closely as is practical to do so and install additional bends, offsets and elbows where required by local conditions from measurements taken at the Building, subject to approval, and without additional cost to the Owner. The right is reserved to make any reasonable changes in outlet location prior to roughing-in, without cost impact.

C. The General and Supplemental Conditions apply to this Division, including but not limited to:
   1. Drawings and specifications.
   2. Public ordinances, permits.
   3. Include payments and fees required by governing authorities for work of this Division.

D. Division 01, General Requirements, General Requirements, applies to this Division.

1.2 RELATED SECTIONS

A. Division 01, General Requirements

B. Division 23, Heating, Ventilating, and Air Conditioning (HVAC)

1.3 QUALITY ASSURANCE

A. Regulatory Requirements:
   1. Products and equipment prohibited from containing pentabrominated, octabrominated, and decabrominated diphenyl ethers. Where products or equipment within this specification contain these banned substances, provide complying products and equipment from approved manufacturers with equal performance characteristics.
   2. General: Work and materials conforms to the local and State codes, and Federal, State and other applicable laws and regulations.
   3. Contractor responsible for obtaining and payment for permits, licenses, and inspection certificates required in accordance with provisions of Contract Documents.

B. New materials and equipment. Work of good quality, free of faults and defects and in conformance with the Contract Documents.

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C. Apparatus built and installed to deliver its full rated capacity at the efficiency for which it was designed.

D. The entire mechanical system and apparatus operates at full capacity without objectionable noise or vibration.

E. Install equipment level and true. Housekeeping pads and curbs account for floor or roof slope.

F. Materials and Equipment:
1. Each piece of equipment furnished meet detailed requirements of the Drawings and Specifications and suitable for the installation shown. Equipment not meeting requirements will not be acceptable, even though specified by name along with other manufacturers.
2. Where two or more units of the same class of equipment are furnished, use products of the same manufacturer. Component parts of the entire system need not be products of same manufacturer.
3. Furnish materials and equipment of size, make, type, and quality herein specified.
4. Equipment scheduled by performance or model number considered the basis of the design. If other specified manufacturer's equipment is provided in lieu of the basis of design equipment the contractor is responsible for changes and costs which may be necessary to accommodate this equipment, including different sizes and locations for connections, different electrical characteristics, different dimensions, different access requirements, or any other differences which impact the project.

G. Workmanship:
1. General: Install materials in a neat and professional manner.
2. Manufacturer's Instructions:
   a. Follow manufacturer's directions where they cover points not specifically indicated.
   b. If conflict with the Drawings and Division 23, HVAC Specifications, obtain clarification before starting work.

H. Cutting and Patching:
1. Cutting, patching, and repairing for the proper installation and completion of the work specified in this Division including plastering, masonry work, concrete work, carpentry work, and painting performed by skilled craftsmen of each respective trade in conformance with the appropriate Division of Work.
2. Additional openings required in building construction made by drilling or cutting. Use of jackhammer is specifically prohibited.
3. Fill holes which are cut oversize so that a tight fit is obtained around the sleeves passing through.
4. Do no pierce beams or columns without permission of Architect and then only as directed.
5. Restore new or existing work cut or damaged to its original condition. Where alterations disturb lawns, paving, walks, etc., surfaces repaired, refinished, and left in condition existing prior to commencement of work.

1.4 SUBMITTALS

A. Shop Drawings:
1. The Contract Drawings indicate the general layout of the piping, ductwork, and various items of equipment. Coordination with other trades and with field conditions will be required. For this purpose, prepare Shop Drawings of piping, ductwork, and equipment installations. Shop Drawings new drawings prepared by Contractor and not reproductions or tracings of Architect's Drawings. Overlay drawings with shop drawings of other trades and check for conflicts. Drawings the same size as Architect's Drawings with title block similar to Contract Drawings and identifying Architect's

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Drawing number or any reference drawings. Drawings fully dimensioned including both plan and elevation dimensions. Shop drawings cannot be used to make scope changes.

2. Prepare in two-dimensional format.
3. Include but are not limited to:
    a. Complete floor plans with sheet metal and HVAC piping to a minimum of 1/4-inch equals 1-foot scale.
    b. Sheet metal and HVAC piping of mechanical and fan rooms to a minimum of 1/2-inch equals 1-foot scale.
    c. Sections of congested areas to a minimum of 1/2-inch equals 1-foot scale.
    d. Controls and Instrumentation: Scale and drawing sizes to suit controls supplier.
    e. Fabricated Equipment: Scale and drawing sizes to suit contractor except equipment not less than 1/4-inch equals 1-foot scale.
    f. Beam penetration drawings indicating beam penetrations meeting the requirements indicated on the floor plans and on the structural drawings to a minimum of 1/4-inch equals 1-foot scale.
    g. Slab penetration drawings of HVAC, plumbing, sprinklers, lighting and electrical to a minimum of 1/4-inch equals 1-foot scale.
    h. Submit shop drawings for review prior to beginning fabrication. Additional shop drawings may be requested when it appears that coordination issues are not being resolved in the field or when there is a question as to whether contract documents are being complied with or the design intent is being met.

B. Product Data:
1. In general, submit product data for review on scheduled pieces of equipment, on equipment requiring electrical connections or connections by other trades, and as required by each specification section or by Drawing notes. Include manufacturer's detailed shop drawings, specifications, and data sheets. Data sheets include capacities, RPM, BHP, pressure drop, design and operating pressures, temperatures, and similar data. Manufacturer's abbreviations or codes are not acceptable.
2. List the name of the motor manufacturer and service factor for each piece of equipment.
3. Indicate equipment operating weights including bases and weight distribution at support points.
4. In the case of equipment such as wiring devices, time switches, valves, etc., specified by specific catalog number, a statement of conformance will suffice.

C. Submission Requirements:
1. Shop Drawings and Product Data:
    a. Refer to Division 01, General Requirements for additional requirements related to submittals.
    b. Submit electronic copies of shop drawings and product data for Work of Division 23, HVAC in PDF format with each item filed under a folder and labeled with its respective specification section number, Article and paragraph and mark if applicable.
    c. Include a complete index in the original submittal. Indicate both original items submitted and note stragglers that will be submitted at a later date to avoid delay in submitting.
    d. The bulk of the shop drawings and product data, excepting Controls and Instrumentation, included with the original submittal. Controls and Instrumentation submittals may lag but complete when submitted. Partial submittals will not be accepted. Other stragglers submitted after return of the original binder includes a tab similar to that originally submitted. Upon receipt of the returned late submittal, insert them in the previously submitted binder.

D. Contractor Responsibilities:
1. Submit submittals one time and are in proper order.
2. Ensure that equipment will fit in the space provided.
3. Assure that deviations from Drawings and Specifications are specifically noted in the submittals. Failure to comply will void review automatically.

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1.5 AS-BUILT DRAWINGS

A. Record Drawings: Provide hard copies and pdf format.
   1. Drawings include the following:
      a. Project Specific Titleblock.
      b. Notations reflecting the as built conditions of any additions to or variations from the construction documents provided as part of the BIM coordination, RFIs, ASIs, Owner Changes, and Field Coordination.

1.6 OPERATING AND MAINTENANCE MANUAL, PARTS LISTS, AND OWNER'S INSTRUCTIONS

A. Refer to Division 01, General Requirements for additional requirements.

B. Submit three bound copies of manufacturer's operation and maintenance instruction manuals and parts lists for each piece of equipment or item requiring servicing. Literature on 8-1/2-inch by 11-inch sheets or catalogs suitable for side binding. Submit data when the work is substantially complete, packaged separately, and clearly identified in durable 3-ring binder. Include name and contact information for location of source parts and service for each piece of equipment. Clearly mark and label in each submittal, the piece of equipment provided with the proper nameplate and model number identified. Provide wiring diagrams for electrically powered equipment.

C. Instruct Owner thoroughly in proper operation of equipment and systems, in accordance with manufacturer's instruction manuals. Operating instructions cover phases of control.

1.7 PROJECT CONDITIONS

A. Existing Conditions:
   1. Prior to bidding, verify and become familiar with existing conditions by visiting the site, and include factors which may affect the execution of this Work.
   2. Include related costs in the initial bid proposal.

B. Coordinate exact requirements governed by actual job conditions. Check information and report discrepancies before fabricating work. Report changes in time to avoid unnecessary work.

C. Coordinate shutdown and start-up of existing, temporary, and new systems and utilities. Notify Owner, the City, and Utility Company.

1.8 WARRANTY

A. Provide a written guaranty covering the work of this Division (for a period of one calendar year from the date of acceptance by the Owner) as required by the General Conditions.

B. Provide manufacturer's written warranties for material and equipment furnished under this Division insuring parts and labor for a period of one year from the date of Owner acceptance of Work of this Division.

C. Correct warranty items promptly upon notification.

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1.9 TEST REPORTS AND CERTIFICATES

A. Submit one copy of test reports and certificates specified herein to the Architect.

1.10 SUBSTITUTIONS

A. Submit requests for product substitutions in accordance with the Instructions to Bidders and the General and Supplemental Conditions.

PART 2 PRODUCTS

2.1 ACCESS PANELS

A. Furnish under this Division as specified in another Division of work.

2.2 PIPE AND DUCT SLEEVES

A. Interior Wall and Floor Sleeves: 18 gauge galvanized steel, or another pre-approved system.

B. FLOOR, WALL AND CEILING PLATES

C. Furnish stamped split type plates as follows:
   1. Floor Plates: Cast brass, chromium plated.
   2. Wall and Ceiling Plates: Spun aluminum.

2.3 MACHINERY GUARDS

A. Furnish guards for protection on rotating and moving parts of equipment. Provide guards for metal fan drives and motor pulleys, regardless of being enclosed in a metal cabinet.

B. Design guards so as not to restrict air flow at fan inlets resulting in reduced capacity.

C. Provide shaft holes in guards for easy use of tachometers at pulley centers. Guards easily removable for pulley adjustment or removal and changing of belts.

D. Guards meet OSHA requirements including back plates.

E. Provide inlet and outlet screens on fans in plenums or where exposed to personnel.

2.4 ELECTRICAL EQUIPMENT

A. General: Equipment and installed work as specified under Division 26, Electrical.

B. Coordinate with the electrical Drawings and electrical contractor for minimum electrical equipment bracing requirements based on the available fault current rating at the bus of the panelboard or switchboard serving the piece of equipment. Provide equipment with a Short Circuit Current Rating (SCCR) that meets the bracing requirement.

C. Motors – AC Induction:
1. Furnish as integral part of driven equipment.
2. Drip proof induction type with ball bearings unless noted otherwise.
3. Motors 1 hp and above premium energy efficient type, except for emergency equipment motors.
4. Built to NEMA Standards for the service intended.
5. Rated for voltage specified, suitable for operation within the range of 10 percent above to 10 percent below the specified voltage.
6. Energy Efficient Motors:
   a. Baldor
   b. Westinghouse
   c. General Electric
   d. Or approved equal.
7. Motors meet the efficiency standards identified in the table below as determined using the IEEE Method B test at full load.

MINIMUM MOTOR EFFICIENCIES					
		RPM IEEE 112B Efficiency			
HP	KW	900	1200	1800	3600
1	0.75	--	82.5	85.5	80.0
1.5	1.15	--	86.5	86.5	85.5
2	1.53	--	87.5	86.5	86.5
3	2.3	84.0	89.5	89.5	88.5
5	3.8	85.5	89.5	89.5	89.5

8. Refer to Equipment Schedules on the Drawings for motor horsepower, voltage, and phase.
9. Refer to individual product sections for additional motor requirements.
10. Furnish motors on belt drive equipment of nominal nameplate horsepower not less than 120 percent of equipment brake horsepower required for performance specified.
11. Built-in thermal overload protection, or be protected externally with separate thermal overload devices with low voltage release or lockout. Hermetically sealed motors have quick trip devices.
12. Motors controlled by variable frequency drives inverter duty rated and have Class F insulation or better. Withstand repeated voltage peaks of 1600V with rise times of 0.1 microseconds and greater in accordance with NEMA Standard MG1 Part 31.
13. Motors served from variable frequency drives equipped with shaft grounding system which provide a path for current to flow between the shaft and motor frame. SGS or equal.
14. Motors located in environment air plenums not tied to air handling functions totally enclosed type motors.
15. Motors – Electronic Commutation (EC):
16. Furnished as integral part of driven equipment.
17. Permanently lubricated with ball bearings unless noted otherwise.
18. Internal motor circuitry converts AC power supplied to the motor to DC power to operate the motor.
19. Speed controllable down to 20 percent of full speed.
20. Motor efficiency at a minimum of 85 percent at all speeds.
21. Refer to Equipment Schedules on the Drawings for motor horsepower, voltage, and phase.
22. Refer to individual product sections for additional motor requirements.
23. Built-in thermal overload protection, or be protected externally with separate thermal overload devices with low voltage release or lockout. Quick trip devices hermetically sealed motors.
24. Starters: Provided under Division 26, Electrical, suitable for performing the control functions required, with the exception of self-contained equipment and where the starters are furnished as part of the control package.

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D. Equipment Wiring:
   1. Interconnecting wiring within or on a piece of mechanical equipment provided with the equipment unless shown otherwise.
   2. This does not include the wiring of motors, starters and controllers provided under Division 26, Electrical.

E. Control Wiring: Control wiring for mechanical equipment provided under Section 23 09 00, Instrumentation and Controls for HVAC.

F. Codes: Electrical equipment and products bear the UL label as required by governing codes and ordinances.

PART 3 EXECUTION

3.1 ACCESS PANELS

A. Install in accord with manufacturer's recommendations, coordinated with architectural features.

B. Provide 2-hour fire rated doors where required bearing the UL label.

C. Furnish 18-inch by 18-inch panels for ceilings and for access to equipment in soffits and shafts, and 12-inch by 12-inch for walls unless indicated otherwise.

D. Furnish where indicated and where required to access valves, fire/smoke dampers, trap primers, shock arresters, and other appurtenances requiring operation, service or maintenance. Submit proposed locations for review prior to installation.

3.2 SLEEVES

A. Interior Floor and Wall Sleeves:
   1. Provide sleeves large enough to provide 3/4-inch clearances around pipe or ductwork.
   2. Where pipe or ductwork is insulated, provide sleeve large enough to provide 3/4-inch clearance around insulation. Maintain continuous insulation as it passes through sleeve.
   3. Penetrations through mechanical room and fan room floors watertight by packing with safing insulation and sealing with Tremco Dymeric Sealant or approved system.

B. Exterior Wall Sleeves Above Grade: Similar to interior wall sleeves except caulk outside with Tremco Dymeric Sealant.

C. Layout work prior to concrete forming. Do cutting and patching required. Reinforce sleeves to prevent collapse during forming and pouring.

D. Floor sleeves maintain a water barrier by providing a water tight seal or they extend 1-inch above finished floor except through mechanical equipment room floors and shafts where sleeves extend 2-inches above finished floor level. Sleeves through roof extend 8-inches above roof. Wall sleeves flush with face of wall unless otherwise indicated.

E. Do not support pipes by resting pipe clamps on floor sleeves. Supplementary members provided so pipes are floor supported.

F. Special sleeves detailed on drawings take precedence over this section.

3.3 CLEANING

A. General: Clean mechanical equipment, piping and ductwork of stampings and markings (except those required by codes), iron cuttings, and other refuse.

B. Painted Surfaces: Clean scratched or marred painted surfaces of rust or other foreign matter and paint with matching color industrial enamel, except as otherwise noted.

C. Additional requirements are specified under specific Sections of this Division.

3.4 EQUIPMENT PROTECTION

A. Keep pipe, ductwork, and conduit openings closed by means of plugs or caps to prevent the entrance of foreign matter. Protect piping, conduit, ductwork, equipment, and apparatus against dirty water, chemical or mechanical damage both before and after installation. Restore damaged or contaminated fixtures, equipment, or apparatus to original conditions or replace at no cost to the Owner.

B. Protect bright finished shafts, bearing housings, and similar items until in service. No rust will be permitted.

C. Cover or otherwise suitably protect equipment and materials stored on the job site.

3.5 ACCESSIBILITY

A. General: Locate valves, thermometers, cleanout fittings and other indicating equipment or specialties requiring frequent reading, adjustments, inspection, repairs, and removal or replacement conveniently and accessibly with reference to the finished building.

B. Thermometers and Gauges: Install thermometers and gauges so as to be easily read from the floors, platforms, and walkways.

3.6 FLOOR, WALL, AND CEILING PLATES

A. Install on piping and ductwork passing through finished walls, floors, ceilings, partitions, and plaster furrings. Plates completely cover opening around pipe and duct.

B. Secure wall and ceiling plates to pipe, insulation, or structure.

C. Plates not penetrate insulation vapor barriers.

D. Plates not required in mechanical rooms or unfinished spaces.

3.7 PAINTING

A. General:
   1. Coordinate painting of mechanical equipment and items with products and methods in conformance with the appropriate Division of Work, Painting.

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2. Exposed work under this Division receives either a factory painted finish or a field prime coat finish, except:
   a. Exposed copper piping.
   b. Aluminum jacketed outdoor insulated piping.

B. Equipment Rooms and Finished Areas:
1. Insulation: Not painted.
2. Hangers, Uninsulated Piping, Miscellaneous Iron Work, Structural Steel Stands, Uninsulated Tanks, and Equipment Bases: Paint one coat of black enamel.
3. Steel Valve Bodies and Bonnets: One coat of black enamel.
4. Brass Valve Bodies: Not painted.
5. Equipment:
   a. One coat of grey machinery enamel.
   b. Do not paint nameplates.
6. Grilles, Diffusers, Registers: Paint sheet metal and visible ductwork behind grilles, diffusers, and registers flat black.

C. Concealed Spaces (above ceilings, not visible):
1. Insulation: Not painted.
2. Do not paint the following:
   a. Hangers
   b. Uninsulated Piping
   c. Miscellaneous Iron Work
   d. Valve Bodies and Bonnets

D. Exterior Steel: Wire brush and apply two coats of rust-inhibiting primer and one coat of grey exterior machinery enamel.

E. Roof Mounted Equipment:
1. Paint two coats of exterior machinery enamel.
2. Color as selected by Architect.
3. Where factory standard finish is indicated in the equipment specification, it is assumed that the standard finish is painted.

F. ADJUSTING AND CLEANING

G. Before operating any equipment or systems, make thorough check to determine that systems have been flushed and cleaned as required and equipment has been properly installed, lubricated, and serviced. Check factory instructions to see that installations have been made accordingly and that recommended lubricants have been used.

H. Use particular care in lubricating bearings to avoid damage by over-lubrication and blowing out seals. Check equipment for damage that may have occurred during shipment, after delivery, or during installation. Repair damaged equipment as approved or replace with new equipment.

3.8 ELECTRICAL EQUIPMENT

A. Ductwork or piping for mechanical systems not serving electrical space not installed in any switchgear room, transformer vault, telephone room, or electric closet except as indicated.

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B. Ductwork or piping for mechanical systems not to pass over switchboards or electrical panelboards. Where conflicts exist, bring to attention of Architect.

3.9 EQUIPMENT CONNECTIONS

A. Make final connections to equipment specified in sections other than Division 23, HVAC of the specifications and Owner furnished equipment in accordance with manufacturer's instructions and shop drawings furnished and as indicated.

B. Piping:
1. Connections include steam supply, steam vent, and condensate.
2. Provide valves and specialties as specified and as detailed on the Drawings. Provide increasers, reducers, and any other fittings required for complete installation.
3. Independently support piping connections supported to prevent undue strain on equipment.

C. Ductwork: Make exhaust connections to fume hoods, emergency generator radiators, and any other processing, laboratory, or kitchen equipment in strict accordance with manufacturer's instructions.

D. Engine Exhaust: Make connections as necessary for complete working installation to the emergency generators as indicated and specified.

END OF SECTION

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SECTION 23 05 48

VIBRATION AND SEISMIC CONTROLS FOR HVAC

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

B. The provisions of Division 23, Heating, Ventilation and Air Conditioning (HVAC) Section 23 05 00, Common Work Results for HVAC, apply to work specified in this Section.

1.2 SUMMARY

A. This Section includes:
   1. Neoprene Waffle Pad
   2. Restrained Neoprene Mount
   3. Spring Isolators
   4. Springs with Restraints
   5. Base with Springs
   6. Inertia Base
   7. Isolating Spring Hangers
   8. Isolating Neoprene Hangers
   9. Rooftop Air Handling Unit Isolation Curb
   10. Isolating Sleeves
   11. Seismic Restraints
   12. Flexible Sphere Connector
   13. Flexible Hose Connector

B. Isolation of mechanical equipment as indicated on the Drawings and specified herein.

C. Seismic restraint of equipment, piping, and ductwork.

1.3 RELATED SECTIONS:

A. Division 01, General Requirements

B. Division 23, Heating, Ventilating, and Air Conditioning (HVAC)

C. Section 23 05 29, Hangers, Supports and Anchors for HVAC

D. Section 23 31 01, HVAC Ducts and Casing-Low Pressure

E. Section 23 31 02, HVAC Ducts and Casing-Medium Pressure

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1.4 QUALITY ASSURANCE

A. Single manufacturer select and furnish isolation required, except packaged equipment with integral isolators meeting all the isolation and seismic requirements of this Specification.

B. System of vibration isolators and seismic controls designed, detailed, and bear the seal of a professional engineer registered in the State having jurisdiction.

C. Isolation performance requirements are indicated in the specifications. Deflections indicated are nominal static deflections for specific equipment supported.

D. Seismic snubbers, restrained isolator housings, and cable system components have anchorage preapproval OPM number from OSHPD in the State of California verifying the maximum certified load ratings.

E. Isolator Stability and Rated Capacity:
1. Spring diameters not less than 0.8 of the compressed height of the spring at rated load.
2. Springs have a minimum additional travel to solid equal to 50 percent of the rated deflection.

F. Seismic Restraints:
1. Restraint of equipment, piping, and ductwork to be in accordance with the current state and local Building Code.
2. Calculations in accordance with current state and local Building Code.

1.5 SUBMITTALS

A. Submit the following:
1. Submit Shop Drawings showing complete details of construction for steel and concrete bases including:
   a. Equipment mounting holes.
   b. Dimensions
   c. Isolation selected for each support point.
   d. Details of mounting brackets for isolator.
   e. Weight distribution for each isolator.
   f. Code number assigned to each isolator.
2. Submit product data and calculation sheets for isolators, showing:
   a. Size, type, load rating, and rated deflection of each required isolator.
   b. Percent of vibration transmitted based on the lowest disturbing frequency of the equipment.
3. Structural Details and Calculations substantiating that building structure, anchorages, and fabricated steel braces can safely withstand maximum calculated loads stamped and signed by a registered structural engineer.
4. Installation report as specified in PART 3 of this Section.
5. Operation and maintenance data.

1.6 EQUIPMENT VIBRATION ISOLATION

A. Provide a balanced set of vibration isolators for each piece of equipment listed in the Equipment Schedules.

B. Isolation work to include, but not necessarily be limited to, the following:
1. Isolation support of motor-driven equipment.
2. Inertia base frames in conjunction with isolation.

3. Isolation support of air-handling housings.
4. Isolation support of piping, piping risers, and ductwork.
5. Penetration isolation of pipework, ductwork, and conduits through walls, floors, or ceilings.
6. Flexible connections of ductwork and piping to equipment.

C. Each piece of rotating equipment must meet a reasonable criterion for maximum vibration levels at each bearing, while in operation. The criteria for varying operating speeds are given as follows:
   1. Rotating equipment operating at peak vibration velocities must not exceed 0.08-inch/second.
   2. If it is discovered that the operating vibration velocities exceed this criteria, the equipment repaired or replaced at no expense to the owner until approval of the equipment is given by the Engineer.

D. Provide components or materials not specially mentioned herein, but necessary to the proper vibration isolation of the equipment.

1.7 CONTRACTOR RESPONSIBILITY

A. Vibration isolation devices, including auxiliary steel bases and pouring forms, design and furnish by a single manufacturer or supplier.

B. Adequately restrain all equipment, piping, and ductwork to resist seismic forces. Design and select restraint devices to meet seismic requirements as defined in the latest issue of the International Building Code under Earthquake Loads and applicable state and local codes.

C. Have the following responsibilities:
   1. Selection, installation, adjustment, and performance of vibration isolators which will meet the requirements given on the plans or in the Specifications.
   2. Provide Engineering drawings, details, supervision, and instruction to assure proper installation and performance.
   3. Provide whatever assistance necessary to ensure correct installation and adjustment of the isolators.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Type 7 – Isolating Spring Hangers:
   1. Mason 30N, similar Amber-Booth
   2. Kinetics Noise Control
   3. Vibrex

2.2 TYPE 7 - ISOLATING SPRING HANGERS

A. Combination rubber-in shear and steel spring isolators installed on the hanger rods.

B. Isolators shall have the proper deflection to allow the piping to deflect as a unit with the equipment isolators.

C. Neoprene element and the cup shall have neoprene bushing bushings projecting through the steel box.

D. Hangers designed for 30 degree angular movement.

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E. Minimum Deflection: 1-inch

2.3 SEISMIC RESTRAINTS

A. General Requirements:
1. Provided for equipment, piping and ductwork, both supported and suspended.
2. Bracing of piping shall be in accordance with state and local code requirements and ASCE 7 Seismic Design Requirements for Nonstructural Components, whichever is most stringent.
3. Bracing of ductwork shall be in accordance with the state and local code requirements, ASCE 7 Seismic Design Requirements for Nonstructural Components, and with the provisions set forth in the SMACNA seismic restraint manual.
4. The structural requirements for the restraints, including their attachment to the building structure, shall be reviewed and approved by the Structural Engineer.
5. Attachments to supported or suspended equipment must be coordinated with the equipment manufacturer.

B. Supported Equipment:
1. All-directional Seismic Rubbers: Interlocking steel members restrained by a one-piece molded neoprene bushing of bridge bearing neoprene.
2. Replaceable bushing and minimum of 1/4-inch thick. Rated loadings not to exceed 1000 psi.
3. An air gap of 1/4-inch shall be incorporated in the snubber design in all directions before contact is made between the rigid and resilient surfaces.
4. Snubber End Caps:
   a. Removable to allow inspection of internal clearances.
   b. Rotated neoprene bushings be rotated to ensure no short circuits exist before systems are activated.
5. Snubber: Mason Industries, Inc. Type Z-1225

C. Bracing of Pipes:
1. Provide seismic bracing of piping as detailed below to meet the building code requirements:
   a. Exception: Piping suspended by individual hangers need not be braced where the following criteria are met.
      1) Distance between the top of the pipe to the bottom of the support structure is 12-inches or less.
      2) Seismic braces are not required on high deformability piping when the Ip=1.0 and provisions are made to avoid impact with larger pipe or mechanical components or to protect the pipe in the event of such impact and the nominal pipe size is 3-inch diameter or less.
      3) Seismic braces are not required on high deformability piping when the Ip=1.5 and provisions are made to avoid impact with larger pipe or mechanical components or to protect the pipe in the event of such impact and the nominal pipe size is 1-inch diameter or less.
2. Seismic braces for pipes on trapeze hangers may be used.
3. Provide flexibility in joints where pipes pass through building seismic joints or expansion joints, or where pipes connect to equipment.
4. Cast iron pipe of all types, glass pipe, and any other pipe joined 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 on unsupported sections of piping shall be braced or stabilized between floors.
5. Vertical risers shall be laterally supported with a riser clamp at each floor. For buildings greater than six stories high or for piping subject to thermal change all risers shall be engineered individually.

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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.
   2. 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.
   3. 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.
   4. 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.
   5. Install duct flex connections at equipment connections to accept expected differential displacement and protect the equipment connection from damage.

E. Suspended Equipment and Piping and Ductwork:
   1. Seismic cable restraints shall consist of galvanized steel aircraft cables sized to resist seismic loads with a minimum safety factor of two and arranged to provide all-directional restraint.
   2. Cable must be pre-stretched to achieve a certified minimum modulus of elasticity. Cable end connections shall be steel assemblies that swivel to final installation angle and utilize two clamping bolts to provide proper cable engagement.
   3. Cable assemblies shall be type SCB at the ceiling and at the clevis bolt, SCBH between the hanger rod and the clevis or SCBV if clamped to a beam, all as manufactured by Mason Industries, Inc.
   4. Steel angles or strut, sized to prevent buckling, shall be clamped to pipe or equipment rods utilizing a minimum of three ductile iron clamps at each restraint location when required. Welding of a minimum of three ductile iron clamps at each restraint location when required. Welding of support rods is not acceptable. Rod clamp assemblies shall be type SRC or UCC as manufactured by Mason Industries, Inc.
   5. Pipe clevis cross-bolt braces are required in all restraint locations. They shall be special purpose preformed channels deep enough to be held in place by bolts passing over the cross bolt. Clevis cross brace shall be type CCB as manufactured by Mason Industries, Inc.

PART 3 EXECUTION

3.1 GENERAL

A. Do not install any equipment or pipe which makes rigid contact with the building.

B. The installation or use of vibration isolators must not cause any change of position of equipment or piping which would result in stresses in piping connections or misalignment of shafts or bearings. In order to meet this objective, equipment and piping shall be maintained in a rigid position during installation. The load shall not be transferred to the isolator until the installation is complete and under full operational load.

C. Correct, at no additional cost, all installations which are defective in workmanship or materials.

3.2 PREPARATION

A. Treat all isolators, including springs, hardware, and housing, with a corrosion protective coating of epoxy powder or electro galvanizing.

B. Coat steel frames exposed to weather with a rustproof metal primer.

C. Provide hot dipped galvanizing on steel frames as indicated on the plans for corrosion protection in severe conditions.

3.3 INSTALLATION

A. General:
1. Install isolation where indicated on the Drawings by type and location and where indicated below.
2. The assigned code number shall be marked on the isolators and bases to assure placement in the proper location.
3. Anchor isolator seismic housing baseplate to floor.
4. Rubber grommets and washers shall be provided to isolate the bolt from the building structure. Under no circumstances shall the isolation efficiency be destroyed when bolting the isolators to the building structure.

B. Type 7 – Isolating Spring Hangers:
1. Service:
   a. Fan Coil Units

3.4 SEISMIC RESTRAINTS

A. General:
1. Install and adjust seismic restraints so that the equipment, piping, and ductwork support is 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 the 1/4-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 Seismic Restraint Manual 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 to resist both the seismic load and the additional force induced by expansion and contraction.

4. Fuel oil, gas, cast iron pipe of all types, glass pipe and any other pipes joined with four band shield and clamp assembly shall be braced at 1/2 the spacings shown above.
5. 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.
6. 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.
7. Branch lines may not be used to restrain main lines.
8. Where thermal expansion is a consideration, guides and anchors may be used as transverse and longitudinal restraints provided they have a capacity equal to or greater than the restraint loads in addition to the loads induced by expansion or contraction.
9. Subject to confirmation by field inspection, seismic bracing is not required on piping when the piping is supported by rod hangers and the hangers in the entire run are 12-inches or less in length from the top of the pipe to the supporting structure, hangers are detailed to avoid bending of the hangers and their attachments and provisions are made for piping to accommodate expected deflections.

D. Bracing of Ductwork:
1. Transverse restraints shall occur at 30-foot intervals or at both ends of the duct run if less than the specified interval. Transverse restraints shall be installed at each duct turn and at each end of a duct run.
2. Longitudinal restraints shall occur at 60-foot intervals with at least one restraint per duct run. Transverse restraints for one duct section may also act as a longitudinal restraint for a duct section connected perpendicular to it if the restraints are installed within 4-feet of the intersection of the ducts and if the restraints are sized for the larger duct. Duct joints shall conform to SMACNA duct construction standards.
3. Hanger straps must be positively attached to the duct within 2-inches of the top of the duct with a minimum of two number 10 sheet metal screws.
4. A group of ducts may be combined in a 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.
5. 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.
6. 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. The cables shall be adjusted to a degree of slackness approved by the Structural Engineer.
2. The uplift and downward restraint nuts and Mason type RW neoprene covered steel rebound washers for the Type 6 hangers adjusted so there is a maximum 1/4-inch clearance.
3. C-clamps for attachment to the bottom of I-beams must incorporate a restraining strap.

3.5 FIELD QUALITY CONTROL

A. Installation Report: Isolation manufacturer's representative shall confirm that all isolation is installed correctly and submit report stating that isolators are installed as shown on Shop Drawings, isolators are free to work properly, and that installed deflections are as scheduled and as specified.

END OF SECTION

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SECTION 23 05 53

IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes:
   1. Valve Identification
   2. Piping Markers
   3. Equipment Identification
   4. Concealed Equipment Identification

1.2 RELATED SECTIONS

A. Division 01, General Requirements

B. Division 23, Heating, Ventilating, and Air Conditioning (HVAC)

1.3 SUBMITTALS

A. Submit the following:
   1. Valve Tag Directory: Submit for approval prior to fabrication of valve tags.
   2. Equipment Nameplate Directory: Submit for approval prior to fabrication.
   3. Operating and Maintenance Data: Include a copy of valve tag and equipment nameplate directories in each set of Operating and Maintenance manuals.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Piping Markers:
   1. W.H. Brady
   2. Seton
   3. Marking Systems, Inc. (MSI)
   4. Other Manufacturers: Submit substitution request.

B. Concealed Equipment Identification:
   1. W.H. Brady
   2. Seton
   3. Other Manufacturers: Submit substitution request.

2.2 VALVE IDENTIFICATION

A. Valve Tags:
   1. General: Identify valves with metal tags, legends to be stamped or embossed. Indicate the function of the valve and its normal operating position; i.e.,

56 HW	(NUMBER AND CONTENT OF PIPE)

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ISOLATION	(VALVE FUNCTION)
NO	(NORMAL OPERATION POSITION)

2. Size: Valve tags 2-inch diameter with 1/4-inch high letters.
3. Material: Use 0.04-inch brass tags.
4. Automatic Valves and Regulating Valves:
   a. Use 1/16-inch thick laminated 3-ply plastic, center ply white, outer ply red, lamicoid, or equal.
   b. Form letters by exposing center ply.
5. Buildings Systems: Contact the Owner for coordination with existing building tagging system and supplementary information required for any specific system before valve tagging begins.

B. Valve Tag Directory:
1. Tag Number
2. Location
3. Exposed or Concealed
4. Service
5. Valve Size
6. Valve Manufacturer
7. Valve Model Number
8. Normal Operating Position of Valve

2.3 PIPING MARKERS

A. Label pipes with all-vinyl, semi-rigid plastic or strap-on labels.

B. For pipes O.D. smaller than 3/4-inch and for valve and fitting identification, use valve tag.

C. For sizes from 3/4 to 1-1/4-inch outside diameter, 1/2-inch letters, 8-inch marker width.

D. For sizes from 1-1/2 to 2-inch outside diameter, 3/4-inch letters, 8-inch marker width.

E. Identify pipe markers and color coded as follows with directional arrows.

HVAC SERVICE	PIPE MARKER *	BACKGROUND/TEXT COLOR
HEATING WATER	HEATING WATER SUPPLY	GREEN/WHITE
	HEATING WATER RETURN	GREEN/WHITE
* Directional arrow applied adjacent to pipe marker indicating direction of flow.		

2.4 EQUIPMENT IDENTIFICATION

A. Nameplates:
1. Tag pumps, air handling supply units, fans, terminal units, converters, and miscellaneous mechanical equipment items with engraved nameplates.
2. 1/16-inch thick, 3-inch by 5-inch laminated 3-ply plastic, center ply white, outer ply black. Form letters by exposing center ply.
3. Identify unit with equipment tag as shown on Drawings and area served.
4. Permanently identify access points to fire dampers, smoke dampers, and combination fire and smoke dampers on the exterior of the duct by a label with letters 1/2-inch in height reading the following:
   a. Fire Damper
   b. Smoke Damper

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c. Fire/Smoke Damper

5. Label constructed from same material as equipment nameplates.

B. Equipment Nameplate Directory:
1. Include Owner and Contractor furnished equipment.
a. Pumps
b. Air Handlers
c. Terminal Units
d. Other Equipment Nameplates
2. List the following on the Nameplate Directory for each piece of equipment:
a. Designation
b. Model Number
c. Location of Equipment
d. Area Served or Function
e. Disconnect Location
f. Normal Position of HOA Switch

2.5 CONCEALED EQUIPMENT IDENTIFICATION

A. Adhesive Laminated Tape:
1. 3/4 width transparent clear tape with black lettering.
2. Lettering in all caps Helvetica font 24 point.

PART 3 EXECUTION

3.1 VALVE IDENTIFICATION

A. Valve Tags:
1. Attach to valve with a brass chain.
2. Valve tag numbers continuous throughout the building for each system.
3. Obtain a list for each system involved from the Owner.

B. Valve Tag Directory: Post final copy in Operation and Maintenance Manual.

3.2 PIPING MARKERS

A. Unless recommendations of ANSI A13.1 are more stringent, apply labels or letters after completion of pipe cleaning, insulation, painting, or other similar work, as follows:
1. Every 20-feet along continuous exposed lines.
2. Every 10-feet along continuous concealed lines.
3. Adjacent to each valve, flange, and stub-out for future.
4. On pipe before and after wall, floor, and ceiling penetrations.
5. On pipe into and out of concealed spaces.
6. Adjacent to changes in pipe direction.
7. On each riser.
8. Adjacent to each leg of a T.
9. Locate conspicuously where visible. Position pipe labels on pipe to achieve the best visibility.
10. Provide pipe identification (over insulation) for reclaimed water systems in accordance with current local codes and rulings.

11. Apply labels or letters to lower quarters of the pipe on horizontal runs where view is not obstructed or on the upper quarters when pipe is normally viewed from above.

B. Apply arrow labels indicating direction of flow.

3.3 EQUIPMENT IDENTIFICATION

A. Nameplates: Attach to prominent area of equipment, either with sheet metal screws, brass chain, or contact cement as applicable.

B. Nameplate Directory: Post final copy in Operation and Maintenance Manual.

3.4 CONCEALED EQUIPMENT IDENTIFICATION

A. Where valves or equipment are located above ceilings or behind walls provide adhesive tape indicating the item (valve tag, equipment tag, etc.) at the access location (T-bar ceiling grid, access door, etc.).

B. Applicable equipment includes, but is not limited to, the following:
1. Terminal Units
2. Fan Coil Units
3. Fans
4. Isolation Valves
5. Control Valves

END OF SECTION

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SECTION 23 05 93

TESTING ADJUSTING AND BALANCING FOR HVAC

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes:
   1. Testing and Balancing of Air Systems
   2. Testing and Balancing of Hydronic Systems
   3. Testing and Balancing of Miscellaneous Mechanical Equipment

1.2 RELATED SECTIONS

A. Division 01, General Requirements

B. Division 23, Heating, Ventilating, and Air Conditioning (HVAC)

C. Section 23 09 00, Instrumentation and Controls for HVAC

1.3 QUALITY ASSURANCE

A. Acceptable Testing and Balancing Firms:
   1. A.I.R., Inc.
   2. Air Balance Specialty, Inc.
   3. Neudorfer Engineers, Inc.
   4. Northwest Engineering Services
   5. Pacific Coast Air Balance
   6. Accurate Balancing Agency, Inc.
   7. Precision Test and Balance, Inc.

B. Other Firms: Submit substitution requests prior to bid date.

C. Industrial Standards: Testing and Balancing shall conform to NEBB, American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE), and American National Standards Institute (ANSI) as follows:
   1. NEBB: Comply with Procedural Standards for Testing, Adjusting Balancing of Environmental Systems.
   2. ASHRAE: Comply with recommendations pertaining to measurements, instruments, and testing, adjusting and balancing.
   3. ANSI:
      a. S1.4 Specifications for sound level meters.
      b. S1.11 Specifications for Octave-Band and Fractional-Octave-Band analog and digital filters.

D. Instrument Certification: Instruments used shall be accurately calibrated and certified within six months of balancing and maintained in good working order.

E. Test Observation: If requested, the tests shall be conducted in the presence of the Architect or the Architect's representative.

F. Pre-Balancing Conference:
   1. Prior to starting balancing, general techniques shall be reviewed with the Engineer. This conference must occur prior to measuring existing conditions.
   2. Measuring of existing conditions must occur prior to any demolition or new work.
   3. The conference will review existing conditions and systems to be affected by the project

1.4 SUBMITTALS

A. Submit the following:
   1. Balancing Log – Existing Systems: Submit preliminary report indicating existing conditions prior to making any modifications to existing systems.
      a. Include all air and water outlets, actual field measured air and water volume, and percentage of design volumes.
      b. Provide drawings identifying location of all outlets.
   2. Equipment Data Sheets – Existing Systems: Indicate actual equipment performance, model numbers, bearing and belt data, motor nameplate data, and final balanced motor data.
   3. Balancing Log:
      a. Include all air and water outlets, actual field measured air and water volume, and percentage of design volumes.
      b. Provide drawings identifying location of all outlets.
   4. Equipment Data Sheets: Indicate actual equipment performance, model numbers, bearing and belt data, motor nameplate data, and final balanced motor data.
   5. Additional Data: Submit additional data as provided by Associated Air Balance Council (AABC) Standard forms.
   6. Number of Copies: Submit six copies of the above completed information to the Engineer for review and insertion into the Operating and Maintenance Data.
   7. Instrument Certification: When requested, submit certificate of calibration for equipment to be used.

B. Record data on NEBB forms or forms approved by the Architect.

1.5 PROJECT CONDITIONS

A. Where existing systems are to be adjusted, establish flow rates in all branches prior to making any modifications to system. Adjust central equipment as required and restore all unmodified branches and outlets to original condition. Obtain existing system drawings from Owner and become familiar with extent and nature of existing systems.

B. Do not perform final testing, adjusting, and balancing work until heating, ventilating, and air conditioning equipment has been completely installed and operating continuously as required.

C. Conduct air testing and balancing with clean filters in place. Clean strainers, etc., prior to performing hydronic testing and balancing.

1.6 WARRANTIES

A. In addition to the Requirements of the Contract, include an extended warranty of six months after completion of test and balance work during which time the Architect at his discretion may request a recheck or resetting of any equipment or device listed in the test reports.

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PART 2 PRODUCTS – NOT APPLICABLE

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

A. Balance to maximum measured flow. Deviation from specified values of ±10 percent at terminal device and ±5 percent at equipment, or mean sound level deviation of 15 decibels. Advise Engineer if deficiencies are generally noted to enable proper corrective actions.

3.2 AIR SYSTEMS

A. General: Make measurements in accord with Industrial Standards specified above. Record on appropriate forms.

B. Preliminary:
1. Identify and list size, type, and manufacture of all equipment to be tested including air outlets and inlets.
2. Use manufacturer's ratings for equipment to make required calculations except where field test shows ratings to be impractical.

C. Central System:
1. Set speed to provide air volume at farthest run without excess static pressure. Provide additional sheaves and belts as required to accomplish speed adjustment.
2. Read and adjust air supply, return, and exhaust fan units to deliver design conditions at minimum OSA and at 100 percent OSA.
3. Adjust automatic dampers, outside air, return air, and exhaust dampers for design conditions.
4. Read static air pressure conditions on all air handling equipment including filter and coil pressure drops and total pressure across the fan. A Dwyer Series 400 air velocity meter only shall be used for final static pressures at equipment and where critical readings are required.
5. Measure temperature conditions across all outside air, return air, and exhaust dampers to check leakage.
6. Read and record motor data and amperage draw.
7. For variable volume systems, establish minimum static pressure required at sensing point to permit operation over entire VAV range. Adjust supply and return fan speed so that at maximum demand the associated VFD is controlling the motor of motor nameplate RPM to 100 percent. Adjust return fan speed so that return air volumes track with supply air volume minus exhaust air volume.
8. Assist controls contractor in establishing minimum outside air damper positions.

D. Distribution:
1. Evaluate all building and room pressure conditions to determine adequate supply and return air conditions. Balance the building to be slightly positive to outdoors.
2. Evaluate all building and room pressure conditions to determine adequate performance of the system to maintain temperatures without draft.
3. Perform multipoint pitot traverses to confirm instrumentation, shaft tightness, fan operation, etc. Pitot traverses shall be performed using a Dwyer Series 400 air velocity meter only with applicable duct probe.
4. Mark balancing dampers.

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3.3 HYDRONIC SYSTEMS

A. General: Make measurements in accord with Industrial Standards specified above. Record on appropriate forms.

B. Preliminary:
1. List complete data of tested equipment and verify against Contract Documents.
2. Open all line valves to full open position, close coil by-pass stop valves, and then set mixing control valve to full coil flow.
3. For each pump:
   a. Verify rotation.
   b. Test and record pump shut-off head.
   c. Test and record pump wide-open head.
4. Verify proper system pressures.
5. Verify air vents in high points of water are properly installed and operating freely.

C. Central Equipment:
1. Check all conditions at all coils for required performance at design conditions.
2. Check conditions at all primary source equipment for performance of design conditions.
3. Read and record pump heads, motor data, and amperage draw.

D. Distribution:
1. Read and adjust water flow for design conditions.
2. Set all memory stops and mark position of adjuster on balancing valves.

3.4 ELECTRIC HEATING EQUIPMENT

A. Test and record voltage and amperage readings at each electric heating device while fully energized and at part load conditions (each step) to verify proper operation.

B. Record data on appropriate forms.

3.5 AUTOMATIC CONTROL SYSTEM

A. In cooperation with control manufacturer's representative, set and adjust automatically operated devices to achieve required sequence of operations.

B. Testing organization shall verify all controls for proper calibration and list controls requiring adjustment by control system installer.

3.6 COORDINATION

A. Coordinate work with other trades to ensure rapid completion of the project.

B. Deficiencies noted during the course of air balancing in the mechanical installation shall be promptly reported to the Architect to allow corrective action to proceed.

C. Periodic review of progress shall be provided as requested.

END OF SECTION

SECTION 23 07 00

INSULATION FOR HVAC

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes:
   1. Pipe Insulation
   2. Ductwork Blanket Insulation
   3. Duct Insulation, Internal
   4. Duct, Pipe and Terminal Unit Acoustical Wrap
   5. Accessories Piping
   6. Accessories Ductwork

1.2 RELATED SECTIONS

A. Division 01, General Requirements

B. Division 23, Heating, Ventilating, and Air Conditioning (HVAC)

C. Section 23 05 29, Hangers, Supports and Anchors for HVAC

D. Section 23 31 01, HVAC Ducts and Casing – Low Pressure

E. Section 23 31 02, HVAC Ducts and Casing – Medium Pressure

1.3 QUALITY ASSURANCE

A. Regulatory Requirements:
   1. Prohibit insulating products from containing pentabrominated, octabrominated, and decabrominated diphenyl ethers. Where products within this specification contain these banned substances, provide complying products from approved manufacturers with equal performance characteristics.
   2. Flame and Smoke Ratings: Installed composite flame spread not to exceed 25 and smoke developed not to exceed 50 as tested by UL 723 or ASTM E84.
   3. Energy Codes: Local Building and Energy Codes govern where insulation performance requirements for thickness exceeds thickness specified.

B. Protection:
   1. Protect against dirt, water, chemical, or mechanical damage before, during, and after installation.
   2. Repair or replace damaged insulation at no additional cost.

C. Source Quality Control:
   1. Service: Use insulation specifically manufactured for service specified.
   2. Labeling: Insulation labeled or stamped with brand name and number.
   3. Insulation and accessories not to provide nutritional or bodily use to fungi, bacteria, insects, rats, mice, or other vermin, not to react corrosively with equipment, piping, or ductwork, and asbestos free.

1.4 SUBMITTALS

A. Submit the following.
   1. Product Data: For each type including density, conductivity, thickness, jacket, vapor barrier, and flame spread and smoke developed indices.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Pipe Insulation:
   1. Fiberglass:
      a. Johns Manville Microlok HP
   2. Ductwork Blanket Insulation:
   3. Fiberglass:
      a. Johns Manville Microlite Type 100
   4. Duct Insulation, Internal:
   5. Round Ductwork:
      a. CertainTeed
      b. Johns Manville
   6. Rectangular Ductwork:
      a. CertainTeed
      b. Johns Manville
      c. Knauf
      d. Owens Corning

B. Duct, Pipe and Terminal Unit Acoustical Wrap:
   1. Kinetics Noise Control model KNM-100ALQ.

2.2 PIPE INSULATION

A. Fiberglass: Split sectional or Snap-On type with 0.23 per-inch maximum thermal conductivity (K-factor) at 75 degrees F mean temperature, 850 degrees F maximum service rating and white, vapor barrier jacket with pressure sensitive closure system.

2.3 DUCTWORK BLANKET INSULATION

A. Fiberglass: 1.0 pcf nominal density, 0.25 per-inch maximum K-factor at 75 degrees F mean temperature, 250 degrees F minimum operating temperature limit.
   1. Exposed: FSK facing (foil scrim Kraft) or vinyl - white appearance.
   2. Concealed with Vapor Barrier: FSK reinforced foil and paper.
   3. Concealed without Vapor Barrier: Facing not required.

B. Semi-Rigid Fiberglass: 2.5 pcf nominal density, 0.24 per-inch maximum K-factor, at 75 degrees F mean temperature, 250 degrees F minimum operating temperature limit.
   1. Exposed: FSK facing (foil scrim Kraft) or vinyl-white appearance.
   2. Concealed with Vapor Barrier: FSK reinforced foil and paper.
   3. Concealed without Vapor Barrier: Facing not required.

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C. Elastomeric: Expanded closed cell sheets, 0.27 per-inch maximum K-factor at 75 degrees F mean temperature and 220 degrees F minimum operating temperature limit.

2.4 DUCT INSULATION, INTERNAL

A. Fiberglass Duct Liner.
1. Thermal Conductance: k-0.23 in accordance with ASTM C518 and ASTM C177 at 75 degrees F mean temperature.
2. Maximum Operating Temperature: 250 degrees F as determined by ASTM C 411.
3. Maximum Air Velocity: 6,000 fpm as determined by ASTM C 1071.
4. Fungi Resistance:
   a. Does not breed or promote as determined by ASTM C1338.
   b. No growth as determined by ASTM G21.
5. Bacteria Resistance: No growth as determined by ASTM G22.
6. Flame-spread index of 25 or less as determined by ASTM E 84 or UL 723.
7. Smoke development index of 50 or less as determined by ASTM E 84 or UL 723.
8. Acoustical Absorption Coefficients:
   a. NRC value as tested in accordance with ASTM C423, type A mounting:
      1) 1-inch thickness: Minimum NRC 0.70
      2) 2-inch thickness: Minimum NRC 0.90

2.5 DUCT, PIPE AND TERMINAL UNIT ACOUSTICAL WRAP

A. Barrier:
1. Construct barrier of a 0.10-inch thick mass loaded, limp vinyl sheet bonded to a layer of reinforced aluminum foil on one side.
2. Nominal density of 1 pound per square-foot and minimum STC rating of 28.
3. Minimum thermal conductivity value of 0.29 and a rated service temperature range of -40 degrees F. to 220 degree F.
4. Flame spread index of no more than 10 and a smoke development index of less than 40.

B. Decoulpling Layer:
1. Combination of 1-inch fiberglass batting, non-woven porous scrim-coated glass cloth, quilted together in a matrix of 4-inch diamond stitch pattern, which encapsulates the glass fibers.

C. Composite Material: Fabricated to include a nominal 6-inch wide barrier overlap tab extending beyond the quilted fiber glass to facilitate a leak-tight seal around field joints.

2.6 ACCESSORIES PIPING

A. Adhesives:
1. General: Maximum Flame Spread/Smoke Developed Rating of 25/50, SCAQMD Rule 1168 compliant.
2. Fiberglass: Integral closure system.
3. Calcium Silicate: Benjamin Foster 30-36.
4. Elastomeric: Armacell 520 BLV.

B. Cements:
1. Insulating: Ryder.
2. Heat Transfer: Chemax Tracit-300.

C. Wire Mesh: 1-inch mesh with 20 gauge annealed steel wire.

D. Pipe Fitting Covers: One piece PVC insulated pipe fitting covers. Zeston, Ceel-Co.

E. Grooved Coupling Insulation: One piece PVC insulated fitting cover. Zeston, Ceel-Co.

F. Metal Pipe Jacket: 0.016-inch thick aluminum jacket with formed fitting covers, aluminum snap straps and sealant.

G. Cloth Facing: Presized fiberglass cloth.

H. Tapes: Pressure sensitive, weather resistant, and for temperatures up to 150 degrees F. Zeston Z-tape.

I. Paint: Ultraviolet resistant latex paint with special adherence capabilities to the PVC fitting covers, elastomeric, aluminum facing, Kraft paper, tapes, and adhesives.

2.7 ACCESSORIES DUCTWORK

A. Adhesives:
1. General: Maximum Flame Spread/Smoke Developed Rating of 25/50, SCAQMD Rule 1168 compliant.
2. Fiberglass: Benjamin Foster 85-62, Design Polymerics 2501/2502
3. Elastomeric: Armacell 520 BLV
4. Duct Insulation, Internal: Foster 85-62, Design Polymerics 2501/2502

B. Weld Pins: Duro-Dyne with NC-1 nylon stop clips

C. Cements:
1. Insulating: Ryder.
2. Heat Transfer: Chemax Tracit-300

D. Wire Mesh: 1-inch mesh with 20 gauge annealed steel wire.

E. Mastic: Chicago Mastic:
1. Vapor Barrier: 17-475
2. Outdoor Mastic: 16-110 white

F. Cloth Facing: Presized fiberglass cloth

G. Tapes: Pressure sensitive, weather resistant, and for temperatures up to 150 degrees F. Zeston Z-tape.

H. Paint: Ultraviolet resistant latex paint with special adherence capabilities to the PVC fitting covers, elastomeric, aluminum facing, Kraft paper, tapes, and adhesives.

PART 3 EXECUTION

3.1 GENERAL

A. Workmanship:
1. Installation: Insulation installed in first class, neat professional manner.

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2. Applicators: Employ by firm that specializes in insulation work.

B. Preparation: Surfaces of piping, ductwork, and equipment clean, free of oil or dirt, and dry before insulation is applied.

C. Stamps: ASME stamps, UL labels, and similar stamps and labels not covered.

3.2 HVAC PIPE AND EQUIPMENT INSULATION APPLIED LOCATIONS

A. Insulation Applied Locations – HVAC Piping:

System	Pipe Size	Insulation Type	Insulation Thickness	Notes
Heating Water (to 200 degrees F)	1-1/4-inch and smaller	Fiberglass	1-1/2-inch	
Heating Water (to 200 degrees F)	1-1/2-inch and above	Fiberglass	2-inch	

B. Include fittings, unions, flanges, mechanical couplings, valve bodies, valve bonnets, piping through sleeves, except valve bonnets, unions and flanges need not be insulated on the following systems:
1. Hot water heating inside building.

C. Piping insulation is not required between the control valve and coil on run-outs when the control valve is located within 4-feet of the coils and the pipe size is 1-inch or less.

D. Valves, humidifier bodies, and irregular fittings insulated with section of pipe insulation and insulating cement, securely fastened, and finished with 6 ounces canvas and Foster 30-36 lagging adhesive.

E. Option on flanges, valves, strainers, not requiring a vapor barrier to insulate with removable replaceable pads fabricated of 1-inch layer of Pittsburgh Corning Temp Mat sandwiched between inner and outer layer of 8 ounces glass cloth held together with stainless staples with sufficient stainless lacing hooks to hold pad firmly to flange or valve with minimum 3-inch overlap onto adjacent pipe insulation using 18 gauge SS lacing wire.

3.3 PIPING INSTALLATION

A. General:
1. Joints: Coat both sides of complete joining area with applicable adhesive.
   a. Longitudinal Joints: Make joints on top or back of pipe to minimize visibility. Except foam plastic, seal with closure system or 3-inch wide tape.
   b. Butt Joints: Butt lightly together and, except for foam plastic, seal with 3-inch wide tape or butt straps.
   c. Multiple Layered Insulation: Joints staggered.
2. Access: Strainer and other items requiring service or maintenance with easily removable and replaceable section of insulation to provide access.
3. Voids:
   a. Fill voids, chipped corners and other openings with insulating cement or material compatible with insulating material.
   b. In insulation with Heat Tracing: Where piping is shown or specified to be heat traced, bed heat tape into heat transfer cement with insulation over heat tape and cement.
4. Seal joints, seams, and fittings of metal watertight jackets at exterior locations.

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B. Fiberglass Insulation: Exterior insulation encased in metal jacket.

C. Fittings: Insulation specified with continuous vapor barrier, the vapor barrier must not be violated.
   1. On Elastomeric Insulation: Fittings covered with covers made up of mitered sections of insulation or with formed pipe fitting covers.
   2. In Other Insulation: Fittings covered with insulation to the same level of the adjoining insulation or fill with insulating cement. Finish with pipe fitting covers or cloth facing and tape.

D. Unions, Mechanical Joints, Valves, etc.:
   1. General:
      a. As specified for fittings.
      b. Minimum thickness same as specified for piping.
   2. Unions: Build up insulation at least 1/2-inch beyond adjoining insulation.
   3. Flanges: With square corners. Where flanges are not insulated, terminate adjacent insulation so flange bolts can be removed.
   4. Flanged Valves: Insulation with square corners.

E. Vapor Barrier Insulation:
   1. Refer to Section 23 05 29 Hangers, Supports, and Anchors for HVAC, for support requirements.
   2. Piping which requires vapor barrier protection has a continuous vapor barrier, which may not be pierced or broken. The following piping systems require vapor barrier protection:
      a. Chilled water including radiant cooling water.
      b. Brine water.
      c. Refrigerant suction.
      d. Other piping systems with a nominal operating temperature below 65 degrees F.
   3. Vapor Barrier Insulation.
      a. Insulation for pipe requiring vapor barrier protection 1-1/4-inch or smaller, insulation continuous through pipe hangers and rollers.
      b. For pipe 1-1/2-inch and larger, 18-inch section of calcium silicate, same thickness as pipe insulation with continuous vapor barrier jacket at each hanger or roller. Provide pipe shield specified in Section 23 05 29, Hangers, Supports, and Anchors for HVAC.

F. Non-Vapor Barrier Insulation:
   1. Refer to Section 23 05 29, Hangers, Supports, and Anchors for HVAC for support requirements.
   2. Insulation may be interrupted at supports. Butt insulation tight to support.
   3. Continue insulation at supports, installation as specified for piping systems with vapor barrier installation.
   4. Void between saddle and pipe filled with insulation.

3.4 EQUIPMENT INSTALLATION

A. General: Install true and smooth. Insulation over curved surfaces conform to curves of surface.
   1. Access:
      a. Insulated removable heads, water boxes, pump casings, access, etc., that require service, inspection or maintenance provided with covers or section that are easily removable and replaceable.
      b. Reinforce openings in adjacent insulation with metal beading.
      c. In vapor barriered insulation, coat joints with vapor barrier mastic.
   2. Voids, Depressions and Cavities: Voids, chipped corners and other openings filled with insulating cement or material compatible with insulating material.

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3. Vapor Barriered Insulation:
   a. Where insulation is specified to have a vapor barrier.
   b. No broken or pierced barrier.
      1) Coated with vapor barrier mastic and patched with insulation facing or tape.
      2) Staples brush coated with vapor barrier coating.
      3) Raw edges coated with vapor barrier mastic covered and cover sealed to equipment surface.
4. Non-Vapor Barriered Insulation:
   a. Patch with insulation facing or tape.
   b. Cover raw edges and neatly bevel to the equipment surface.
5. Multilayered Insulation: With staggered joints.

3.5 DUCT INSULATION APPLIED LOCATIONS

A. General:
1. Provide external insulation with continuous vapor barriers unless specifically noted otherwise.
2. Internally line ductwork completely to grille or diffuser or to indicated terminal points. Dimension shown are net inside of liner.
3. Internally lined ductwork need not be externally insulated.
4. In addition to locations described in specification, internally line medium, low, return and exhaust air ductwork where shown on drawings.
5. Internal lining is not allowed downstream of final filters in systems serving inpatient healthcare facilities.

B. Insulation Applied Location – HVAC Ductwork:

System	Location	Duct Type	Insulation Type	Thickness	Notes
Medium Pressure Supply*	Exposed or Visible (Including above a cloud ceiling)	Rectangular	Internally Lined	1-1/2-inch	
		Round/Oval	Internally Lined	1-1/2-inch	
	Concealed or in mechanical rooms	All	Fiberglass Blanket	1-1/2-inch	
	15-feet upstream and downstream of fans	All	Internally Lined	1-1/2-inch unless otherwise indicated	
Low Pressure Supply*	Exposed or Visible (Including above a cloud ceiling)	Rectangular	Internally Lined	1-1/2-inch	
		Round	Internally Lined	1-1/2-inch	
	Concealed or in mechanical rooms	All	Fiberglass Blanket	1-1/2-inch	
	Downstream of Air Terminal Units	All	Internally Lined	1-1/2-inch	

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System	Location	Duct Type	Insulation Type	Thickness	Notes
	15-feet upstream and downstream of fans	All	Internally Lined	1-1/2-inch unless otherwise indicated	
Return Air* (not insulated except)	Concealed Outside Building Envelope	All	Externally insulated without vapor barrier	2-inch	
	Exposed Outside Building Envelope	All	Internally Lined	2-inch	
	15-feet upstream and downstream of fans	All	Internally Lined	1-inch unless otherwise indicated	
Exhaust Air* (not insulated except)	15-feet upstream and downstream of fans	All	Internally Lined	1-inch unless otherwise indicated	
	In Toilet Rooms, 10-feet downstream of exhaust grilles	All	Internally Lined	1-inch	
Outside Air (untempered)	Exposed or Visible (Including above a cloud ceiling)	Rectangular	Internally Lined	2-inch	
		Round	Internally Lined	2-inch	
	Concealed or in mechanical rooms	All	Fiberglass Blanket	2-inch	
Supply and Return Plenums	All	All	Internally Lined	2-inch	
Transfer Air	All	All	Internally Lined	1-inch	

3.6 DUCTWORK INSTALLATION

A. General:
1. Install in accordance with manufacturer's instruction.
2. Continuous vapor barrier. Coat with vapor barrier mastic and patch with facing or tape. Joints between insulation and access with vapor barrier mastic.
3. Insulation at access panels to be removable or attached to panel with edges of panel and opening reinforced with metal beading.

B. External Blanket Insulation:
1. Insulation secured to ductwork with 20-gauge snap wires 24-inches on center and at all joints.
2. Joints and seams lapped a minimum of 3-inches and sealed with jacket tape.

C. Internal Duct Liner:
   1. Air stream coated surface.
   2. Weld pins spaced maximum of 15-inch on center in both directions and within 2-inches of corners and joints. Weld pins flush with liner surface.
   3. Complete duct surface coated with adhesive and insulation pressed tightly thereto.
   4. Provide edges at terminal points with metal beading and heavily coated with adhesive.
   5. Heavily coat joints and corners with adhesive.
   6. Damaged areas replaced or heavily coated with adhesive.

D. Volume Dampers: Where volume dampers do not allow for continuous insulation, terminate insulation clear of handle sweep, and finish edges to maintain vapor barrier and to prevent damage to the insulation.

3.7 DUCT, PIPE AND TERMINAL UNIT ACOUSTICAL WRAP

A. Installed in accordance with the manufacturer's instructions.

B. Applied locations for piping and duct systems:
   1. Variable and constant volume terminal units with maximum air volumes over 2000 cfm. Wrap installed such that control devices are easily accessible without circumventing the acoustical value.
   2. Where specified or indicated on drawings.

3.8 FIELD QUALITY CONTROL

A. Field Test: Test and approve systems prior to installation of insulation.

B. Existing Insulation:
   1. Repair existing insulation damaged during construction.
   2. Make neat connections where new and existing insulation meet.
   3. Where existing piping, ductwork or equipment is removed, cover existing surfaces neatly to match existing.
   4. Where existing insulation is damaged or missing, notify the architect prior to performing to work.

END OF SECTION

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SECTION 23 31 01

HVAC DUCTS AND CASING – LOW PRESSURE

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes:
   1. Supports, Anchorage And Restraints
   2. Sheet Metal Ductwork
   3. Flexible Ducts
   4. Exposed or Visible Ductwork In Finished Spaces
   5. Related Sections

B. Division 01, General Requirements

C. Division 23, Heating, Ventilating, and Air Conditioning (HVAC)

D. Section 22 30 00, Plumbing Equipment

E. Section 23 05 48, Vibration and Seismic Controls for HVAC Piping Equipment

F. Section 23 07 00, Insulation for HVAC

G. Section 23 33 00, Air Duct Accessories

1.2 QUALITY ASSURANCE

A. Installer Qualifications: Work performed by qualified, experienced mechanics, in accordance with the manual of Duct and Sheet Metal Construction of the Sheet Metal and Air Conditioning Contractors National Association and these Specifications.

B. Regulatory Requirements:
   1. Entire ductwork system, including materials and installation, installed in accordance with NFPA 90A.
   2. Ductwork and components UL 181 listed, Class I air duct, flame rating not to exceed 25 and smoke rating not to exceed 50.

1.3 SUBMITTALS

A. Submit the following:
   1. Provide catalog data on each product specified hereunder.
   2. Schedule of duct construction standards.
   3. Provide shop drawings showing materials and construction details for single wall housing plenum.
   4. Provide shop drawings showing construction details, support, and seismic restraint of ductwork distribution systems.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Flexible Ducts:
1. Thermaflex M-KE
2. Gen Flex IMP-25S
3. Other Manufacturers: Submit substitution request.

B. SUPPORTS, ANCHORAGE AND RESTRAINTS

C. General:
1. Provide design for supports, anchorages, and seismic restraints for equipment when not shown on the Drawings.
2. Supports, anchorage and restraints provided are required to resist seismic forces as specified in the latest edition of the International Building Code for the seismic zone in which the project is constructed.
3. Follow provisions in Section 23 05 48, Vibration and Seismic Control for HVAC Piping and Equipment for seismic restraints.
4. Seismic restraints are not to introduce stresses in the ductwork caused by thermal expansion or contraction.
5. Connections to structural framing are not to introduce twisting, torsion, or lateral bending in the framing members. Provide supplementary steel as required.

D. Suspended Ductwork: Provide seismic restraints in accordance with the latest edition of the SMACNA, Seismic Restraint Manual - Guidelines for Mechanical Systems for the seismic hazard level corresponding to the seismic zone in which the project is constructed.

E. Engineered Support Systems: Provide designs and details for the following support systems with the seal of a professional engineer registered in the State having jurisdiction:
1. Supports and seismic restraints for suspended ductwork and equipment.
2. Support frames for ductwork and equipment which provide support from below.
3. Equipment and ductwork support frame anchorage to supporting slab or structure.

2.2 SHEETMETAL DUCTWORK

A. Fabricate from galvanized steel, unless noted otherwise.

B. Minimum gauge, duct construction, joint reinforcing, fittings, hangers, and supports in accordance with SMACNA HVAC Duct Construction Standards – Metal and Flexible, Latest Edition.

C. Duct Classification: Ducts considered low pressure when design velocities are 2000 fpm or less and maximum static pressure is 2-inches wg positive or negative.
1. The following ductwork constructed in accordance with minimum reinforcement requirements for static pressure class of 1/2-inch wg positive or negative.
   a. Supply ductwork downstream from terminal units.
   b. Supply, return or exhaust ductwork serving fans scheduled to operate at less than 1/2-inch wg
   c. Supply, return, or exhaust branch ductwork which serves one or two inlets/outlets.

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2. The following ductwork constructed in accordance with minimum reinforcement requirements for static pressure class of 1-inch wg positive or negative.
    a. Supply, return, or exhaust ductwork serving fans scheduled to operate at less than 1-inch wg On supply fans pressure drops for louvers, coils, clean filters, and sound traps may be deleted from scheduled fan static.
    b. Supply, return, or exhaust ductwork serving multiple duct branches where contractor can demonstrate that pressures will not exceed 1-inch wg positive or negative.
    c. Boiler direct vent combustion air intake ductwork.
    d. Water heater direct vent combustion air intake ductwork.
3. The following ductwork constructed in accordance with minimum reinforcement requirements for static pressure class of 2-inches wg, positive or negative.
    a. Supply, return, or exhaust ductwork serving fans scheduled to operate at pressures greater than 1-inch wg positive or negative.

D. Longitudinal seams on rectangular duct, Pittsburgh or Button punch snap lock. Snap lock seams for round duct may be used only on ducts classified for 1/2-inch wg. Longitudinal seams for round ducts using lap and rivet, spot weld, or fillet weld may be used only on ducts classified for statics 1-inch wg or less.

E. Joining and reinforcing systems manufactured by Ductmate, Roloc, or TDC are acceptable. Ductmate 35 is equivalent to SMACNA J, and Ductmate 25 is equivalent to SMACNA F.

F. Use of adjustable round elbows not permitted.

2.3 FLEXIBLE DUCTS

A. Flexible air duct with CPE or metal film liner permanently bonded to coated spring steel wire helix with 1-inch thick fiberglass insulation blanket covered with fiberglass reinforced metal film vapor barrier jacket.

B. Duct rated for 6-inch wg positive and 1-inch wg negative.

2.4 EXPOSED OR VISIBLE DUCTWORK IN FINISHED SPACES

A. Round:
    1. Material:
        a. Round or flat oval, machine formed, spiral lock-seam galvanized sheet metal ductwork of thicknesses as listed for sheet metal duct.
        b. Paintable surface.
    2. Fittings: Machine formed, shop fabricated, with welded seams, designed for easiest air flow, similar to United Sheet Metal numbers listed.
        a. Mitered Elbow with Turning Vanes: Type EV-90-2.
        b. Radius Elbows: Type E090-5. Similar for less than 90 degree elbows.
        c. Tees: Type Con-T-1.
        d. Reducing Fittings: May be used unless noted otherwise.

B. Rectangular:
    1. Same as for sheet metal ductwork but paintable surface.
    2. Inside reinforcing.
    3. Use special care to prevent imperfections in the metal surface.

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PART 3 EXECUTION

3.1 APPLIED LOCATIONS

A. Supply ductwork on downstream side of terminal box. Galvanized sheet metal ductwork, lined where indicated on the Drawings or as specified in Section 23 07 00, Insulation for HVAC.

B. Supply Ductwork from Spin-In Fittings to Supply Outlet Collar Connection: Flexible duct, maximum 4-foot length.

C. Return Air Trunk Ductwork from End Run to Unit Connection: Galvanized sheet metal ductwork, lined where indicated on the Drawings or as specified in Section 23 07 00, Insulation for HVAC.

D. Exhaust Ductwork: Galvanized sheet metal ductwork, lined where indicated on the Drawings or as specified in Section 23 07 00, Insulation for HVAC.

E. Ductwork between Transfer Grilles: Galvanized sheet metal ductwork, lined where indicated on the Drawings or as specified in Section 23 07 00, Insulation for HVAC.

F. Exposed or Visible Ductwork in Finished Spaces: Sheet metal as specified for application, lined where indicated on the Drawings or as specified in Section 23 07 00, Insulation for HVAC.

3.2 INSTALLATION

A. Ductwork:
   1. Seal traverse joints with an approved mastic during joining procedure or tape after joining to provide airtight duct system.
   2. Low pressure ductwork hanger and support systems in accordance with SMACNA HVAC Duct Construction Standards – Metal and Flexible. Wire supports are not allowed.
   3. Provide supplementary steel for support of ductwork in shafts and between building structural members.
   4. Fabricate changes in direction to permit easy air flow, using full 1.5D radius bends or fixed turning vanes in square elbows. Radius elbows less than 1.5D radius, splitter vanes.
   5. Change in duct size or shape necessitated by interference made using rectangular equivalents of equal velocity.
   6. Where pipe, structural member, or other obstruction passes through a duct, provide streamlined sheet metal collar around member and increase duct size to maintain net free area. Fit collar and caulk to make air tight.

B. Sound Attenuation (Internal Insulation):
   1. Provide sound attenuation duct where shown and as specified under Section 23 07 00, Insulation for HVAC.
   2. Duct dimensions shown are net inside attenuating material.

C. Dampers: Install where shown and where necessary to complete final balancing of system. Install regulators as specified in Section 23 33 00, Air Duct Accessories for each specific project condition. Leave dampers locked wide open in preparation for balancing.

D. Extractors: Install behind supply grilles and registers where shown.

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E. Flexible Connectors: Make connections to fans and other rotating equipment with flexible connectors with 2-inch minimum clearance between casing and ductwork. Not required on internally spring isolated units.

F. Spin-in Fittings:
1. Install at branch takeoffs to outlets using round or flex duct.
2. Connect to flexible duct with draw band strap and minimum of two wraps of duct tape.
3. Leave dampers locked wide open.

G. Flexible Ducts:
1. Make connections at ends using draw band strap and a minimum of 2 wraps of duct tape.
2. Suspend center spans from structure above using wire as required by code. Connect to manufacturer's eyelet on jacket or use 1-inch wide galvanized steel strap with single loop at top and smooth edges.
3. Suspending duct by laying it on the ceiling is prohibited.
4. Avoid crimping flex duct. Changes in direction made using 2D radius. Duct connections to grilles, registers, and diffusers using less than 2D radius bends are not acceptable. Where space is constricted, use sheet metal elbows or Thermaflex Flex Boots (or equal).

H. Ductwork, Exposed or Visible in Finished Areas:
1. Use extreme care in handling and installing.
2. Replace dented or damaged sections.
3. Install ductwork straight and true, parallel to building lines.
4. Make connections with pop rivets using couplings where applicable. Grind raw edges smooth and apply paintable sealant to cover imperfections.
5. Remove excess sealant to provide a finished joint.
6. Provide floor, wall, and ceiling plates as specified in Section 23 05 00, Common Work Results for HVAC.
7. Finish, clean and prime ductwork, and hangers for painting.

I. FIELD QUALITY CONTROL

J. Coordination with Balance Agency:
1. Provide services of a sheet metal person familiar with the system ductwork to provide assistance to the balancing agency during the initial phases of air balancing in locating sheet metal dampers.
2. Install missing dampers required to complete final balancing.

END OF SECTION

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SECTION 23 31 02

HVAC DUCTS AND CASING-MEDIUM PRESSURE

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes:
   1. Supports, Anchorage, and Restraints
   2. Single Wall Round Duct and Fittings
   3. Single Wall Oval Duct and Fittings
   4. Rectangular Steel Ductwork
   5. Related Sections

B. Division 01, General Requirements

C. Division 23, Heating, Ventilating, and Air Conditioning (HVAC)

D. Section 23 05 48, Vibration and Seismic Controls for HVAC Piping and Equipment

E. Section 23 05 90, Pressure Testing for HVAC Systems

F. Section 23 07 00, Insulation for HVAC

G. Section 23 33 00, Air Duct Accessories

1.2 QUALITY ASSURANCE

A. Installer Qualifications: Work performed by qualified, experienced mechanics, in accordance with the manual of Duct and Sheet Metal Construction of the Sheet Metal and Air Conditioning Contractors National Association and these Specifications.

B. Regulatory Requirements:
   1. Entire ductwork system including materials and installation, installed in accordance with NFPA 90A.
   2. Ductwork and components UL 181 listed Class I air duct, flame rating not to exceed 25 and smoke rating not to exceed 50.

1.3 SUBMITTALS

A. Submit the following:
   1. Shop Drawings of ductwork specified hereunder. Include details of supports and seismic restraint of ductwork distribution systems.
   2. Product data on medium pressure round and flat oval ductwork and fittings.
   3. Schedule of rectangular duct construction standards.

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PART 2 PRODUCTS

2.1 GENERAL

A. Fabricate from galvanized steel unless otherwise noted.

B. Minimum gauge, duct construction, joint reinforcing, fittings, hangers, and supports in accordance with the latest edition of SMACNA HVAC Duct Construction Standards, Third Edition, 2005.

C. Duct Classification:
1. Medium pressure when design velocities exceed 2000 fpm or static pressure is 2.0-inches wg or greater positive.
2. Ducts constructed in accordance with minimum reinforcement requirements for static pressure class of 4-inches positive.

2.2 SUPPORTS, ANCHORAGE AND RESTRAINTS

A. General:
1. Provide design for supports, anchorages, and seismic restraints for equipment when not shown on the Drawings.
2. Supports, anchorage and restraints provided are required to resist seismic forces as specified in the latest edition of the International Building Code for the seismic zone in which the project is constructed.
3. Follow provisions in Section 23 05 48, Vibration and Seismic Control for HVAC Piping and Equipment for seismic restraints.
4. Seismic restraints are not to introduce stresses in the ductwork caused by thermal expansion or contraction.
5. Connections to structural framing are not to introduce twisting, torsion, or lateral bending in the framing members. Provide supplementary steel as required.

B. Suspended Ductwork: Provide seismic restraints in accordance with the latest edition of the SMACNA, Seismic Restraint Manual - Guidelines for Mechanical Systems for the seismic hazard level corresponding to the seismic zone in which the project is constructed.

C. Engineered Support Systems: Provide designs and details for the following support systems with the seal of a professional engineer registered in the State having jurisdiction:
1. Supports and seismic restraints for suspended ductwork and equipment.
2. Support frames for ductwork and equipment which provide support from below.
3. Equipment and ductwork support frame anchorage to supporting slab or structure.

2.3 SINGLE WALL ROUND DUCT AND FITTINGS

A. Materials:
1. Medium pressure round ductwork up to 36-inch diameter spiral lock seam. Round ducts over 36-inches in diameter either spiral lock seam or shop fabricated with longitudinal seams.
2. Takeoffs:
   a. Main and branch takeoffs similar to United Spiral Uniform Duct fittings type SRHTC, SRHTL, or SRHL, typically.
   b. No saddle fittings allowed.
   c. Welded fittings.

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d. Saddle fittings with pop rivet fasteners and sealed with high pressure duct sealer may be used only when adding takeoff fittings to existing duct.

3. Transitions, Elbows:
   a. Transitions of concentric type or eccentric type to maintain elevations detailed, with not more than 15 degree angle variation on sloped portion.
   b. 90 degree elbows of 5 piece design with centerline radius equal to 1-1/2 of duct diameter minimum. Mitered elbows not allowed.
   c. 60 degree and 45 degree elbows of 3 piece design with long radius.
   d. Y-Branch fittings similar to United Uniseal SRHY or SRHYR. Bull head tees not allowed.

2.4 RECTANGULAR STEEL DUCTWORK

A. Fabricate from galvanized steel unless noted otherwise.

B. Longitudinal seams, Pittsburg type. Button punch snap lock may be used only if sheet metal screws are added on 24-inch centers.

C. Joining and reinforcement systems as manufactured by Ductmate, Roloc, or TDC are acceptable. Ductmate 35 is equivalent to SMACNA J reinforcement and Ductwork 25 is equivalent of SMACNA F. Fasten Ductmate to duct with sheet metal screws minimum of 6-inch on center.

D. Fittings:
   1. Fabricate fittings for easiest airflow using radius elbows with center-line radius elbows equal to 1-1/2 times the duct dimension in the plane of the turn.
   2. Transitions: Concentric or eccentric type to maintain elevations with not more than 15 degree angle variation on sloped portion.
   3. Conical Taps: For branch take-off to terminal unit, construct with inlet 4-inches wider than outlet and no raw edges inside.

E. Use of mitered elbows with turning vanes is not acceptable except where indicated on drawings. Radius elbows with centerline radius less than 1.5D radius vaned type and may be used only with approval of engineer.

PART 3 EXECUTION

3.1 APPLIED LOCATIONS

A. Supply ductwork on upstream side of air terminal unit.

B. Supply ductwork serving fans scheduled to operate at pressures greater than 2-inches wg positive.

C. Supply ductwork 20-feet downstream of air handling equipment and the first 6-feet of duct mains connect to the vertical ducts at each floor with round or oval double walled ductwork.

D. Acoustical line plenums on discharge of rooftop units. Plenum size sufficient for supply duct connections as shown on plans, minimum plenum size the same as unit opening.

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3.2 MEDIUM PRESSURE ROUND AND OVAL DUCTWORK INSTALLATION

A. Install in accordance with manufacturer's instructions and with the latest edition of SMACNA HVAC Duct Construction Standards.

B. Seal traverse and longitudinal joints with high pressure duct sealer and wrap with duct sealer tape or hard cast with minimum 2-inch overlap.

C. Field connections for ducts 36-inch diameter and less for round duct and 42-inches major axis and less for oval ducts not requiring additional reinforcing, use slip on connections. For other ducts use flanged joint connections, fabricated and sealed per manufacturer's instructions.

D. Oval duct uses reinforced per SMACNA standards.

E. Branch takeoffs rigidly connected to terminal unit without flex duct.

3.3 MEDIUM PRESSURE ROUND AND OVAL DOUBLE WALL DUCT INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Seal traverse and longitudinal joints with high pressure duct sealer and wrap with duct sealer tape or hardcast with minimum 2-inch overlap. Treat welded seams with protective paint inside and outside.

C. Use slip on connections for double wall round duct 34-inches diameter and below or 40-inch major axis on oval duct and below. Use flange connections on other sizes.

3.4 MEDIUM PRESSURE RECTANGULAR DUCT INSTALLATION

A. Install duct, fittings, supports, and hangers in accordance with the latest edition of SMACNA HVAC Duct Construction Standards.

B. Seal traverse and longitudinal joints with high pressure duct sealer and wrap with duct sealer tape or hard cast with minimum 2-inch overlap.

C. Provide supplementary steel for support of ductwork in shafts and between building structural members.

D. Change in duct size or shape necessitated by interference made using rectangular equivalents of equal velocity.

3.5 FIELD QUALITY CONTROL

A. Field Tests: Perform leakage tests in accord with Section 23 05 90, Pressure Testing for HVAC Systems.

END OF SECTION

SECTION 23 33 00

AIR DUCT ACCESSORIES

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes:
   1. Medium Pressure Duct Accessories
   2. Low Pressure Duct Accessories

1.2 RELATED SECTIONS

A. Division 01, General Requirements

B. Division 23, Heating, Ventilating, and Air Conditioning (HVAC)

C. Section 23 31 01, HVAC Ducts and Casing-Low Pressure

D. Section 23 31 02, HVAC Ducts and Casing-Medium Pressure

E. Section 23 09 00, Instrumentation and Controls for HVAC

1.3 QUALITY ASSURANCE

A. Work performed by qualified, experienced mechanics in accordance with the manual of Duct and Sheet Metal Construction of the National Association of Sheet Metal and Air Conditioning Contractors and these Specifications.

B. Install entire ductwork system, including materials and installation, in accordance with NFPA 90A.

C. Flexible connectors, flexible equipment connections, tapes, and sealants listed as UL 181, Class I air duct. Flame spread rating not to exceed 25 and smoke developed rating not to exceed 50.

1.4 SUBMITTALS

A. Submit the following: Product data for Duct Accessories.
   1. Medium Pressure Duct Accessories:
      a. Acoustical Turning Vanes
      b. Access Doors
      c. Bell Mouth Fittings
      d. Duct Sealer
   2. Low Pressure Duct Accessories:
      a. Access Doors
      b. Backdraft Dampers
      c. Water Eliminators
      d. Automatic Dampers
      e. Duct Sealer

B. Operation and Maintenance Data: Automatic dampers, fire dampers, smoke dampers. Combination smoke and fire dampers, air flow station.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Medium Pressure Duct Accessories:
   1. Duct Sealer:
      a. McGill Airseal Zero
      b. Design Polymerics DP 1090
      c. Or approved equal.
   2. Flexible Equipment Connector:
      a. Duro Dyne Corporation
      b. Ventfabrics
   3. Acoustical Turning Vanes:
      a. AirSan Acoustiturn
      b. Or approved equal.
   4. Access Doors:
      a. United Sheetmetal APR or ASR
      b. Metco
      c. Semco
      d. Cesco
      e. Ruskin
      f. Nailor-Hart
      g. Or approved equal.

B. Low Pressure Duct Accessories:
   1. Flexible Equipment Connector:
      a. Duro Dyne Corporation
      b. Ventfabrics
   2. Extrators:
      a. Carnes
      b. Anemostat
      c. Barber-Coleman
      d. Nailor-Hart
      e. Or approved equal.
   3. Access Doors:
      a. Air Balance
      b. Ruskin
      c. Metco
      d. Duro Dyne Corporation
      e. Cesco
      f. Nailor-Hart
      g. Or approved equal.
   4. Backdraft Dampers:
      a. Air Balance
      b. Ruskin
      c. Cesco
      d. Advanced Air

e. Nailor-Hart
f. Or approved equal.

2.2 MEDIUM PRESSURE DUCT ACCESSORIES

A. Duct Sealer:
1. Description:
a. Suitable for indoor/outdoor use, including application in moist conditions, rated to 10-inch wg.
b. Maximum Flame Spread/Smoke Developed Rating of 25/50, maximum VOC of 420 g/L less water.
c. SCAQMD Rule 1168 compliant.

B. Flexible Equipment Connector:
1. Description: Woven fiberglass fabric with neoprene coating, air-tight, water-tight, fire retardant.
2. Minimum Density: 30 oz. per sq. yd.
3. Temperature Range: -20 degrees F to 200 degrees F
4. Pressure Range: -10-inch wg to +10-inch wg

C. Turning Vane Assemblies:
1. Sheet Metal Vanes: Multiple radius hollow vane air foil type with 4-1/2-inch inside radius, galvanized steel construction.
2. Runners: Embossed type

D. Acoustical Turning Vanes: Multiple radius air foil type, perforated steel construction with fiberglass fill.

E. Access Doors:
1. Round, oval or rectangular to match duct, single wall to open against positive duct pressure, fastened with spring clips, pressure seal gasket, fastened with chain. Double wall access doors similar except provide insulated frame and insulated door.

F. Bell Mouth Fittings: Round or flat oval, radius of 0.20 D minimum.

2.3 LOW PRESSURE DUCT ACCESSORIES

A. Damper Regulators:
1. Acceptable Manufacturers:
a. Ventlok
b. Young
c. Duro Dyne Corporation
d. Or approved equal.
2. Dial Regulator – Concealed or exposed duct in unfinished spaces:
a. Blade lengths 18-inch and less: 3/8-inch shaft
b. Blade lengths 19-inches and above: 1/2-inch shafts
c. Ventlok 635, or 638 for insulated duct
3. Dial Regulator – Exposed duct in finished space:
a. 3/8-inch shaft
b. Ventlok 640
4. Dial Regulator – Concealed or non-accessible duct:
a. Blade lengths 18-inch and less: 3/8-inch shaft

b. Blade lengths 19-inches and above: 1/2-inch shafts
c. Ventlok 666 regulator with 680 mitered gear assembly where right angled turn is necessary.

5. End Bearings:
   a. Ducts rated to 1-inch WG, open end, Ventlok 607.
   b. Ducts rated above 1-inch WG, closed end, Ventlok 609.
   c. Exposed ductwork, finished spaces, Ventlock 609.
   d. Spring end bearings not allowed.

B. Volume Damper Fabrication:
1. Single blade dampers reinforced or crimped for rigidity, with pivot rod extending through duct. Dampers over 12-inches high use multiple opposed blade damper. Single blade damper no larger than 12-inches by 48-inches. Multiple blade damper factory fabricated, Ruskin MD-35 or equal.
2. Minimum gauge and duct construction in accordance with SMACNA, HVAC Duct Construction Standards, latest edition.
3. Splitter and butterfly dampers fabricated of 18 gauge galvanized steel.
4. Dampers of length suitable to close branch ducts without damper flutter.
5. Damper blade must be aligned with handle and index pointer.

C. Flexible Equipment Connector:
1. Description: Woven fiberglass fabric with neoprene coating, air-tight, water-tight, fire retardant.
2. Minimum Density: 30 oz. per sq. yd.
3. Temperature Range: -20 degrees F to 200 degrees F
4. Pressure Range: -10-inch wg to +10-inch wg

D. Extractors (EX): Gang operated blades, steel construction, blades at 1-inch centers, slide operator set 15 degrees into main trunk duct, Titus AG-45 with No. 1 operator.

E. Spin-in Fittings:
1. Sheet Metal Duct:
   a. Straight pattern sheet metal spin-in fitting with scoops designed for connection to sheet metal ductwork, volume damper, and locking quadrant.
   b. Construction with spot welds or rivets.
   c. Button-punch fabrication prohibited.
2. Fiberglass Duct:
   a. Straight pattern sheet metal spin-in fitting with scoops designed for connection to fiberglass ductwork volume damper, and locking quadrant.
   b. Spot weld or rivet construction.
   c. Button-punch fabrication prohibited.

F. Duct Sealer:
1. Based On:
   a. McGill Airseal Zero
   b. Design Polymerics DP 1090
2. Description:
   a. Suitable for indoor/outdoor use, including application in moist conditions, rated to 10-inch wg.
   b. Maximum Flame Spread/Smoke Developed Rating of 25/50, maximum VOC of 420 g/L less water.
   c. SCAQMD Rule 1168 compliant.

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G. Duct Tape for Sheet Metal:
   1. ARNO C520 duct tape similar United
   2. Duro Dyne Corporation
   3. Nashua

H. Tape and Adhesive/Activator System for Sheet Metal: Hardcast, Polymer Adhesives.

I. Turning Vane Assemblies:
   1. Sheet Metal Vanes: Multiple radius hollow vane air foil type 2-inch (small vane) or 4-1/2-inch (large vane) inside radius, galvanized steel construction.
   2. Runners: Push-on type.
   3. Acoustical Vanes: Multiple radius air foil type, perforated steel construction with fiberglass fill. AirSan Acoustiturn or as approved.

J. Access Doors:
   1. Doors complete with steel frame, steel door with backing plate, cam latches (two on units 14-inch by 14-inch and larger), hinge, and gasketing. Insulate doors on insulated or lined ducts.
   2. Grease Duct Access Door: Construct of metal thickness equal to metal duct, doors air, and grease tight with hinge and hand operable latches. Ductmate.
   3. Size:

Duct Width or Duct Diameter	Net Access Door Opening
Up to 8-inch	6-inch by 6-inch
9-inch to 12-inch	8-inch by 8-inch
13-inch to 20-inch	12-inch by 12-inch
21-inch to 30-inch	16-inch by 14-inch
31-inch to 42-inch	18-inch by 14-inch
Over 42-inch	Two 16-inch by 14-inch

K. Backdraft Dampers:
   1. Description: Gravity operated, vinyl edged, metal bladed backdraft dampers.

L. Drip Pans: Provide Type 304 stainless steel drip pans for cooling coils and exhaust heat recovery coils on built-up units as indicated.

M. Louver Blank-off Panels:
   1. At air intake or exhaust louvers which are only partially active area, blank off inactive area with sheet metal closure panels caulked airtight secured to louver frame and insulated with 2-inch rigid fiberglass insulation per Section 23 07 00, Insulation for HVAC.

N. Automatic Dampers:
   1. Description:
      a. Multi-blade air foil type, except where either dimension is less than 10-inches a single blade may be used. Maximum blade length to be 48-inches.
      b. Provide parallel blades for positive or modulating mixing service and opposed blades for throttling service.
      c. Blades to be interlocking, minimum 16 gauge galvanized steel.
   2. Compression type edge seals and side seating stops.
   3. Reinforced blades, have continuous full length axle shafts, axle to axle linkage, and/or operating jackshafts to provide coordinated tracking of blades.

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4. Dampers over 25 square-feet in area to be in two or more sections, with interconnected blades. Maximum air leakage of 3 cfm per square foot at 1-inch wg pressure.
5. Provide automatic dampers except those specified to be provided with units. Tested in accordance with AMCA Standard 500. Based on Ruskin CD-60.
6. Damper Operators: Refer to Section 23 09 00, Instrumentation and Controls for HVAC.
7. Manufacturers:
   a. Ruskin
   b. Greenheck
   c. Air Balance
   d. Cesco
   e. Or approved equal.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install devices as shown on the Contract Drawings and per manufacturer's recommendations.

B. Medium Pressure Duct Accessory installation specified under Section 23 31 02, HVAC Ducts and Casing-Medium Pressure.

C. Low Pressure Duct Accessory installation specified under Section 23 31 01, HVAC Ducts and Casing-Low Pressure.

D. Access Doors: Install where indicated and at duct mounted coils, humidifiers, automatic control dampers, smoke dampers, fire dampers, air flow stations, to provide access for cleaning and maintenance.

E. Back Draft Dampers: Install where indicated and at the discharge (or inlet) of exhaust fans where automatic dampers are not indicated.

F. Automatic Dampers:
   1. Install where indicated and are not specified with equipment or in Section 23 09 00, Instrumentation and Controls for HVAC.
   2. Coordinate damper operators with Section 23 09 00, Instrumentation and Controls for HVAC.

G. Drip Pans:
   1. Install under each cooling coil and exhaust heat recovery coil as indicated.
   2. Provide drain connection from each drip pan and pipe to nearest floor drain through trap.
   3. Drip pans over 6-feet in length require drain connections from both ends.
   4. Pitch drip pans in direction of air flow and to drain.

H. Louver Blank-off Panels: Install blank-off panels on unused portions of louvers.

END OF SECTION

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SECTION 23 34 00

HVAC FANS

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes:
   1. Inline Centrifugal Fans
   2. related sections

B. Division 01, General Requirements

C. Division 23, Heating, Ventilating, and Air Conditioning (HVAC)

1.2 SUBMITTALS

A. Submit the following:
   1. Shop Drawings: Showing dimensions, details of construction.
   2. Product Data: Showing performance of fans.
   3. Operation and Maintenance Data
   4. Submit certified sound power ratings for each fan.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Inline Centrifugal Fans:
   1. Greenheck
   2. Penn
   3. Cook
   4. Acme
   5. Carnes
   6. Twin City
   7. Other Manufacturers: Submit substitution request.

B. INLINE CENTRIFUGAL FANS
   1. General Description: Inline centrifugal, belt driven, cabinet fan, AMCA rated, backward inclined wheel, heavy gauge steel housing adequately braced with edges sealed, externally mounted 1800 rpm motor, hinged access doors.
   2. Refer to Section 23 05 00, Common Work Results for HVAC for energy efficient motor requirements.

C. Smoke Control Fans: Provide UL listing as “Power Ventilators for Smoke Control Systems” where used as a smoke control fan.

D. Drive:
   1. Multiple belt with fixed sheave and OSHA approved metal guard.
   2. Size drive for 150 percent of motor horsepower.

3. Fans used as part of a life safety system, provide 1-1/2- times the number of belts required, with a minimum of 2.

E. Vibration Isolation: Provide vibration isolation as indicated on drawings and in accordance with Section 23 05 48, Vibration and Seismic Controls for HVAC Piping and Equipment.

PART 3 EXECUTION

3.1 INSTALLATION, GENERAL

A. Provide flexible connections on inlet and discharge duct connection. Flexible connection for vane axial fans to be barium loaded vinyl.

3.2 INLINE CENTRIFUGAL FAN

A. Mount in ductwork using Vibration Isolation as specified in Section 23 05 48 Vibration and Seismic Controls for HVAC Piping and Equipment, and as indicated on drawings.

B. Connect ductwork using flexible connections.

C. Arrange for unobstructed access to access door.

END OF SECTION

SECTION 23 37 00

AIR OUTLETS AND INLETS

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes:

1. Diffusers and Grilles

1.2 RELATED SECTIONS

A. Division 01, General Requirements

B. Division 23, Heating, Ventilating, and Air Conditioning (HVAC)

C. Section 23 33 00, Duct Accessories

1.3 SUBMITTALS

A. Submit the following:

1. Shop Drawings: Showing dimensions and details of construction.

2. Product Data

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Where only Titus figure numbers are listed, equivalent products by the following manufacturers by using only one:

1. Carnes

2. Price

3. Krueger

4. Tuttle & Bailey

5. Anemostat

6. Nailor

7. Other Manufacturers: Submit substitution request.

2.2 DIFFUSERS AND GRILLES

A. Ceiling Supply Diffuser (C-1):

1. Perforated face modular diffuser with adjustable modular core, steel panel, square or rectangular neck size as indicated, discharge pattern as indicated, lay-in tee bar ceiling, or surface mounted as required (coordinate with architectural reflected ceiling plan).

2. White baked enamel finish, Titus PMC.

B. Ceiling Return/Exhaust Grille (C-2): Perforated face modular ceiling grille, steel panel, with duct adapters for round or rectangular as indicated, lay-in tee bar ceiling, or surface mounted as required (coordinate with architectural reflected ceiling plan), white baked enamel finish, Titus PAR.

C. Wall Supply Grille (H-1):

1. Adjustable aluminum double deflection blades, horizontal front with vertical rear blades, 3/4-inch spacing, 1-1/4-inch border, gasketed around face flange, white baked enamel finish.

2. Titus Model 272FL.

D. Wall Return/Exhaust Grille (H-2):

1. Aluminum 45 degree fixed single deflection, horizontal blades 3/4-inch spacing 1-1/4-inch border, gasketed around face flange, white baked enamel finish.

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2. Titus Model 3F manufacturer.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install diffusers tight to their respective mounting surfaces.

B. Installed plumb and true with room dimensions and accurately centered on projections as shown on the Architectural reflected ceiling plans.

C. Install extractors behind duct mounted sidewall supply grilles, and where shown. Turning vanes allowable if condition is the last outlet on a branch.

D. Set pattern control for directions of throw as shown on Drawings prior to air balancer arriving on Project.

E. Paint ductwork behind outlets flat black.

3.2 PERFORMANCE

A. Unit sizing is based on air being introduced at 20 degrees F temperature differential and being diffused at the 5-foot level to a velocity not greater than 50 FPM and a temperature differential not greater than 1.5 degrees F. Units are also selected so as not to exceed the NC-30 curve.

END OF SECTION

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SECTION 23 81 00

DECENTRALIZED UNITARY HVAC EQUIPMENT

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes:
   1. Fan Coil Unit
   2. Related Sections

B. Division 01, General Requirements

C. Division 23, Heating, Ventilating, and Air Conditioning (HVAC)

D. Section 23 05 48, Vibration and Seismic Controls for HVAC Piping and Equipment

E. Section 23 82 00, Convection and Heating and Cooling Units

F. SUBMITTALS

G. Submit the following:
   1. Shop drawings showing details of construction, dimensions, arrangement of components, isolation, filters, etc.
   2. Product data showing performance data, standard items, and accessories, operating weight.
   3. Flow diagrams and pipe sizing for refrigerant systems.
   4. Operating and maintenance data.
   5. Testing Submittals:
      a. Provide test plan and test procedures for approval.
      b. Explain in detail, step-by-step, actions and expected results to demonstrate compliance with the requirements of this specification and methods for simulating necessary conditions of operation to demonstrate performance of the system.
      c. Test plan and test procedures demonstrate capability of system to monitor and control equipment and to accomplish control and monitoring specified.

1.2 ACCEPTANCE TESTING AND TRAINING

A. Site Testing:
   1. General:
      a. Provide personnel, equipment, instrumentation, and supplies necessary to perform testing by a representative authorized by the manufacturer.
      b. Owner or Owner's representative will witness and sign off on acceptance testing.
   2. Acceptance Test:
      a. Demonstrate compliance of completed control system with contract documents.
      b. Use approved test plan, physical and functional requirements of project

B. Training:
   1. General:
      a. A representative authorized by the manufacturer conduct training courses for designated personnel in operation and maintenance of system.
      b. Orient training to specific system being installed under this contract.
      c. Provide training manuals for each trainee, with two additional copies provided for archival at project site.
      d. Manuals include detailed description of the subject matter for each lesson.
      e. Copies of audiovisuals delivered to Owner.
      f. Training day is defined as 8 hours of classroom instruction, including two 15-minute breaks and excluding lunchtime, Monday through Friday, during normal first shift in effect at training facility.
      g. Notification of planned training given to the Owner's representative at least 15 days prior to the training.
   2. Operator's Training I:
      a. Teach at a convenient location for a period of one training day.
      b. Upon completion, each student, using appropriate documentation, should be able to perform elementary operations with guidance and describe general hardware architecture and functionality of system.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Fan Coil Unit:
   1. Trane
   2. Daikin
   3. Carrier
   4. York
   5. Other Manufacturers: Submit substitution request.

2.2 HEATING AND VENTILATION UNIT (HV-20, 21)

A. Description:
   1. Furnish complete unit including cabinet, fan, and motor assembly, heating water coil and filter.
   2. Unit UL approved for application and wired per NEC.

B. Cabinet: 18 gauge steel, removable panels for access to components.

C. Fan and Motor: Centrifugal type, belt driven, permanently lubricated motor.

D. Filters: Throwaway type, 1-inch thick fiberglass.

E. Heating Coil: Non-ferrous construction with aluminum fins mechanically bonded to seamless copper tubing with brazed joints.

F. Configuration: Horizontal unit, ducted inlet, and outlet connection.

G. Electrical:
   1. Furnish magnetic contactors.

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2. Arrange for single point electrical connection.
3. Provide field wiring.

PART 3 EXECUTION

3.1 FAN COIL UNIT

A. Installation:
   1. Install in location shown on the Drawings. Level unit and secure to structure.
   2. Make piping connection and unit installation per manufacturer's recommendations and installation guides.

B. Start-Up:
   1. General: Comply with manufacturer's instructions.
   2. Install filters before operating unit.

END OF SECTION

SECTION 23 82 00

CONVECTION HEATING AND COOLING UNITS

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes:
   1. Panel Radiator

1.2 RELATED SECTIONS

A. Division 01, General Requirements

B. Division 23, Heating, Ventilating, and Air Conditioning (HVAC)

1.3 SUBMITTALS

A. Submit the following:
   1. Catalog data showing dimensions and performance.
   2. Computer calculations for coil performance.
   3. Operation and Maintenance Data: radiant panels.

PART 2 PRODUCTS

2.1 MANUFACTURERS
   1. Panel Radiators:
      a. Jaga
      b. Runtal
      c. Rittling
      d. Other Manufacturers: Submit substitution request.

2.2 PANEL RADIATORS (PR)

A. Panel radiator. Length, height and depth as indicated on drawings. Minimum Capacity in Btuh per lineal foot at 135°F average water temperature as scheduled.

B. Mounts: Wall mounting brackets.

C. Provide 12" side cover plate to conceal piping connections at side of radiator. Cover shall conceal piping from front view as well as from above. Cover piece shall be adjustable from side to side to provide varying lengths of cover.

D. Provide ¾" pipe connections. Connection locations as indicated on mechanical drawings.

E. Finish: Gloss powder coat finish of color to be selected by Architect. Architect to select from manufacturer's standard colors.

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PART 3 EXECUTION

3.1 INSTALLATION

A. Panel Radiators: Mount according to manufacturer's recommendations and architectural details.

END OF SECTION

SECTION 26 05 00

COMMON WORK RESULTS FOR ELECTRICAL

PART 1 GENERAL

1.1 SUMMARY

A. The intent of Division 26, Electrical Specifications and Drawings is to provide a complete and workable facility, with complete systems as required by applicable codes, as indicated, and as specified.

B. Include work specified in Division 26, Electrical and as indicated on Drawings. Include appurtenances, connections, fasteners, and accessories required to make a complete working system, whether indicated or not indicated.

C. Refer to Division 01, General Requirements.

1.2 RELATED SECTIONS

A. Division 01, General Requirements

B. Division 26, Electrical

1.3 REFERENCES

A. The latest adopted revisions of the publications listed below apply to these Specifications as referenced:

1. IBC International Building Code
2. NEC National Electrical Code
3. NFPA National Fire Protection Association
4. NEMA National Electrical Manufacturers Association
5. NECA National Electrical Contractors Association
6. ANSI American National Standards Institute
7. IEEE Institute of Electrical and Electronic Engineers
8. UL Underwriters Laboratories

1.4 SYSTEM DESCRIPTION

A. Ground Systems:

1. Provide complete ground systems indicated.
2. Include conduit system, transformer housings, switchboard frame, and neutral bus, motors, and miscellaneous grounds required by Contract Documents and by applicable codes.

B. System Identification:

1. Clearly identify elements of the Project electrical system to indicate the loads served, or the function of each item of equipment, connected under this work.
2. Comply with requirements of Division 26, Electrical, and with applicable codes.

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C. Drawings:
   1. Drawings are diagrammatic. They do not show every offset, bend, tee, or elbow, which may be required to install work in the space, provided and avoid conflicts with other construction.
      a. Prior to installing work, take field dimensions, and note conditions available for, installation.
      b. Follow the Drawings as closely as practical to do so, and install additional bends, offsets, and elbows where required by installation conditions.
         1) Additional offsets, bends, and other connectors are subject to approval by Project Engineer.
         2) Install additional offsets, bends, and other connectors without additional cost to Owner.
      c. The right to make any reasonable changes in outlet location prior to roughing in is reserved to the Owner's Representative.
   2. Luminaire Designations:
      a. Lower case letters adjacent to devices or luminaires indicate switching arrangement or circuit grouping.
      b. Numbers adjacent to devices indicate circuit connection.
   3. Circuits and Switching:
      a. Do not change branch circuiting and switching indicated; nor combine homeruns, without Engineer's prior approval.
      b. Do not combine or change feeder runs.
   4. Circuit Conductors:
      a. Cross or hash marks on conduit runs indicate quantity of No. 12 copper branch circuit conductors, unless otherwise noted.
      b. Where such marks do not appear, provide quantity of circuit conductors to the outlets shown to perform the control or circuiting indicated.
      c. Include ground, travelers, and switch legs required by the circuiting arrangement indicated.
      d. Provide a dedicated neutral conductor with each circuit. Do not use a shared neutral conductor between phases unless, requested or directed.

1.5 SUBMITTALS

A. Comply with Division 01, General Requirements.

B. Contractor Responsibilities:
   1. Submit submittals one time and in proper order.
   2. Ensure equipment will fit in the space provided.
   3. Deviations from the Drawings and Specifications specifically noted in the submittals. Failure to comply will automatically void any implied approval for use of the equipment on this project.

C. Shop Drawings and Equipment Data:
   1. Combine electrical shop drawings and equipment data in Submittal binders.
   2. Include in Submittal binders:
      a. Complete index of materials and equipment as required by Specifications to be documented by submittals.
      b. Fully describe equipment furnish per manufacturer's detailed specifications.
      c. All deviations from the Drawings and Specifications, noted on the submittals. Failure to comply will automatically void any implied approval for use of the equipment on this project.

D. Installation Drawings:
   1. Submit prior to starting installation.

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2. Show outlets, devices, terminal cabinets, conduits, wiring, and connections required for the complete system described.

E. Record Drawings:
1. Keep record drawings up to date as the work progresses.
2. Show changes, deviations, addendum items, change orders, corrections, and other variations from the Contract Drawings.
3. Keep record drawings at the jobsite and available for the Architect's review.
4. At the completion of the work, incorporate all deviations from the installation drawings to indicate as-built conditions.

F. Operation and Maintenance Data:
1. As specified in Division 01, General Requirements.
2. Provide a separate manual or chapter for each system as follows:
   a. Lighting System
   b. Lighting Control System
   c. Description of system.
3. Operating Sequence and Procedures:
   a. Step-by-step procedure for system start-up, including a pre-start checklist.
      1) Refer to controls and indicators by nomenclature consistent with that used on panels and in control diagrams.
   b. Detailed instruction in proper sequence, for each mode of operation (i.e., day-night, staging of equipment).
   c. Emergency Operation:
      1) If some functions of the equipment can be operated while other functions are disabled, give instructions for operations under those conditions.
      2) Include here only those alternate methods of operations (from normal) which the operator can follow when there is a partial failure or malfunctioning of components or other unusual condition.
   d. Shutdown Procedure:
      1) Include instructions for stopping and securing the equipment after operation.
      2) If a particular sequence is required, give step-by-step instructions in that order.
4. Preventive Maintenance:
   a. Schedule for preventive maintenance.
      1) State the recommended frequency of performance of each preventive maintenance task such as cleaning, inspection, and scheduled overhauls.
   b. Cleaning: Provide instructions and schedules for all routine cleaning and inspection with recommended lubricants.
   c. Inspection: If periodic inspection of equipment is required for operation, cleaning, or other reasons, indicate the items to be inspected and give the inspection criteria.
   d. Provide instructions for lubrication and adjustments required for preventive maintenance routines. Identify test points and given values for each.
5. Manufacturers' Brochures:
   a. Include manufacturers' descriptive literature covering devices and equipment used in the system, together with illustrations, exploded views, and renewal parts lists.
   b. Clearly define manufacturers' standard brochures so that the information applying to the actual installed equipment.
6. Results of performance testing, as specified in PART 3 of this Section.

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G. Submittals Procedures:
   1. Review and recommendations by the Architect or Engineer are not to be construed as change authorizations.
   2. Either if discrepancies are discovered between the materials or equipment submitted, and the Contract Documents, prior to or after the data is processed, the Contract Documents govern.

1.6 QUALITY ASSURANCE

A. Regulatory Requirements:
   1. Products and equipment comply with Oregon Revised Statute (ORS) 453.005(7)(e) prohibiting pentabrominated, octabrominated, and decabrominated diphenyl ethers. Where products or equipment within this specification contains these banned substances, provide complying products and equipment from approved manufacturers with equal performance characteristics.
   2. Provide work and materials conforming to:
      a. Local and State codes.
      b. Federal and State laws and regulations.
      c. Other applicable laws and regulations.
   3. Obtain and pay for all permits, licenses, and inspection certificates required by authorities having jurisdiction.
   4. Pay any other fees required by governing authorities for work of this Division.

B. Install only electrical products listed by a recognized testing laboratory, or approved in writing by the local inspection authority as required by governing codes and ordinances.

1.7 SITE VISITATION

A. Visit the site prior to bidding and become familiar with existing conditions and other factors which may affect the execution of the work. Complete coordination of installation of equipment with prior bid packages previously issued. Include related costs in the initial bid proposal.

1.8 COORDINATION

A. Coordinate Work of This Division with all other trades to ensure proper installation of electrical equipment.
   1. Review Drawings of other trades or crafts to avoid conflicts with cabinets, counters, equipment, structural members, and other possible impediments to electrical work.
   2. Report potential conflicts to the Architect prior to rough-in.
   3. Proceed with rough-in following Architect's directives to resolve conflicts.
   4. Architectural Drawings govern.

B. Verify the physical dimension of each item of electrical equipment to fit the available space. Contractor's responsibility includes:
   1. Coordination of the equipment to fit into the available space.
   2. Access routes through the construction.

C. Layout Drawings:
   1. Equipment arrangement shown on Drawings is diagrammatic to indicate general equipment sizing and spatial relationship. Include, as part of distribution equipment submittal, a scaled floor plan, which includes equipment shown with their submitted sizes. Include all feeder conduit routing, both aboveground and underground, including termination points at equipment. Submit for Engineer's review prior to commencing work.

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2. Provide additional wiring details at switchboards, motor control centers, and other areas where work is of sufficient complexity to warrant additional detailing for coordination.
3. Submit layout drawings for approval prior to commencing field installation.

D. Where electrical connections are required for equipment provided as Work of other Divisions, coordinate rough in and wiring requirements for that equipment with its supplier and installer prior to commencing work. Notify Architect and Engineer of any discrepancies between the actual rough in and wiring requirements, and those identified on Drawings for resolution prior to installation.

E. Arrange raceways, wiring, and equipment to permit ready access to switches, motors, and control components.
1. Keep doors and access panels clear.

F. Coordinate electrical, telephone, and other utility services with the appropriate serving utility.
1. No additional compensation will be allowed the Contractor for connection fees or additional work or equipment required by the serving utility, but not covered in the Drawings or Specifications.

G. Coordinate underground work with other contractors working on the site.
1. Coordinate particularly with contractors installing storm sewer, sanitary sewer, water, and irrigation lines to avoid conflicts.
2. Common trenches may be used with other trades, providing clearances required by codes and ordinances are maintained.

H. Coordinated Shop Drawings.
1. Prepare in two-dimensional format.
2. Include but are not limited to:
   a. Superplot plans of above ground work with a colored overlay of all trades including, but not limited to, HVAC piping, HVAC equipment, plumbing piping and equipment, sprinklers, lighting, lighting controls, cable tray, fire alarm devices, electrical power conduit, and ceiling system to a minimum of 1/2-inch equals 1-foot scale.
   b. Beam penetration drawings indicating beam penetrations meeting the requirements indicated on the floor plans and on the structural drawings to a minimum of 1/4-inch equals 1-foot scale.

1.9 CHANGE ORDERS

A. Supplemental cost proposals by the Contractor accompanied with a complete itemized breakdown of labor and materials. At the Architect's request, make available estimating sheets for the supplemental cost proposals. Separate and allocate labor for each item of work.

1.10 WARRANTY

A. Provide a written warranty covering the work of this Division as required by the General Conditions.
1. Incandescent Lamps: Excluded from this warranty.

B. Apparatus:
1. Free of defects of material and workmanship and in accord with the Contract Documents.
2. Built and installed to deliver its full rated capacity at the efficiency for which it was designed.
3. Operate at full capacity without objectionable noise or vibration.

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C. Include in Contractor's warranty for Work of Division 26, Electrical system damage caused by failures of any system component.

1.11 ALLOWANCES

A. Comply with Division 01, General Requirements.

1.12 ALTERNATES

A. Comply with Division 01, General Requirements.

B. Refer to Electrical Drawings for detailed information relating to the appropriate alternates.

PART 2 PRODUCTS

2.1 GENERAL

A. Where specified materials or methods conflict with applicable codes, the more stringent requirement applies.

B. Provide apparatus built and installed to deliver its full rated capacity at the efficiency for which it was designed.

C. Ensure that entire electrical system operates at full capacity without objectionable noise or vibration.

D. Materials and Equipment:
   1. Use materials and equipment that are:
      a. New
      b. Quality meeting or exceeding specified standards.
      c. Free of faults and defects.
      d. Conforming to Contract Documents.
      e. Of size, make, type, and quality specified.
      f. Suitable for the installation indicated.
      g. Manufactured in accordance with NEMA, ANSI, UL, or other applicable standards.
      h. Otherwise as specified in Division 01, General Requirements.
   2. Equipment not meeting all requirements will not be acceptable, even though specified by name.
   3. Where two or more units of the same class of equipment are furnished, use products of the same manufacturer.
      a. Component parts of the entire system need not be products of same manufacturer.
   4. Basis of Design:
      a. Consider the Basis of Design equipment scheduled or specified by performance or model number.
      b. If other equipment is provided in lieu of the Basis of Design equipment, assume responsibility for all changes and costs which may be necessary to accommodate this equipment, including, but not limited to:
         1) Different sizes and locations for connections.
         2) Different dimensions.
         3) Different access requirements.
         4) Other differences.

PART 3 EXECUTION

3.1 INSTALLATION

A. General:
1. Provide a complete properly operating system for each item of equipment specified.
2. Install materials in a neat and professional manner.
3. Comply with equipment manufacturer's written instructions, the best industry practices, and the Contract Documents.
4. Comply with latest published NECA Standard of Installation, and provide competent supervision.

B. Clarification:
1. Where there is a conflict among manufacturer's instruction, best practice, and the Documents, request clarification from the Architect prior to rough-in.
2. Architect's decision will be final.
3. Remove and correct work installed without clarification at no cost to the Owner.

C. Existing concrete, block, or brick walls are considered not accessible and may require use of Surface Mounted Raceway (SMR) if existing concealed raceway and device boxes are not available for reuse or do not meet the intent of the design (i.e., proximity to egress path, point of use, etc.). Coordinate route and installation where SMR is required with the Architect/Engineer prior to rough-in. Responsible for reinstalling SMR routed without such prior approval to the Architect's satisfaction.

D. Existing stud walls (wood or metal) with or without blocking with plaster, plasterboard, or paneling finish are considered accessible with accessible ceiling, attic, tunnel, or crawl space above, below, or adjacent. Remove, patch, and repair finished surface as required to conceal rough in for new device locations. If it is determined that a specific instance will not permit concealment of rough-in due to obstructions such as beams, headers, and other structural elements, prior approval before rough-in from the Architect is required.

3.2 INSTALLATION IN RATED CONSTRUCTION

A. Install intumescent material around ducts, conduits, and other electrical elements penetrating rated construction.

B. Comply with firestop materials manufacturer written instructions to prevent spread of smoke or fire through sleeves or block-outs penetrating rated fire barriers.

C. Provide firestop materials specified in Division 07, and as follows:
1. Capable of passing a 3-hour test per ASTM E-814 (UL 1479).
2. Consisting of material capable of expanding nominally eight times when exposed to temperatures of 250 degrees F-350 degrees F.
3. An alternate method utilizing intumescent materials in caulk or putty complying with Division 07, Thermal and Moisture Protection Section, "Through-Penetration Firestop Systems" may be used.

3.3 EXCAVATION AND BACKFILL

A. Perform all necessary excavation and backfill for the installation of electrical work in compliance with Division 31, Earthwork.

B. Direct Burial Cable or Non-Metallic Conduit:
   1. Minimum 3-inch cover of sand or clean earth fill placed around the cable or conduit on a leveled trench bottom.
   2. Lay steel conduit on a smooth level trench bottom, so that contact is made for its entire length.
   3. Where the electrical conduit is being laid, remove water from trench.

C. Place backfill in layers not exceeding 8-inches deep and compact to 95 percent of maximum density at optimum moisture to preclude settlement.
   1. Interior: Bank sand or pea gravel.
   2. Exterior: Excavated material with final 8-inches clean soil.

D. Following backfilling, grade all trenches to the level of surrounding soil. Dispose excess soil at the site as directed.

E. Provide 6-inches wide vinyl tape marked ELECTRICAL in backfill, 12-inches below finished grade, above all high voltage cable or conduit runs.

F. Coordinate patching of all asphalt or concrete surfaces disturbed by this work with General Contractor.

3.4 NOISE CONTROL

A. Minimize transmission of noise between occupied spaces.

B. Outlet Boxes:
   1. Do not install outlet boxes on opposite sides of partitions back to back.
   2. Do not use straight through outlet boxes, except where indicated.

C. Conduit:
   1. Route conduit along corridors or other “noncritical” space to minimize penetrations through sound rated walls, or through non-sound-rated partitions between occupied spaces.
   2. Grout solid and airtight all penetrations through sound rated partitions.
   3. Use flexible connections or attachments between independent wall structures.
      a. Do not rigidly connect (i.e., bridge) independent wall structures.

D. Do not install contactors, transformers, starters, and similar noise-producing devices on walls that are common to occupied spaces, unless otherwise indicated.
   1. Where such devices are indicated to be mounted on walls common to occupied spaces, use shock mounts, or otherwise isolate them to prevent the transmission of noise to the occupied spaces.

E. Ballasts, contactors, starters, transformers, and like equipment which are found to be noticeably noisier than other similar equipment on the project will be deemed defective and shall be replaced.

3.5 EQUIPMENT CONNECTIONS

A. General:
   1. Provide complete electrical connections for all items of equipment requiring such connections, including incidental wiring, materials, devices, and labor necessary for a finished working installation.
   2. Verify the location and method for connecting to each item of equipment prior to roughing-in.
   3. Check the amperage, maximum overcurrent protection, voltage, phase, and similar attributes of each item of equipment before rough in and connection.

B. Motor Connections:
   1. Make motor connections for the proper direction of rotation.
   2. Minimum Size Flex for Mechanical Equipment: 1/2-inch; except at small control devices where 3/8-inch flex may be used.
   3. Exposed Motor Wiring: Jacketed metallic flex with minimum 6-inches slack loop.
   4. Do not test run pump motors until liquid is in the system.

C. Control devices and wiring relating to the HVAC systems are furnished and installed under Division 23, HVAC; except for provisions or items indicated in Division 26, Electrical Drawings and Specifications.

3.6 EQUIPMENT SUPPORT

A. Minimum Support Capacity:
   1. Provide fastening devices and supports for electrical equipment, luminaires, panels, outlets, and cabinets capable of supporting not less than four times the ultimate weight of the object or objects fastened to or suspended from the building structure.

B. Luminaire Supports:
   1. Support luminaires from the building structure.
   2. Use supports that provide proper alignment and leveling of luminaires.
   3. Where permitted at exposed luminaires, install flexible connections neat and straight, without excess slack, and attached to the support device.

C. Support all junction boxes, pull boxes, or other conduit terminating housings located above the suspended ceiling from the floor above, roof, or penthouse floor structure to prevent sagging or swaying.

D. Conduits:
   1. Support suspended conduits 1-inch and larger from the overhead structural system with metal ring or trapeze hangers and threaded steel rod having a safety factor of four.
   2. Conduits smaller than 1-inch installed in ceiling cavities, may be supported on the mechanical system supports when available space and support capacity has been coordinated with the subcontractor installing the supports.
   3. Anchor conduit installed in poured concrete to the steel reinforcing with No. 14 black iron wire.

E. Powder actuated or similar shot-in fastening devices will not be permitted for any electrical work except by special permission from the Architect.

3.7 ACCESS DOORS

A. Location and size of access doors is Work of Division 26, Electrical.

B. Furnishing and installation of access doors is work of Division 08, Openings.

3.8 ALIGNMENT

A. Install panels, cabinets, and equipment level and plumb, parallel with structural building lines.

B. Install distribution equipment and electrical enclosures fitted neatly, without gaps, openings, or distortion.

C. Properly and neatly, close unused openings with approved devices.

D. Fit surface panels, devices, and outlets with neat, appropriate, trims, plates, or covers without overhanging edges, protruding corners, or raw edges.

3.9 CUTTING AND PATCHING

A. General:
   1. Comply with Division 01, General Requirements.
   2. Restore to original condition new or existing work cut or damaged by installation, testing, and removal of electrical Work.
   3. Patch and finish spaces around conduits passing through floors and walls to match the adjacent construction, including painting or other finishes.
   4. Clean up and remove all dirt and debris.

B. Make additional required openings by drilling or cutting. Use of jackhammer is prohibited.

C. Cut oversize fill holes so that a tight fit is obtained around the objects passing through.
   1. In rated construction, comply with Division 07, Thermal and Moisture Protection.

D. Obtain Architect's permission and direction prior to piercing beams or columns.

E. Where alterations disturb lawns, paving, walks, and other permanent site improvements, repair and refinish surfaces to condition existing prior to commencement of work.

3.10 PROTECTION OF WORK

A. Protect electrical work and equipment installed under this Division against damage by other trades, weather conditions, or any other causes.
   1. Equipment found damaged or in other than new condition will be rejected as defective.

B. Keep switchgear, transformers, panels, luminaires, and electrical equipment covered or closed to exclude dust, dirt, and splashes of plaster, cement, paint, or other construction material spray.
   1. Equipment not free of contamination is not acceptable.

C. Provide enclosures and trims in new condition, free of rust, scratches, and other finish defects.
   1. If damaged, properly refinish in a manner acceptable to the Architect.

3.11 UNINTERRUPTED SERVICE

A. Maintain electrical service to all functioning portions of the building throughout construction.

B. Pre-arrange with Owner outages necessary for new construction.
   1. Comply with Division 01, General Requirements.
   2. Apply for scheduled shutdowns minimum 4 weeks prior to time needed and reconfirm a minimum of 72 hours prior to time needed.
   3. Contractor is liable for any damages resulting from unscheduled outages or for those not confined to the pre-arranged times. Damages include costs incurred by the Owner and by the Owner's tenants.

C. Maintain signal and communication systems and equipment in operation at all times.
   1. Outages of these systems shall be treated the same as electrical power outages.

D. Maintain telephone services in accordance with Division 01, General Requirements.

3.12 DEMOLITION AND SALVAGE

A. General:
   1. Remove or relocate all electrical wiring, equipment, luminaires, etc., as may be encountered in removed or remodeled areas in the existing construction affected by this work.
   2. Disconnect electrical service to hard-wired equipment scheduled for removal under other Divisions of Work.
   3. Wiring which serves usable existing outlets restored and routed clear of the construction or demolition.
   4. Safely cut off and terminate wiring abandoned and removed to leave site clean.

B. Reuse of Existing:
   1. Existing concealed conduits in good condition may be reused for installation of new wiring where available.
   2. Existing undamaged, properly supported surface conduits may be reused where surface conduits are called for, if the installation meets all workmanship requirements of the Specifications.
   3. Where new wiring is added or existing wiring disturbed in existing branch circuit raceways, existing wires replaced with new.

C. Salvage and Disposal:
   1. Removed materials, not containing hazardous waste, not scheduled for reuse shall become the property of the Contractor for removal from the site, except for those items specifically indicated on the Demolition Drawings for salvage or reuse.
   2. Materials containing, or possibly containing, hazardous waste identified for removal and disposal by the Owner's Hazardous Waste Contractor.
   3. Neatly store salvaged items at one location at the site where directed by the Owner's Representative.
   4. Salvage properly operating circuit breakers from panels scheduled for removal and use to replace faulty or inadequate breakers in existing panels scheduled to remain.

3.13 COMPLETION AND TESTING

A. General:
   1. Comply with Division 01, General Requirements.

B. Upon completion, test systems to show that installed equipment operates as designed and specified, free of faults and unintentional grounds.
   1. Schedule system tests so that several occur on the same day.
   2. Coordinate testing schedule with construction phasing.
   3. Conduct tests in the presence of the Architect or its representative.
   4. Notify Architect of tests 48 hours in advance.

C. Engage a journeyman electrician with required tools to conduct equipment tests. Arrange to have the equipment factory representative present for those tests where the manufacturer's warranty could be impacted by the absence of a factory representative.

D. Perform tests per the requirements of each of the following systems:
   1. Lighting System
   2. Lighting Control System
   3. Provide a written record of performance tests and submit with operation and maintenance data.

3.14 COMMISSIONING

A. Complete phases of work so the system, equipment, and components can be checked out, started, calibrated, operationally tested, adjusted, balanced, functionally tested, and otherwise commissioned. Complete systems, including subsystems, so they are fully functional.

B. Perform commissioning as specified in Section 01 91 00, General Commissioning Requirements, the technical sections, and Section 26 08 00, Commissioning of Electrical Systems.
   1. Unless specified otherwise in the technical sections, provide factory startup services for the following items of equipment:
      a. Lighting Control Systems

C. Participation in Commissioning:
   1. Provide skilled technicians to checkout, startup, calibrate, and test systems, equipment, and components.
   2. The Engineer reserves the right to judge the appropriateness and qualifications of the technicians relative to each item of equipment or system.

D. Resolution of Deficiencies:
   1. Complete corrective work in a timely fashion to permit timely completion of the commissioning process. Experimentation to render system performance permitted.

E. Verification and Documentation:
   1. Once each test is performed, have the commissioning manager observe the physical responses of the system and compare them to the specified requirements to verify the test results.
   2. Submit site observation reports for deficiencies in the system.
   3. Record the result of individual checks or tests on the pre-approved checklist, test, and report form from the commissioning plan and submit results for review.

END OF SECTION

SECTION 26 05 19

LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes:
   1. Conductors - 600V
   2. Power Limited Wiring
   3. Conductors - Fire Pump Circuits
   4. MC Branch Circuit Cable
   5. Connectors - 600V and Below

1.2 RELATED SECTIONS

A. Division 01, General Requirements

B. Division 26, Electrical

C. Section 26 05 26, Grounding and Bonding for Electrical Systems

D. Section 26 05 33, Raceways and Boxes for Electrical Systems

E. Section 26 05 53, Identification for Electrical Systems

F. Section 26 05 80, Electrical Testing

1.3 REFERENCED STANDARDS

A. ASTM: American Society For Testing and Materials:
   1. ASTM B 3 Soft or Annealed Copper Wire
   2. ASTM B 8 Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft
   3. ASTM B 33 Tinned Soft or Annealed Copper Wire for Electrical Purposes

B. ICEA: Insulated Cable Engineers Association:
   1. S-95-658 Non-shielded 0-2 kV Cables

C. IEEE: Institute of Electrical and Electronic Engineers:
   1. IEEE 383 Type Test of Class IE Electric Cables, Field Splices, and Connections

D. UL: Underwriters Laboratories:
   1. UL 44 Rubber-Insulated Wires and Cables
   2. UL 83 Thermoplastic-Insulated Wires and Cables
   3. UL 1277 Type TC Power and Control Tray Cable

1.4 SUBMITTALS

A. Submit product data for the following materials:
   1. Single conductor 600V power and control conductors.
   2. Fire Pump Cable
   3. MC Cable

B. Submittals of the following materials consist only of a listing of the manufacturer's name and the applicable catalog numbers of the items to be utilized:
   1. Connectors
   2. Branch Circuit Conductor Splices
   3. Splices with Compression Fitting and Heat-Shrinkable Insulator

C. Submit cable test data per testing requirements of PART 3.

1.5 QUALITY ASSURANCE

A. Copper Conductors: Indicated sizes considered minimum for ampacities and voltage drop requirements.

B. Conductors for special systems as recommended by the equipment manufacturer except as noted.

C. Deliver conductors to the job site in cartons, protective covers, or on reels.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Conductors - 600V:
   1. General
   2. Essex
   3. Southwire
   4. Or approved equal.

B. Conductors - Fire Pump Circuits:
   1. Pryotenax

C. MC Branch Circuit Cable:
   1. AFC Cable Systems
   2. Southwire
   3. Okonite

D. Connectors - 600V and Below:
   1. Burndy
   2. Anderson
   3. Or approved equal

2.2 CONDUCTORS – 600V

A. Type:

1. Copper: 12 AWG minimum size unless noted otherwise. 12 AWG and 10 AWG, solid or stranded, 8 AWG or larger, Class B concentric or compressed stranded.
2. Aluminum: Not allowed.
3. Insulation:
4. THHN/THWN-2 for conductors 6 AWG and smaller.
5. XHHW-2 for conductors 4 AWG and larger.

B. Thru wiring in fluorescent luminaires rated for 90 degree C minimum.

2.3 POWER LIMITED WIRING

A. Copper, stranded or solid as recommended by the system manufacturer.

B. Insulation appropriate for the system and location used.

2.4 MC BRANCH CIRCUIT CABLE

A. Sheath:
1. Steel or Aluminum, of the interlocking metal type, continuous and close fitting.
2. Sheath not considered a current carrying or grounding conductor.

B. Conductors:
1. Solid copper, of the same ampacity as the conduit/wire system indicated for the specific location.
2. Provide separate green insulated grounding conductors in circuits where an isolated ground is called for.

2.5 CONNECTORS – 600V AND BELOW

A. Branch Circuit Conductor Splices:
1. Twist-on wire connectors: 3M Insulated Electrical Spring Connector (312/512), Ideal Industries Wing-Nut, or Buchanan B-Cap.
2. Push in self-locking type connectors, WAGO.

B. Cable Splices:
1. Compression tool applied sleeves, Kearney, Burndy, or equivalent with 600V heat shrink insulation.
2. Submit proposed splice location to the Engineer for review, except where indicated on the plans

C. Terminator Lugs for Stranded Wire:
1. 10 AWG Wire and Smaller: Spade flared, tool applied.
2. 8 AWG Wire and Larger: Compression tool applied.
3. Setscrew type terminator lugs furnished as an integral part of distribution equipment, switches and circuit breakers will be acceptable.

PART 3 EXECUTION

3.1 CONDUCTORS

A. Pulling compounds may be used for pulling conductors. Clean residue from the conductors and raceway entrances after the pull is made.

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B. Pulleys or Blocks:
   1. Use for alignment of the conductors when pulling.
   2. Pulling in accordance with manufacturer's specifications regarding pulling tensions, bending radii of the cable, and compounds.

C. Make up and insulate wiring promptly after installation of conductors. Do not pull wire in until bushings are installed and raceways terminations are completed. Do not pull wire into conduit embedded in concrete until after the concrete poured and forms stripped.

D. Provide a dedicated neutral conductor with each branch circuit, do not use a shared neutral conductor between phases unless specifically requested or directed.

3.2 MC CABLE

A. Allowed only for connection to motors or equipment and limited to 8' in length.

B. Do not use as branch circuit homeruns to branch panelboards.

C. Terminate MC cabling within a local junction box and transition to conduit and building wire homerun back to panelboard within the room or as soon as possible.

D. Locate junction box within one of the following spaces:
   1. Ceiling space
   2. Other accessible area of the room
   3. Immediate area where MC cabling is servicing devices.

E. EMT or RMC conduit utilized for branch circuit homeruns to branch panelboards.

F. Provide enclosures and terminals to transition from MC Cable to building wire as required.

3.3 CONNECTORS

A. Terminate control and special systems with a tool applied spade flared lug when terminating at a screw connection.

B. Screw and bolt type connectors made up tight and retightened after an 8-hour period.

C. Apply tool applied compression connectors per manufacturer's recommendations and physically checked for tightness.

3.4 COLOR CODING

A. Color code secondary service, feeders, and branch circuit conductors. Phase color code to be consistent at feeder terminations, A-B-C left-to-right, A-B-C top-to-bottom, or A-B-C front-to-back. Color code is as follows:

120/240V 208Y/120V	Phase
Black	A
Red	B

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Blue	C
White	Neutral
Green	Ground**
Pink or Tan	Switchlegs
Purple	Travelers
* or white with colored (other than green) tracer	
**Ground for isolated ground receptacles green with yellow tracer.	

B. Use solid color compound or solid color coating for 12 AWG and 10 AWG branch circuit conductors and neutral sizes.

C. Phase conductors 8 AWG and larger color code using one of the following:
   1. Solid color compound or solid color coating.
   2. Stripes, bands, or hash marks of color specified above.
   3. Colored as specified using 3/4-inch wide tape. Apply tape in half overlapping turns for a minimum of three inches for terminal points and in junction boxes, pull boxes, troughs, manholes, and handholes. Apply the last two laps of tape with no tension to prevent possible unwinding. Apply tags to cable stating size and insulation type where cable markings are tape covered.

D. Color-coding of the flexible wiring system conductors and connectors.

E. For modifications and additions to existing wiring systems, conform color-coding to the existing wiring system.

3.5 FIELD TESTING

A. 600V Rated Conductors: Test for continuity. Conductors 100A and over in meggered after installation and prior to termination. Provide the megger, rated 1,000V DC, and record and maintain the results, in tabular form, clearly identifying each conductor tested.
   1. Replace cables when test value is less than 1 megohms.
   2. Cable test submittal include results, equipment used, and date.

END OF SECTION

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SECTION 26 05 26

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes:
   1. Ground Conductors
   2. Connectors
   3. Ground Pads
   4. Ground Rods

1.2 RELATED SECTIONS

A. Division 01, General Requirements

B. Division 26, Electrical

C. Section 26 05 13, Medium Voltage Cables

D. Section 26 05 19, Low Voltage Electrical Power Conductors and Cables

E. Section 26 05 33, Raceways and Boxes for Electrical Systems

F. Section 26 05 80, Electrical Testing

G. Section 26 27 26, Wiring Devices

H. Section 26 29 00, Motor Controllers

1.3 QUALITY ASSURANCE

A. Provide complete ground systems as indicated. Include conduit system, transformer housings, switchboard frame and neutral bus, motors, and miscellaneous grounds required.

B. Provide 600V insulated main bonding jumper for utility company connection between ground bus in switchgear lineup and ground termination point or service ground in transformer vault as directed by the utility.

C. Provide an insulated ground conductor in every conduit or raceway containing power conductors.

D. Continue existing system as specified herein and shown on the Drawings.

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PART 2 PRODUCTS

2.1 GROUND CONDUCTORS

A. Green insulated copper for use in conduits, raceways, and enclosures.

B. Bare copper for ground grids and grounding electrode systems.

2.2 CONNECTORS

A. Cast, set screw, or bolted type.

B. Form poured, exothermic welds.

C. Grounding lugs where provided as standard manufacturer's items on equipment.

PART 3 EXECUTION

3.1 INSTALLATION

A. Grounding Conductors: Sized in accordance with Article 250, Tables 250.66 and 250.122 of the National Electrical Code.

B. Grounding Conductor Connectors: Make up tight, located for future servicing, and ensure low impedance.

C. Ground the electrical system, the cold-water service, structural steel, and transformers to the building ground grid.

D. Plug-in Receptacles: Bonded to the boxes, raceways, and grounding conductor.

3.2 EQUIPMENT

A. Provide separate green insulated equipment ground conductor in non-metallic and flexible electrical raceways.

B. Ground luminaires, panels, controls, motors, disconnect switches, exterior lighting standards, and noncurrent carrying metallic enclosures. Use bonding jumpers, grounding bushings, lugs, buses, etc., for this purpose.

C. Provide grounding bushings on feeder conduit entrances to panels and equipment enclosures and bond bushings to enclosures with minimum 10 AWG conductor. Connect the equipment ground to the building system ground. Use the same size equipment ground conductors as phase conductors, up through 10 AWG.

3.3 GROUND RESISTANCE TEST

A. Accomplish with a ground resistance direct-reading single test meter utilizing the Fall-of-Potential method and two reference electrodes. Perform test prior to interconnection to other grounding systems. Orient

the concrete-encased ground electrode to be tested and the two reference electrodes in straight-line spaced 50-feet apart. Drive the two reference electrodes 5-feet deep.

B. Provide test results writing.
   1. Show temperature, humidity, and condition of the soil at the time of the tests.
   2. Where the ground resistance exceeds 5 Ohms, the Engineer will issue additional instructions.

END OF SECTION

SECTION 26 05 29

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes:
   1. Hangers
   2. Pipe Straps
   3. Support of Open Cabling
   4. Rooftop Conduit Supports

1.2 RELATED SECTIONS

A. Division 01, General Requirements

B. Division 26, Electrical

C. Section 26 05 33, Raceways and Boxes for Electrical Systems

D. Section 26 05 36, Cable Trays for Electrical Systems

E. Section 26 22 00, Low Voltage Transformers

F. Section 26 24 13, Switchboards

G. Section 26 24 16, Panelboards

H. Section 26 50 00, Lighting

1.3 REFERENCED STANDARDS

A. International Building Code (IBC)

B. Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)

PART 2 PRODUCTS

2.1 HANGERS

A. Kindorf B-905-2A Channel, H-119-D washer, C105 strap, minimum 1/2-inch rod with ceiling flange, or approved equal.

2.2 PIPE STRAPS

A. Two-hole galvanized or malleable iron.

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2.3 SUPPORT OF OPEN CABLING

A. Support of Open Cabling: Label NRTL for support of Category 16 cabling, designed to prevent degradation of cable performance and pinch points that could damage cable.
   1. Support brackets with cable tie slots for fastening cable ties to brackets.
   2. Lacing bars, spools, J-hooks, and D-rings.
   3. Straps and other devices.

2.4 ROOFTOP CONDUIT SUPPORTS

A. Manufacturer:
   1. Cooper B-Line Dura-Blok Rooftop Supports
   2. Erico
   3. Or approved equal.

B. Curb base made of 100 percent recycled rubber and polyurethane prepolymer with a uniform load.

C. Capacity of 500 pounds per linear foot of support.

D. UV Resistant.

E. Steel frame: 14 gauge galvanized strut per ASTM A653 or 12 gauge galvanized strut per ASTM A653 for bridge series.

F. Continuous block channel supports with 1-inch gaps to allow water flow, bridge change supports, extendable height channel supports, and elevated single conduit supports.

G. Attaching hardware: Zinc plated threaded rod, nuts and attaching hardware per ASTM B633 fastened directly into rubber material with weather resistant Type 12 lag screws.

H. Provide load distribution plates as required for concentrated loads.

I. Finish: Black

J. Provide hot dipped galvanized components where exposed to weather.

PART 3 EXECUTION

3.1 INSTALLATION

A. Provide electrical equipment supports.

B. Install vertical support members for equipment, straight and parallel to building walls.

C. Provide independent supports to structural member for electrical fixtures, materials, or equipment installed in or on ceiling, walls, or in void spaces and/or over furred or suspended ceilings.

D. Do not use other trades' fastening devices to support electrical equipment materials or fixtures.

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E. Do not use supports and/or fastening devices to support other than one particular item.

F. Support conduits within 18-inches of outlets, boxes, panels, cabinets, and deflections.

G. Provide complete seismic anchorage and bracing for the vertical and lateral restraint of conduit, cable trays, bus ducts, and electrical equipment as required by IBC Chapter 6 and the most recent version of the SMACNA Seismic Restraint Manual for Seismic Hazard Level (SHL) A.

H. Submit shop drawings of bracing systems to the Architect for review and bear the seal of a professional engineer registered in the State the project is located.

3.2 LUMINAIRES

A. Light-Duty Ceiling Systems:
1. Attach 12 gauge hanger wire from each corner of the luminaire to the structure above.
2. Positively and securely, attach luminaire within 6-inches of each corner to the suspended ceiling-framing member by mechanical means.

B. Intermediate-Duty Ceiling Systems:
1. Positively and securely, attach luminaire within 6-inches of each corner to the suspended ceiling-framing member by mechanical means.
2. Attach 12 gauge hanger wire within 3-inches of each corner of each luminaire.
3. Connect two 12 gauge slack wires from the luminaire housing to the structure above for luminaires weighing less than 56 pounds.
4. Support luminaries weighing 56 pounds or more directly from the structure above with approved hangers attached to each corner of the luminaire.

C. Heavy-Duty Ceiling Systems:
1. Positively and securely attach luminaire within 6 inches of each corner to the suspended ceiling-framing member by mechanical means.
2. Connect two 12-gauge slack wires from the luminaire housing to the structure above for luminaires weighing less than 56 pounds.
3. Support luminaries weighing 56 pounds or more directly from the structure above with approved hangers attached to each corner of the luminaire.

3.3 PULL AND JUNCTION BOXES

A. Pull and junction boxes installed within the cavity of a suspended ceiling that is not a fire rated assembly may be attached to the suspended ceiling framing members, provided the following criteria are met:
1. Installation complies with the ceiling system manufacturer's instructions.
2. Pull or junction box is not larger than 100 cubic inches.
3. Support to the main runner with two fastening devices designed for framing member application and positively attach or lock to the member.
4. Serves branch circuits and associated equipment in the area.
5. Pull or junction box is within 6-feet of the luminaires supplied.
6. Framing members are not rotated more than 2 degrees after installation.
7. Install within the cavity of a suspended ceiling may be attached to independent support wires, provided the following criteria are met:
   a. Independent support wires are taut and connected at both ends, one end to the ceiling framing member and the other to the structure above.

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b. Not larger than 100 cubic inches.
c. Secure to the independent support wires by two fastening devices designed for the application.
d. Independent support wires in a fire-rated ceiling are distinguishable by color, tagging, or other effective means.

3.4 CABLES AND RACEWAY

A. Cables and raceway installed within the cavity of a suspended ceiling may be attached to independent support wires provided the following criteria are met:
1. Independent support wires are taut and connected at both ends, one end to the ceiling framing member and the other to the structure above.
2. Raceways no larger than 1-inch trade size and cables and bundled cables are not larger than 1-inch diameter including insulation.
3. Not more than three raceways or cables supported by independent support wire and supported within the top or bottom 12-inches.
4. Cables for telecommunications, data processing, Class 2 power-limited signaling systems, fiber optics, and other power limited systems are securely fastened within 2 feet of each termination and at intervals not to exceed 5-feet or per the manufacturer's installation instructions.
5. Secure raceways at intervals required for the type of raceway installed.
6. Secure cables and raceway to independent support wires by fastening devices and clips designed for the purpose.
7. Independent support wires are distinguishable by color, tagging, or other effective means.

B. Cables and raceway installed within the cavity of a suspended ceiling may be supported with trapezes constructed of steel rods and channels provided the following criteria are met:
1. The size of the rods, channel, and fastening devices are suitable for the anticipated weight.
2. The spacing of the trapezes meets that required for the type of raceway installed.
3. Secure to a trapeze by straps designed for the purpose.
4. Cables and raceway do not support other raceway or cables.
5. An appropriately sized seismic bracing system is installed.

3.5 ROOFTOP CONDUIT SUPPORTS

A. Coordinate with roofing manufacturer for roof membrane compression capacities. Provide a compatible sheet of roofing material under each support to disperse concentrated loads and provide added membrane protection. Do not use supports that will void roofing warranty,

B. Install in accordance with recommendations and instructions provided by manufacturer.

C. Provide supports such that rooftop raceways are a minimum of 4-inches above roof.

END OF SECTION

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SECTION 26 05 33

RACEWAYS AND BOXED FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes:
   1. Metallic Conduits
   2. Non-Metallic Conduits
   3. Wireways
   4. Fittings
   5. Metallic Boxes
   6. Floor Boxes
   7. Non-Metallic Boxes

1.2 RELATED SECTIONS

A. Division 01, General Requirements

B. Division 26, Electrical

C. Section 26 05 13, Medium Voltage Cables

D. Section 26 05 19, Low Voltage Electrical Power Conductors and Cables

E. Section 26 05 26, Grounding and Bonding for Electrical Systems

F. Section 26 05 29, Hangers and Supports for Electrical Systems

G. Section 26 05 53, Identification for Electrical Systems

PART 2 PRODUCTS

2.1 GENERAL

A. Raceways and conduits of specified types for electrical system wiring, except where clearly indicated otherwise.

B. Fittings, boxes, hangers, and appurtenances required for the conduits and raceways.

C. Size raceways and conduits as indicated. Where no size indicated, conduit may be the minimum code permitted size for the quantity of conductors installed, based upon NEC tables for conductors with type THW insulation.

2.2 METALLIC CONDUITS

A. Rigid Metal Conduit (RMC):
   1. Smooth surfaced, heavy wall mild steel tube of uniform thickness and temper, reamed and threaded at each end and protected inside and out with galvanizing, sherardizing, or equivalent process.
   2. Comply with NEC Article 344.

B. Intermediate Metallic Conduit (IMC):
   1. Smooth surface, intermediate wall mild steel tube of uniform thickness and temper, reamed and threaded at each end, and protected inside and out with galvanizing, sherardizing, or equivalent process.
   2. Comply with NEC Article 342.

C. Electrical Metallic Tubing (EMT):
   1. Smooth surface, thin wall mild steel tube of uniform thickness and temper, galvanized or sherardized on the outside, and enameled on the interior.
   2. Comply with NEC Article 358.

D. Flexible Conduits (Flex):
   1. Flexible Metallic Conduit:
      a. Interlocking single strip steel construction, galvanized inside and out after fabrication.
      b. Comply with NEC Article 348.
   2. Liquid Tight:
      a. Similar to flexible metallic conduit, except encased in a liquid tight polyvinylchloride or equivalent outer jacket over the flexible steel core.
      b. Comply with NEC Article 350.

2.3 NON-METALLIC CONDUITS

A. Rigid Non-Metallic Conduit:
   1. Type II PVC Schedule 40 or 80, suitable for use with 90 degree C rated wire.
   2. Conform to UL Standard 65l and carry appropriate UL listing for above and below ground use.
   3. Comply with NEC Article 352.

2.4 WIREWAYS

A. Troughs: Steel, painted, square in cross section, preformed knockouts on standard spacing, screw cover.

B. Fittings: Tees, elbows, couplings as required for configuration shown on the Drawings.

2.5 FITTINGS

A. RMC and IMC:
   1. Threaded Locknuts: Sealing type where used with NEMA 2, 3, 3R, 4, and 12 enclosures.
   2. Threaded Bushings: 1-1/4-inch and larger, insulated, grounding type as required under Section 26 05 26, Grounding and Bonding for Electrical Systems.
   3. Threaded Couplings:
      a. Standard threaded of the same material and as furnished with conduit supplied.

b. Erickson type couplings may be used where required to complete conduit runs larger than 1-inch.

B. EMT:
1. Connectors:
a. Steel compression ring or steel set screw type for conduit termination, with insulated throat, suitable for conditions used.
b. Use lay-in grounding type bushings where terminating grounding conductors.
2. Couplings: Steel compression ring or steel set screw type, concrete tight.

C. Threadless: RMC and IMC couplings and box connectors may be steel threadless, compression ring or set screw type for use with conduits 1-inch and smaller where installed in poured concrete locations or where limited working space makes threaded fittings impractical.

D. Weatherproof Connectors: Threaded

E. Expansion Couplings: Equivalent to O.Z. type EX with jumper.

F. Seal-Offs: With filler fiber, compound, and removable cover.

2.6 METALLIC BOXES

A. Flush and Concealed Outlet Boxes: Galvanized stamped steel with screw ears for device ring mounting, knock-out plugs, mounting holes, fixture studs if required, RACO or equivalent.

B. Surface Outlet Boxes: Galvanized stamped steel same as above for use on ceilings; cast steel or aluminum with threaded hubs or bosses for use on walls.

C. Large Boxes:
1. Boxes exceeding 4-11/16-inches when required welded steel construction with screw cover and painted, steel gauge as required by physical size.
2. Manufacturers:
a. Hoffman
b. Circle AW
c. Or equivalent.

D. Systems:
1. Boxes for systems devices as recommended by the systems manufacturer, suitable for the equipment installed.
2. Equip with grounding lugs, brackets, device rings, etc., as required.

2.7 NON-METALLIC BOXES

A. PVC, molded enclosures, threaded hubs.

PART 3 EXECUTION

3.1 INSTALLATION

A. Conceal conduits in finished spaces. Concealed conduits run in a direct line with long sweep bends and offsets. Where RMC and IMC embedded is in concrete below grade or in damp locations make watertight by painting the entire male thread with Rustoleum metal primer or equivalent before assembly.

B. Route exposed conduit parallel or at right angles to structural building lines and neatly offset into boxes. Conduits attached directly to building surfaces closely follow the surfaces. Conduit fittings used to saddle under beams. Coordinate drilling or notching of existing beams, trusses on structural members with Architect prior to commencing.

C. Rigidly secure RMC and IMC terminations at boxes, cabinets, and general wiring enclosures with double locknuts and bushings or approved fittings. Screw in conduit and engage at least five threads in hub where conduit boxes with threaded hubs or bosses are used. Use insulating bushings for conduits 1-1/4-inches or larger.

D. Keep conduit and raceways closed with suitable plugs or caps during construction to prevent entrance of dirt, moisture, concrete, or foreign objects. Clean and dry raceways before installation of wire and at the time of acceptance.

E. Pack spaces around conduits with polyethylene backing rods and seal with polyurethane caulking to prevent entrance of moisture where conduits are installed in sleeves or block-outs penetrating moisture barriers.

3.2 CONDUIT

A. RMC:
1. Use in areas for wiring systems.
2. Install for exposed runs of medium voltage circuits outside of the electrical rooms.
3. Install where subject to mechanical injury.
4. Install with threaded fittings made up tight.

B. IMC:
1. Use for medium voltage circuits where concealed or where exposed in the electrical rooms.
2. Use for circuits rated 600V and less where not in contact with earth or fill.
3. Install with threaded fittings made up tight.

C. EMT:
1. Use in other dry protected locations for circuits rated 600V and less.
2. Securely support and fasten whether exposed or concealed at intervals of nominally every 8-feet and within 24-inches of each outlet, ell, fitting, panel, etc.

D. Flex:
1. Use for connections to vibration producing equipment and where installation flexibility is required with a minimum 12-inches slack connection.
2. Limit flex length to 36-inches for exposed equipment connections and 72-inches in concealed ceiling and wall cavities.
3. Use PVC jacketed flex in wet locations, areas subject to washdown, and exterior locations.

E. PVC:
1. Type II Schedule 40 and 80 PVC may be used underground and in and under interior slabs, poured concrete walls, and where scheduled or noted on the Drawings.
2. Make connections with waterproof solvent cement.
3. Provide RMC at 60 degree and larger bends and where penetrating slabs.

3.3 RACEWAYS

A. Surface metal wireways may be installed at locations to serve motor starters or other control devices where required by a multitude of wiring interconnections or physical layout.

3.4 FITTINGS

A. Assemble continuous and secured metallic raceways and conduits to boxes, panels, etc., with appropriate fittings to maintain electrical continuity. Cut square and reamed smooth conduit joints with fittings drawn up tight.

B. Do not use Crimp-on, tap-on, indenter type, malleable iron, or cast set screw fittings.

3.5 BOXES

A. General:
1. Outlet Boxes: Code required size to accommodate wires, fittings, and devices.
2. Provide multi-gang boxes as required to accept devices installed with no more than one device per gang.
3. Equip metallic boxes with grounding provisions.

B. Size and Type:
1. Flush wall switch and receptacle outlets used with conduit systems 4-inches square, 1-1/2-inches or deeper, with one or two-gang plaster ring, mounted vertically. Where three or more devices are at one location, use one piece multiple gang tile box or gang box with suitable device ring.
2. Wall bracket and ceiling surface mounted luminaire outlets 4-inch octagon 1-1/2-inches deep with 3/8-inch fixture stud where required. Wall bracket outlets have single gang opening where required to accommodate luminaire canopy. Provide larger boxes or extension rings where quantity of wires installed requires more cubic capacity.
3. Junction boxes installed in accessible ceiling or wall cavities or exposed in utility areas minimum of 4-inches square, 1-1/2 inches deep with appropriately marked blank cover.
4. Boxes for the special systems suitable for the equipment installed. Coordinate size and type with the system supplier.

C. Pull Boxes:
1. Provide pull boxes where shown for installation of cable supports or where required to limit the number of bends in conduits to not more than three 90-degree bends.
2. Use galvanized boxes of code-required size with removable covers installed so that covers will be accessible after work is completed.

D. Installation:
1. Mount boxes and outlets at nominal centerline heights shown on the drawings.
2. Adjust heights in concrete masonry unit (CMU) walls to prevent devices or finish plates from spanning masonry joints.

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3. Recessed Boxes:
   a. Flush with finished surfaces or not more than 1/8-inch back, level and plumb.
   b. Long screws with spacers or shims for mounting devices will not be acceptable.
   c. No combustible material exposed to wiring at outlets.
4. Covers for flush mounted boxes in finished spaces extend a minimum of 1/4-inch beyond the box edge to provide a finished appearance. Finish edge of cover to match cover face.
5. Boxes installed attached to a stud in sheet rock walls equipped with opposite side box supports equivalent to Caddy 760. Install drywall screw prior to finish taping. Methods used to attach boxes to studs not to cause projections on the face of the stud to prevent full-length contact of sheet rock to the stud face.

3.6 PULL WIRES

A. Install nylon pull lines in empty conduits larger than 1-inch where routing includes 25-feet or more in length or includes 180 degrees or more in bends.

B. Where conduits requiring pull lines are stubbed out and capped, coil a minimum of 36-inches of pull line and tape at termination of conduit for easy future access. Label pull lines as to conduit starting or terminations point and intended future use.

END OF SECTION

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SECTION 26 05 40

SURFACE METALLIC RACEWAYS FOR ELECTRICAL SYSTEM

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes:
   1. Raceways

1.2 RELATED SECTIONS

A. Division 01, General Requirements

B. Division 26, Electrical

C. Section 26 05 19, Low Voltage Electrical Power Conductors and Cables

D. Section 26 05 26, Grounding and Bonding for Electrical Systems

E. Section 26 05 53, Identification for Electrical Systems

F. Section 26 27 26, Wiring Devices

1.3 SUBMITTALS

A. Shop Drawing Submittals:
   1. Submit Shop Drawings of the complete system.
   2. Include sizes and lengths of raceways as verified with laboratory furniture Shop Drawings, end caps, raceway cover spacing's, grounding, branch circuiting and wiring including locations of service entrances, receptacle types and manufacturers, receptacle spacing, receptacle labeling with proper voltage, phase, circuit and panelboard designations as indicated on the drawings.
   3. Accompany at the same time of the submittal, by floor plans showing raceway locations, with each piece numbered the same as the corresponding number of the raceway piece number in the submittal.

PART 2 PRODUCTS

2.1 GENERAL

A. Provide a complete surface metallic raceway system for standard receptacles to include receptacles, devices, supports, fittings, and accessories necessary to complete the installations indicated.

B. In the event the Contractor chooses to furnish and install a system or item of equipment of different arrangement from the system herein specified, provide additional labor and material required by the system at no additional cost to the Owner, and obtain prior approval.

C. Tests and operational check determine the suitability for energization.

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D. Schedule tests and give a minimum of one week's advance notice of time and date to the Architect and Owner for any major systems tests specified in this Section.

2.2 RACEWAYS

A. Factory pre-assembled complete including bases, covers, end plates, wiring, receptacles, fittings and connections, to exact lengths to match the lengths of the cabinets and shelving as indicated on laboratory furniture Shop Drawings since the lengths shown on electrical drawings are illustrative and diagrammatic only and are not accurate, also see island bench details on the drawings.

B. Receptacle circuits to be prewired for the entire length of the section, leaving 2-foot pigtail for field connection and properly tagged for circuit identification in field.

C. Tap splicing of wires using twist-on wire connectors, 3M insulated spring connector (312/512), Ideal Industries Wing-Nut, Buchanan B-Cap wire connectors, or equivalent.

D. Raceway base, cover and end plates to be constructed of extruded aluminum 6063-T5, 0.060 inch minimum wall thickness. Finish to be clear anodized AA-C22A31 Architectural Class II.

E. Blank snap-in raceway covers to be precut to 12-inch sections. Each cover plate able to withstand 45 pound cord pull pressure. Regardless, raceway covers stay on when pulling off any receptacle plug. Support receptacles in the raceway from the raceway covers by countersunk screws, and independent of the raceway bases or main body. Covers to be provided with receptacles mounted and identified by means of engraved 3/16 inch black letters indicating receptacle voltage, phase, and amperage for receptacles other than the regular 20A, 120V receptacles (i.e., 208V, 1-phase, 30A) at top of receptacle. Receptacles have panel and circuit designation (i.e., LPA22) at bottom of receptacle. Dedicated 20A, 120V receptacles labeled DEDICATED at top of receptacles. Receptacles on optional standby circuits labeled as STANDBY.

F. Where raceways are shown connected at right angles to each other, the end plate of the raceway overlapping the faceplate of the other raceway regressed flush with the ends of the raceway base/body.

G. Raceway Type A a minimum 6 inches high by 2-1/2 inches deep Series ALA4800 as manufactured by The Wiremold Company ISOduct Prewired Raceway Systems, Post Glover/Halsey Versa-Duct Series 255 with devices mounted to cover plate with countersunk screws. Provide with a barrier to divide the raceway interior into 2 equal sections. Each sections has its own cover. Where raceways are shown on the Drawings with telecom outlets, verify outlet openings configuration at raceway covers in the telecom compartment with the telecom Section of the specifications. Do the same for knockout cutout configuration for future punch-out where no outlets are shown at the raceways on the Drawings (provide one knockout for each raceway length).

PART 3 EXECUTION

3.1 GENERAL

A. Raceway Type A to receive receptacles of type, quantity, and spacing as indicated on Plans.

B. Raceways to be mounted on walls and casework parallel to or at right angles to structure and casework.

C. The number of conductors installed in any raceway not greater than the number for which the raceway is approved.

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D. Ground continuity maintained throughout the entire raceway length by means of factory installed separate insulated Code-size grounding conductors. Each equipment grounding conductor in a conduit homerun entering the raceway connected to the ground terminals of the receptacles and to the ground stud in the raceway interior. Bonded receptacle cover plates.

E. Each 20A, 120V circuit of an individual or multi-circuit wiring in a raceway provided with individual 12 AWG neutral conductor for each circuit.

F. In multi-wire branch circuits, the continuity of a grounded conductor (neutral) not dependent upon device connections, such as receptacles, etc., where the removal of such devices would interrupt the continuity.

G. At least 6-inches of free conductors left at each outlet, junction and switch point for splices or the connection of fixtures or devices.

END OF SECTION

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SECTION 26 05 45

SEISMIC RESTRAINTS FOR ELECTRICAL RACEWAYS AND EQUIPMENT

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes:
   1. Seismic Bracing
   2. Channel Type Elements
   3. Bolting Accessories

1.2 RELATED SECTIONS

A. Division 01, General Requirements

B. Division 26, Electrical

C. Section 26 05 29, Hangers and Supports for Electrical Systems

1.3 REFERENCED STANDARDS

A. The following are the referenced standards:
   1. SMACNA Sheet Metal and Air Conditioning Contractor's National Association
   2. AISC American Institute of Steel Construction
   3. ASTM American Society for Testing and Materials
   4. AWS American Welding Society
   5. IBC International Building Code
   6. ICC International Code Council
   7. OSHPD Office of Statewide Health Planning and Development
   8. ASCE 7-16 Minimum Design Loads and Associated Criteria for Buildings and Other Structures

1.4 QUALITY ASSURANCE

A. General Requirements:
   1. Provide seismic restraints for equipment, both supported and suspended, conduits, and cable tray systems.
   2. Bracing of conduits and cable trays in accordance with the provisions set forth in the SMACNA seismic restraint manual and the requirements set in ASCE 7 Section 13.2.
   3. Review and approve structural requirements for restraints, including their attachment to the building structure by a registered structural engineer in the same state as the project.
   4. Attachments to supported or suspended equipment must be coordinated with the equipment manufacturer.

B. Bracing of Conduits:
   1. Provide seismic bracing of conduit as detailed below:
      a. Brace electrical conduits 2-1/2 inch nominal diameter or larger.

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b. Brace conduits located in electrical rooms, boiler rooms, mechanical equipment rooms, and refrigeration mechanical rooms that are 1-1/4-inch nominal diameter and larger.

2. Exception: Conduits suspended by individual hangers 12-inches or less in length, as measured from the top of the conduit to the bottom of the support where the hanger is attached, need not be braced.

C. Suspended Equipment and Raceways:
1. Cable Method: The seismic restraint shall consist of a combination of stranded steel aircraft cable with an added nut and neoprene and steel washer.
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.

D. Seismic restraints, including anchors to building structure, designed by a registered professional structural engineer licensed in the state of Oregon. Design includes:
1. Number, size, capacity, 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. For units weighing greater than 2500 pounds, or curbs more than 10 feet long, provide substantiating calculations the curb can accept the prescribed seismic forces.
2. Number, size, capacity, and location of seismic restraint devices and anchors for vibration-isolation and suspended equipment. Provide calculations, test data, or California OSHPD approval number verifying the horizontal and vertical ratings of the seismic restraint devices.
3. Number, size, capacity, and location of braces and anchors for suspended raceways, bus ducts, and cable trays on as-built plan drawings.
a. Select a single seismic restraint system pre-designed to meet the requirements of the latest edition of the IBC such as the 1999 Mason Industries Seismic Restraint Guidelines for Suspended Piping, Ductwork, and Electrical Systems.
b. Details or designs from separate seismic restraint guidelines are not acceptable. Installation not addressed by the selected system shall be designed, detailed, and submitted alone with the as-built plan drawings.
c. Maximum seismic loads shall be indicated on drawings at each brace location. Drawings shall bear the stamp and signature of the registered professional structural engineer licensed in the state of Oregon who designed the layout of the braces.

E. Supports, Hangers, and Anchors: Comply with the requirements of Section 26 05 29, Hangers and Supports for Electrical Systems meet the requirements of ASCE 7 Section 13.2 based on the Seismic Design Criteria located on the structural drawings.

1.5 SUBMITTALS

A. Product Data: Submit product data for products specified herein.

B. Shop Drawings:
1. Submit shop drawings complying with the requirements of the Quality Assurance article of this Section.
2. Stamp shop drawings by a professional structural engineer licensed in the state of Oregon
3. Approve submittals prior to rack fabrication and installation.

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C. Calculations:
   1. Submit seismic calculations indicating restraint loadings resulting from the design seismic forces presented in the Quality Assurance article of this Section.
   2. Include anchorage details that include the diameter, embedment, and material grade of the material in which the anchor is placed.
   3. Stamped by a professional structural engineer licensed in the state of Oregon.

D. Certifications:
   1. Submit certification of seismic restraint's and building structural member's capability to safely accept loads resulting from seismic forces calculated in the previous paragraph.
   2. Tests in three planes clearly showing ultimate strength and appropriate safety factors performed by independent laboratories and certified by a professional structural engineer licensed in the state of Oregon or calculations by a professional structural engineer licensed in the state of Oregon are acceptable.

PART 2 PRODUCTS

2.1 SEISMIC BRACING:

A. Steel fabrication, in accordance with AISC Steel Manual, with structural steel shapes of ASTM A 36 steel.

B. Welding in accordance with AWS D1.1.

C. Design and sizes as required.

D. Fastenings, bracing, and assembly selected by a professional structural engineer licensed in the state of Oregon.

E. Show that the maximum stress in any structural steel member will not exceed 18,000 psi.

2.2 CHANNEL TYPE ELEMENTS

A. 12 gauge formed steel, 1-5/8-inch square prime painted or chromate dip finish. Use spring-in nuts with grooves.

2.3 BOLTING ACCESSORIES

A. Machine bolts with semi-finished nuts.

PART 3 EXECUTION

3.1 INSTALLATION

A. Provide support assemblies to meet the seismic zone indicated. Equipment shall be braced and anchored to conform to the requirements listed under the Quality Assurance article of this Section.

B. Seismically brace raceways, cable trays, and suspended bus duct to conform to the requirements listed under the Quality Assurance article of this Section.

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C. Provide pipeline seismic flexible connectors where piping crosses building earthquake joints. Arrange raceways and connectors for the amount of motion required. Maintain continuity of the grounding system for each of the joints.

D. Do not use powder-actuated inserts.

E. Seismic Restraints:
   1. Attach to structural members of the building, which are capable of withstanding the design load of the seismic restraint.
   2. Ensure load capacity of the structural members is greater than or equal to the capacity of the seismic restraint.

END OF SECTION

SECTION 26 05 53

IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes:
   1. Labels

1.2 RELATED SECTIONS

A. Division 01, General Requirements

B. Division 26, Electrical

C. Section 26 05 19, Low Voltage Electrical Power Conductors and Cables

D. Section 26 05 33, Raceways and Boxes for Electrical Systems

E. Section 26 27 26, Wiring Devices

F. Section 26 50 00, Lighting

PART 2 PRODUCTS

2.1 LABELS

A. Pre-printed:
   1. Permanent material pre-printed with black on white, with adhesive backing.
   2. Manufacturer:
      a. Brady
      b. 3M
      c. Or equal.

B. Engraved Laminated Plastic:
   1. 3-ply laminated plastic, colors indicated herein, with beveled edges, engraved letters, and stainless steel screw attachment.
   2. Nameplate length to suit engraving.
   3. Adhesive attachment is not acceptable.

C. Clear Plastic Tape:
   1. Black (normal) or red (emergency or standby) 12 point Helvetica medium text, clear adhesive backing, field printed with proper equipment for device labeling.
   2. Manufacturers:
      a. Brother P-Touch
      b. Dyno-tape
      c. Kroy

d. Or equal.

D. Wire Markers:
1. White with black numbers, adhesive-backed tape on dispenser roll.
2. Manufacturers:
a. Brady
b. 3M
c. Or equal.

E. Feeder Conduit Marking:
1. Provide one-piece snap-around vinyl feeder conduit markers for feeder conduits.
2. Provide custom label, black letters on orange background indicating destination equipment, 1-1/4-inch high letters (minimum) – Seton Setmark Pipe Marker Series.
3. Provide additional one-piece snap-around vinyl label, black letters on orange background for voltage designation (i.e., 277/480V, 120/208V).
4. Secure labels to conduits using plastic tie wrap, two per label.

F. Marker Pen: Black permanent marker suitable for writing on metallic surfaces.

PART 3 EXECUTION

3.1 GENERAL

A. Nameplate and text coloring:
1. Normal Black nameplate with white lettering.

3.2 MOTOR CONTROL CENTERS

A. Provide engraved laminated plastic nameplates for main and feeder protective devices indicating the function or the load served (e.g., ELEV-5, PANEL 4HA, AHU-5, or SPARE) and the protective device trip rating (i.e., 175A). Text height: 3/8-inch.

B. Provide engraved laminated plastic nameplate for bussed spaces indicating the maximum ampere rating of future breaker, switch, or starter that may be installed (e.g., SPACE (225A)). Text height: 3/8-inch.

C. Provide engraved laminated plastic nameplate on the face of equipment enclosure as follows:
1. Line 1: Equipment identification (e.g., MDP, SDP, or MCC 4H). Text height: 3/4-inch.
2. Line 2: Equipment voltage, phase and wire quantity (e.g., 480Y/277V, 3-Phase, 4W). Text height: 1/2-inch.

D. Provide additional engraved laminated plastic nameplate to indicate upstream source and location of upstream source as follows:
1. Line 1: Upstream source equipment (e.g., FED FROM MDP). Text height: 3/8-inch.
2. Line 2: Location of upstream source (e.g., MAIN ELEC ROOM 102). Text height: 3/8-inch.
3. Confirm final room designations with Architect and Owner prior to procurement of nameplates.

3.3 EQUIPMENT

A. Provide engraved laminated plastic nameplate on the face of disconnect switches, motor starters, relays, contactors, and etc., indicating equipment served (e.g., AHU-1) and equipment load (e.g., 20 hp). Provide additional engraved laminated plastic nameplate indicating serving panel designation and circuit number.

B. Provide clear plastic tape label for relays, contactors, time switches, and miscellaneous equipment provided under this Division of work indicating equipment served.

3.4 FEEDER CONDUIT

A. Provide feeder conduit marker for electrical feeders.

B. Provide markers when exiting source equipment and located along the entire conduit length 20-feet on centers in exposed areas, above ceilings, and upon entering or leaving an area or room.

3.5 DEVICES

A. Label each receptacle plate with preprinted clear plastic tape indicating serving panel and circuit number (e.g., PANEL 2PA-5). Clean oils, dirt, and foreign materials from plate prior to label application. Label receptacles connected to a GFCI protected circuit downstream from the protecting device.

3.6 RACEWAYS AND BOXES

A. Label pull boxes and junction boxes for systems with paint or marker pen on box cover identifying system. Where box covers are exposed in finished areas, label inside of cover.

B. Color label covers as follows:

1.	208Y/120V wiring	Black
2.	Fire Alarm	Red
3.	Communications	Green
4.	Security	Blue

C. Label each end of pull wires left in empty conduits with tags or tape indicating location of other end of wire.

3.7 SYSTEMS

A. Complex control circuits may utilize combination of colors with each conductor identified throughout using wraparound numbers or letters. Use the number or letters shown where the Drawings or operation and maintenance data indicate wiring identification.

B. Label the fire alarm and communication equipment zones, controls, indicators, etc., with machine-printed labels or indicators appropriate for the equipment installed as supplied or recommended by the equipment manufacturer.

3.8 EXISTING EQUIPMENT

A. Provide new nameplates and labels for existing distribution equipment in accordance with panel descriptions shown on the Drawings. Provide new labels for feeder devices where labels are non-existent, incorrect, or confusing on existing distribution panels affected by this work.

B. Equip existing branch circuit panelboards scheduled to remain with new, accurate, typed, circuit directories where circuiting changes are made.

END OF SECTION

SECTION 26 09 23

LIGHTING CONTROL DEVICES

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes:
   1. Control Stations
   2. Standalone Room Controllers
   3. Occupancy/Vacancy Sensors
   4. Photosensor
   5. Relays, Switchpacks, and Room Controllers
   6. Power Supplies and Transformers
   7. Emergency Lighting Control Relays
   8. Low Voltage Control Wiring
   9. Test Equipment

B. Responsibilities and participation under Division 26, Electrical in the automatic dimming system installation and commissioning process.

C. Installation, connection, adjustment, and testing of the equipment including labor, materials, tools appliances, wire, junction boxes and equipment necessary for and incidental to the delivery, installation and furnishing of a completely operational lighting control system

1.2 RELATED SECTIONS

A. Division 01, General Requirements

B. Division 26, Electrical

C. Section 26 27 26, Wiring Devices

D. Section 26 50 00, Lighting

1.3 GENERAL REQUIREMENTS

A. Provide qualified personnel for participation in commissioning tests, including seasonal testing required after the initial commissioning.

B. Providing equipment, materials, and labor necessary to correct deficiencies found during the commission process which fulfill contract and warranty requirements.

C. Provide Operating and Maintenance Data and Record Drawings to the Test Engineer for verification, organization, and distribution.

D. Provide assistance to the Test Engineer to develop and edit descriptions of system operation.

E. Providing training for the systems specified in this Division with coordination by the Test Engineer and Commissioning Agent.

1.4 SUBMITTALS

A. Shop drawings:
   1. Submittal drawings with a complete system diagram to show quantity of devices, location in the building, dimensions and required wiring.
   2. Occupancy sensors, show the required quantity to cover the space controlled (note: this may be more than the quantity shown on the drawings.
   3. The locations shown on the drawings are for reference only and coordinated with the manufacturer and Architect for final quantity and location during the bid process to allow for allowance of proper quantity, wiring lengths and installation coordination)
   4. Provide physical samples of user interface devices and visually exposed control devices for approval by Owner and Architect.

B. Product data with wiring schematics for system and user interface components

C. Installation and Record Drawings

D. Operation and Maintenance Manuals:
   1. Include product data of system components, one line diagrams of installed components and their locations throughout the building, a final floor plan noting the locations of devices installed above ceilings, behind access panels or in concealed but accessible spaces and the lighting zones or devices they control.
   2. Final relay schedule with the zone of control, location of control zone, voltage, power feed, time clock setting, photocell set point, switch, or dimmer stations controlling the relay, and sweep function set points will be provided by the contractor.

1.5 DEFINITIONS

A.	BACNET	Protocol for integration with BAS/BMS/EMS
B.	BAS / BMS / EMS	Building Automated System, Building Management System, Energy Management System
C.	CS	Control Station
D.	D	Dimming Wall Switch
E.	DT	Dual Technology (PIR + U)
F.	FC	Footcandles. The metric for measuring light levels / illuminance levels
G.	GUI	Graphic User Interface
H.	LCP	Lighting Control Panel
I.	LED	Light Emitting Diode

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J. LonWorks Protocol for integration with BAS/BMS/EMS

K. OS/VS Occupancy Sensor / Vacancy Sensor,
1. Occupancy sensors provide automatic on and automatic shut-off.
2. Vacancy sensors provide automatic shut-off only, and require manual-on.

L. PC Photocell

M. PIR Passive Infrared Technology

N. RS RS-232 Connection for AV Integration

O. SC Scene Control

P. TC Timeclock, or astronomical timeclock

Q. U Ultrasonic Technology

R. WS Wall Switch

S. WS/O Wallbox Occupancy Sensor Switch
1. Wall Switch with integrated Occupancy Sensor

1.6 SYSTEM DESCRIPTION

A. Control Stations:
1. Control Station Types:
a. Provide control stations for occupant lighting control as scheduled on the drawings and may include and/or combine the following type of individual control type within a single station:
1) On/Off Switching
2) Dimming Raise/Lower
3) Occupancy/Vacancy Sensor

B. Relays, Switchpacks, and Room Controllers:
1. Analog and Digital: Room controller devices to accept line voltage input as well as input from any combination of control stations, occupancy/vacancy sensors and/or daylight sensors and produce the required effect (switching or dimming) on up to four zones of connected lighting.

C. Occupancy/Vacancy Sensing:
1. Reduce electric energy consumption by reducing or eliminating lighting energy use in unoccupied spaces by switching lighting off with occupancy and/or vacancy sensors.

D. Photoelectric Daylight Harvesting:
1. Daylit Areas:
a. Reduce electric energy consumption during daylight hours by reducing the light output of the electric lighting system via continuous dimming power supply in response to measured lighting levels provided by daylight within the building interior.
b. Dimming zones will correlate with the distribution of daylight within the space as noted on plans.

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E. Emergence Override: Provide automatic load control relay devices for controlling egress lighting circuiting.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design Manufacturer:
   1. Wattstopper

B. Approved Basis of Design Alternate Manufacturers:
   1. Cooper Controls
   2. Wattstopper
   3. Lutron

C. Products described in this section are to be provided by the single BOD (basis of design), or approved alternate, manufacturer, listed above, or by a compatible, BOD approved third party alternate manufacturer.
   1. Manufacturer series numbers are identified herein to establish the minimum level of quality for each product.
   2. Comparable products that meet the requirements of the specification by other acceptable manufacturers identified herein are acceptable with prior approval.
   3. Other or equivalent Manufacturers and Products: Submit Substitution Request, complying with requirements of Division 00, Procurement and Contracting Requirements.

2.2 CONTROL STATIONS

A. Control Station Types:
   1. Scene Select: Provide scene selection control station including discrete, engraveable pushbuttons allowing on/off and raise/lower control of entire space and means for occupants to select from scenes indicated on drawings
   2. On/Off:
      a. Provide individual pushbuttons
      b. Controls lighting in entire space if no zones indicated on plans.
   3. Dimming/Raise Lower:
      a. Provide individual pushbuttons for on and off control of zones indicated on plans.
      b. Controls lighting in entire space if no zones indicated on plans.
      c. Dimming accomplished by and hold the ON and OFF buttons for dimming up and down respectively.
   4. Integral Occupancy:
      a. Automatically switches lighting on when occupant enters space.
      b. Switches lights off after predetermined period of vacancy.
      c. Controls lighting in entire space.
   5. Integral Vacancy:
      a. Includes pushbuttons for occupant manual on/off and dimming control of lighting in space.
      b. Automatically switches lights off after predetermined period of vacancy.
      c. Includes provision to revert to occupancy control in absence of configurable amount of daylight.
      d. Controls lighting in entire space.

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B. Line Voltage Dimming Switches:
   1. Architectural grade, line voltage, 20A rated, single pole, preset style, slide up to brighten and down to dim, with on/off rocker style switch, decora style, wattage rating and lamp/power supply compatibility as required.
   2. Forward Phase, Reverse Phase, 0-10V.

C. Wallbox Occupancy Sensor Switches:
   1. 180 degree coverage, type as shown on plan (PIR, ultrasonic or dual-technology), configurable automatic-on or manual on operation, 3-wire type, daylight override, adjustable time-out, selectable walk-through mode and override off switch. Single or dual relay type as required or as shown on Drawings.
   2. Provide 3-way type where shown on plan.
   3. WattStopper PW series.

D. Digital Control Stations:
   1. Provide control stations with configuration as indicated or as required to control the loads as indicated.
   2. General Requirements:
      a. Power: Class 2 (low voltage).
      b. UL listed.
      c. Provide faceplates with concealed mounting hardware, with matching finish.
      d. Borders, logos, and graduations to use laser engraving or silk-screened graphic process that chemically bonds graphics to faceplate, resistant to removal by scratching and cleaning. Self-Adhesive labels not permitted.
      e. Finish: As specified for wall controls in this Section.
   3. Single-Zone or Single-Group:
      a. Turn an individual fixture or group of fixtures as shown on plans on and off via button press.
      b. Raise and lower light levels via press and hold button.
         1) Separate buttons for dimming and on/off functions not allowed.
   4. Multi-Scene or Multi-Group:
      a. General Requirements:
         1) Allows control of any devices part of the lighting control system as indicated on plans.
         2) Controls can be programmed with different functionality through system software without any hardware changes. Allows contextual functions based upon button press and press and hold input.
         3) Allows for easy reprogramming without hardware replacement.
         4) System will automatically update programming without direct human interaction upon replacement of any component.
         5) Communications: Utilize RS485 or similar wiring for low-voltage communication.
         6) To help occupants understand how to use the lighting control system, engraving requirements should be included for controls. Engraving details should include text size and style.
         7) Engrave keypads with button, zone, and scene descriptions as indicated on the drawings.
         8) Software Configuration:
            a) Single defined action.
            b) Buttons can be programmed to perform defined action on press and defined action on release.
            c) Buttons can be programmed using conditional logic off of a state variable such as time of day or partition status.
            d) Buttons can be programmed to perform automatic sequence of defined actions.

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e) Capable of deactivating select keypads to prevent accidental and/or unwanted changes to light levels and other settings.
f) Buttons can be programmed for raise/lower of defined loads.
g) Buttons can be programmed to toggle defined set of loads on/off.

9) Status LEDs:
a) Upon button press, LEDs to immediately illuminate.
b) Time delays inherent in large systems can cause short delays between button press and system confirmation. To avoid any confusion and prevent multiple button presses, keypads should immediately show that the button has been pressed for visual confirmation.
c) LEDs to reflect the true system status. LEDs to remain illuminated if the button press was properly processed or LEDs to turn off if the button press was not processed.
d) Support logic that defines when LED is illuminated:
(1) Scene logic (logic is true when zones are at defined levels).
(2) Room logic (logic is true when at least one zone is on).
(3) Pathway logic (logic is true when at least one zone is on).
(4) Last scene (logic is true when spaces are in defined scenes).

b. Wired Keypads:
1) Style:
a) Mounting: Wall box or low-voltage mounting bracket; provide wall plates with concealed mounting hardware.
2) Design keypads to allow field-customization of button color, configuration, and engraving using field-changeable replacement kits.
3) Terminal block/connector inputs to be over-voltage and miswire-protected against wire reversals and shorts.
4) LEDs next to each button are used during programming and provide feedback when the buttons are pressed.
5) Available with status LEDs.
6) Available in several button configurations and finishes.

2.3 STANDALONE ROOM CONTROLLERS

A. General:
1. Provides a common, standalone interface via dimming and/or switching to a group of 0-10V Dimming or Fixed Output Ballasts and/or 0-10V LED Drivers.
2. Direct conduit connection or provision for mounting to junction box.
3. Physical barriers provided between Class 1 and Class 2 wiring as well as between normal power and emergency power wiring.
4. Dual voltage 120/277V, 60HZ operation, 20A rating for each relay Relays utilize zero crossing technology for increased life.
5. Plenum Rated.

B. Digital Room Controllers and Switchpacks:
1. Replacement of any component requires no reconfiguration or reprogramming.
2. Low voltage connections via CAT5/6 and RJ-45 connectors.
3. On board power supply for a minimum of six accessory devices including, but not limited to occupancy sensors and control stations.
4. Up to four on-board relays and accompanying 0-10V dimming channels.
5. Provision for IR or RF remote for configuration and editing of connected device settings.
a. Provide means to copy settings from on system to another.

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6. Field configurable to support, occupancy (automatic on) and vacancy (manual on) control protocol. Daylight harvesting feature for any number of zones.
7. Room Controller: WattStopper LMRC Series
8. Switchpack: WattStopper LMZC Series

C. Analog Room Controllers and Power Packs:
1. On board power supply for a minimum of six accessory devices including, but not limited to occupancy sensors.
2. Up to four on-board relays and accompanying 0-10V dimming channels.
3. Provision for IR or RF remote for configuration and editing of connected device settings.
   a. Provide means to copy settings from on system to another.
4. Field configurable to support, occupancy (automatic on) and vacancy (manual on) control protocol with optional daylight harvesting feature.

2.4 OCCUPANCY/VACANCY SENSORS

A. General Requirements:
1. Power Failure Memory: Settings and learned parameters to be saved in non-volatile memory and not lost should power be interrupted and subsequently restored.
2. Furnished with necessary mounting hardware and instructions.
3. NEC Class 1 or 2 devices, refer to plans.
4. Ceiling-Mounted Sensors: Indicate viewing directions on mounting bracket.
5. Wall-Mounted Sensors: Provide swivel-mount base.
6. Ceiling-Mounted Sensors: Provide customizable mask to block off unwanted viewing areas.
7. Isolated Relay: Provide ceiling mounted sensors with an internal isolated relay with Normally Open, Normally Closed, and Common outputs rated at 1A at 30VDC/VAC for use with HVAC control, Data Logging and other control options.
8. Line Voltage sensors accept line voltage input and output switched line voltage directly to controlled luminaires.
   a. Line voltage sensors must be capable of occupancy or vacancy control. Operation is to be determined by onboard device settings.
   b. Sensor configuration to be made by integral pushbutton or dial controls.
   c. Types:
      1) PIR: utilize invisible light to determine occupancy.
      2) Ultrasonic/Microphonic: utilize audible or subaudible sound to determine occupancy.
      3) Dual-Tech: utilize a combination of the above technologies to determine occupancy.
         a) Detection of vacancy by both ultrasonic and PIR sensors required to turn lights off.
9. Low Voltage sensors are paired with a switch pack or room controller. Provide digital sensors compatible with room controller/switchpack and balance of system.
   a. Low voltage sensors must be capable of occupancy or vacancy control. Operation is to be determined by overall system configuration and/or device settings.
   b. Sensor configuration to be made by IR or wireless handheld configuration tool.
   c. Types:
      1) Dual-Tech: Utilize a combination of the above technologies to determine occupancy.
         a) Detection of vacancy by both ultrasonic and PIR sensors required to turn lights off.

B. Ceiling Mounted: 360 degree coverage:
1. Automatic-on operation, light-level sensing, adjustable time-out, automatic sensing/adjustment for optimal time-out delay setting, selectable walk-through mode.
2. Low- or line-voltage as shown on Drawings

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3. Surface mounted, provide power packs as required.
    a. Dual Technology Type:
        1) Low Voltage: WattStopper DT-300 Series.
        2) Line Voltage: WattStopper DT-355 Series
    b. Passive infrared type:
        1) Low Voltage: WattStopper CI-300 Series
        2) Line Voltage: WattStopper CI-355 Series
    c. Ultrasonic type:
        1) Low Voltage: WattStopper UT-300 Series
        2) Line Voltage: WattStopper UT-355 Series

C. Ceiling/Wall Mounted/Corner: 180 degree coverage:
1. Automatic-on operation, light-level sensing, adjustable time-out, automatic sensing/adjustment for optimal time-out delay setting, selectable walk-through mode,
2. Low-voltage with power pack, surface mounted as required.
    a. Dual Technology type: WattStopper DT-200 series.
    b. Passive infrared type: WattStopper CX-100 series.

D. Provide multiple contacts and/or power packs for Low Voltage occupancy sensors that:
1. Control both normal and emergency lighting and require separation of branch circuit wiring systems. In case of occupancy sensor failure, emergency lighting fail to the on state.
2. Control separate lighting control zones. Unless otherwise noted, occupancy sensors are intended to control light in a designated zone or room. Contractor is responsible for providing the required power packs to insure functionality of the system.
3. Provide UL924 listed relay or power pack for to bypass occupancy sensors in event of power failure. During normal operation, relay to operate lighting in conjunction with adjacent normal power lighting.

E. Low Temperature/Wet Location Occupancy Sensor:
1. Provide line voltage occupancy sensors where shown on plans.
2. Automatic-on operation, light-level sensing, adjustable time-out, automatic sensing/adjustment for optimal time-out delay setting, selectable walk-through mode.
3. Temperature Range at least -40 degrees F to +95 degrees F. With a minimum IP 65 rating.
4. Surface mounted, provide auxiliary contacts if required.
    a. Passive infrared type: WattStopper CB-100 Series

2.5 PHOTOSENSOR

A. General Requirements:
1. Use NEC Class 2 wiring for low voltage communication.
2. Can be replaced without reprogramming.
3. Photopically corrected to approximate human vision.
4. Daylight sensing equipment will be digital, full range type, self or manually calibrated.
5. Provide proper photocell type(s) as required to:
    a. Measure lighting levels on an affected interior surface. Illumination contribution to this measured surface will include both daylighting and electric lighting (closed-loop system).
    b. Measure light levels entering space through glazing. Illumination contribution to this measured surface will include daylighting only (open-loop system).

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c. Measure light levels on affected interior surface and entering space through glazing. Illumination contribution to these measured surfaces will include both daylight and electric lighting (combination open and closed loop/dual loop system).

6. Independently control multiple zone(s) of luminaires for maximum energy savings while maintaining even task illumination across the entire area between zones. Refer to drawings for control groupings.
7. Incorporate time delay logic to prevent cycling due to clouds and other short-term influences to lighting levels.
8. Accept indoor, skylight, and outdoor photo sensing heads. Photo sensing control permit the user to specify the actual footcandle level where desired switching occurs.

B. Indoor:
1. Stable output over temperature from 32 degrees F (0 degrees C) to 104 degrees F (40 degrees C).
2. Open Loop:
   a. Adjustable aiming angle to accommodate various glazing configurations
   b. Provide linear response from 0 to minimum 1000 foot-candles.
   c. Mountable on lighting fixtures or recessed acoustical ceiling tiles.
   d. Wattstopper LMLS-500 Series.
3. Closed Loop:
   a. Indoor sensors have a Fresnel lens, with a minimum 60 degree cone of response.
   b. Provide linear response from 0 to minimum 500 foot-candles.
   c. Partially shielded for accurate detection of available daylight to prevent fixture lighting and horizontal light component from skewing sensor detection.
   d. Mountable on lighting fixtures or recessed acoustical ceiling tiles.
   e. Wattstopper LMLS-400 Series.
4. Dual Loop (Skylight/Atrium):
   a. Indoor sensors have a Fresnel lens, with a minimum 60 degree cone of response.
   b. Partially shielded for accurate detection of available daylight to prevent fixture lighting and horizontal light component from skewing sensor detection.
   c. Atrium:
      1) Translucent dome with a 180 degree field of view.
      2) Sensor range from 2 to 2,500 FC.
   d. Skylight:
      1) Sensors have a translucent dome with a 180 degree field of view.
      2) Range between 10 and 7,500 FC.
   e. Wattstopper LMLS-600 Series.

C. Analog: Interior/Exterior: PLC CES Series

2.6 RELAYS, SWITCHPACKS AND ROOM CONTROLLERS

A. Analog:
1. Devices interconnected via low voltage cabling.
2. Configurable to produce the following sequences of operation by handheld IR or RF remote
   a. Occupancy control: Automatically turns lights on when occupant is detected in space. Automatically turns lights off after a configurable period of vacancy.
   b. Vacancy Control: Occupant must manually turn lights in space on, automatically turns lights off after a configurable period of vacancy.
   c. Timeclock

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d. Daylight Harvesting:
   1) Occupant must manually turn lights in space on, automatically turns lights off after a configurable period of vacancy.
   2) Accepts input from analog daylight sensing equipment and adjusts light level settings accordingly.

B. Digital:
1. Devices interconnected by pre-terminated CAT5e/CAT6 Cabling
2. Configurable to produce the following sequences of operation by handheld IR or RF remote.
   a. Occupancy Control:
      1) Automatically turns lights on when occupant is detected in space.
      2) Automatically turns lights off after a configurable period of vacancy.
   b. Vacancy Control: Occupant must manually turn lights in space on, automatically turns lights off after a configurable period of vacancy.
   c. Timeclock
   d. Daylight Harvesting
      1) Occupant must manually turn lights in space on, automatically turns lights off after a set period of vacancy.
      2) Accepts input from daylight sensing equipment and adjusts light level settings accordingly.
3. Provides additional capability or accessories to integrate with AV, BAS, HVAC, and/or shade control systems.

2.7 POWER SUPPLIES AND TRANSFORMERS

A. Provide from same manufacturer of equipment served.

B. Compatible with specified photocells and dimming control station protocols.

C. Refer to Section 26 50 00, Lighting, for product specification on luminaire power supplies and transformers.

2.8 EMERGENCY LIGHTING CONTROL RELAYS

A. Manufacturers:
1. Bodine
2. Nine 24
3. Wattstopper
4. Or approved equivalent.

B. General Requirements
1. Comply with UL924 requirements:
   a. If controlled off, must turn on automatically.
   b. Provide required egress illuminance along entire egress path.
   c. Must not be able to be overridden by building occupants.
2. Device can be integral to other components listed above or operate in conjunction with other lighting control components as a discrete component, but must be fed via UL 1008 compliant power source, such that in event of a power failure, control and dimming signals are bypassed and lighting operates at full power. Fed via the UL 1008 source.

C. Description:
1. Normally closed, electrically held relay, arranged for wiring in parallel with manual or automatic switching contacts.
2. UL924 listed for connected load of 10A at 277V or 120V.
3. UL rated N.C. contacts, minimum 10A rating.
4. Integral surge protection.
5. Two separate status emergency lighting indicators for troubleshooting:
   a. Amber LED indicates presence of normal utility power.
   b. Red LED indicates presence of unswitched emergency power.
6. Manual and/or automatic diagnostic testing feature.
7. Self-contained enclosure UL listed for installation in indoor or damp locations.

2.9 LOW VOLTAGE CONTROL WIRING

A. 18 gauge shielded cable or as recommended by the manufacturer.

2.10 TEST EQUIPMENT

A. Provide multi-function digital Illuminance meter with detachable receptor head with the following characteristics:
1. Receptor: Silicon photocell type
2. Illuminance Units: Lux or footcandles (switchable)
3. Measuring range: 0.1 to 19,990 lux, 0.01 to 1,999 footcandles
4. Accuracy: ±4 percent ±1 digit of displayed value
5. Cosine Correction Characteristics: Within ±1 percent at 10 degrees; within ±5 percent at 60 degrees.
6. Measuring functions: Illuminance, integrated illuminance, average illuminance.
7. Temperature/humidity drift: Within ±3 percent ±1 digit (of value displayed at 68 degrees F) within operating temperature/humidity range.
8. Operating conditions: 32 degrees F to 104 degrees F) at less than 85 percent humidity.

B. Provide proof of calibration within 12 months of use. Calibration performed by an independent calibration lab approved by the manufacturer of the meter.

PART 3 EXECUTION

3.1 INSTALLATION

A. Submittal data required prior to ordering and installation.

B. General Testing:
1. Functionally test control devices to ensure that control devices, components, equipment and systems are calibrated, adjusted and operate in accordance with approved drawings, specifications, and manufacturers installation instructions.
2. Prepare and complete report of test procedures and results and file with the Owner.
3. Install items per manufacturers written instructions.

C. Control Stations:
1. Control Stations to be combined wherever possible to minimize quantity of discrete gangs.
2. Combine under common cover plates wherever shown together on plans.

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D. Low Voltage Wiring:
   1. Install in conduit where running through inaccessible areas. Provide plenum rated wiring in accessible ceiling spaces.
   2. Test CAT5/6 cables terminated on site prior to wiring of digital lighting control systems. Provide evidence of successful testing to engineer and owner. Factory pre-terminated cabling is not subject to this requirement.
   3. Coordinate low voltage wiring connection and location with luminaires to be controlled.

E. Photocell:
   1. Install surface mounted on recessed junction box in location best suited for accurate measurement. Avoid placement in high traffic or confined spaces.

F. Occupancy Sensors:
   1. For installation of low voltage occupancy sensors in inaccessible ceiling systems, coordinate power pack locations with Architect prior to installation coordinate access panel locations with Architect.
   2. Sensor locations identified on Drawings are diagrammatic and are meant to indicate only that occupancy sensing within a given space is required. Locate sensors as required by the manufacturer to provide maximum coverage of the room, to operate as someone enters the room, and to avoid false operation due to persons outside the room passing an open door.
      a. Provide additional sensing heads as necessary or per manufacturer's recommendation to achieve complete coverage of each room.
   3. Set sensitivity as required to provide small movement coverage throughout the room without extending coverage beyond the room.
   4. System performance testing done with the sensor timing set to the time delay indicated by space type in Section 26 09 93, Sequence of Operations for Lighting Controls.
   5. Upon Completion of installation and prior to turning space over to Owner, Contractor reset occupancy sensor automatic self-adjustment settings to insure proper time delay self-adjustment for Owner occupant schedule and room use.
   6. Allow for up to 24 hours of callback sensor adjustments to be made by the contractor or occupancy sensor manufacturer qualified installer for up to six months after the owner has taken occupancy of the space.

G. Emergency Lighting Control Relays:
   1. Provide unswitched emergency circuit, and unswitched and switched normal circuit to UL924 relay for control of emergency luminaires with remaining room luminaires on normal power.
   2. Install each relay within dedicated 4-11/16-inch junction box with double-gang plaster ring for wall or ceiling flush-mount or in a self-contained enclosure from the manufacture, as indicated on Drawings.
   3. Where location in ceiling would interfere with removal of ceiling tiles, install relay flush-mounted in nearest wall at ceiling level.
   4. Do not locate behind wall switch.

3.2 WORK PRIOR TO COMMISSIONING

A. Complete phases of work so the system can be powered, tested, adjusted, and otherwise commissioned. Under Division 26, Electrical, complete systems, including subsystems, so they are fully functional. This includes the complete installation of equipment, materials, wire, controls, etc., in accordance with the contract documents and related directives, clarifications, change orders, etc.

B. A commissioning plan will be developed by the Test Engineer and approved by the Commissioning Agent. Under Division 26, Electrical, assist the Test Engineer and Commissioning Agent in preparing the commissioning plan by providing necessary information pertaining to the actual equipment and

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installation. If system modifications and clarifications are in the contractual requirements of this and related sections of work, they will be made at no additional cost to the Owner. If Contractor initiated system changes have been made that alter the commissioning process, the Commissioning Agent will notify the Owner.

C. Specific pre-commissioning responsibilities under Division 26, Electrical are as follows:
   1. Factory startup services for the following items of equipment:
      a. Lighting Control System
   2. Normal startup services required to bring each system into a fully operational state. This includes complete installation and cleaning. The Test Engineer will not begin the commissioning process until each system is documented as being installed complete.

D. Begin commissioning after installation of interior and exterior finishes including but not limited to adjacent roofing, finished floor, wall, and ceiling systems including final painting, furniture and book stacks in place, and other building systems which have direct or indirect influence on the performance and distribution of the daylight and electric lighting systems.

E. Start of commissioning before such items are complete will not relieve Contractor from completing those systems in accordance with the Construction Schedule.

3.3 SEQUENCE OF COMMISSIONING

A. Provide to Architect prior to start of commissioning layout drawings indicating proposed location of measurement points. Proceed with commissioning after review and acceptance by Architect.

B. Illuminance measurements oriented horizontal, facing up, at 30-inches above finished floor. Measurements for a control group occurs at the same location. Ensure constancy of local surface reflectance conditions throughout commissioning of each control group.

C. Ensure no personnel or outside influence affects the amount of flux striking the receptor head during the recording session.

D. Document measurements in clearly understandable format for review by the Architect. Include time of measurement, temperature, and relative humidity.

E. Measure illuminance at least two hours after local sunset with full output of electric lighting. Record integrated illuminance and average illuminance for a 2 hour period.

F. During daylight hours, measure illuminance with electric lighting off, including emergency and nightlight circuits. Record integrated illuminance and average illuminance for a two hour period. Document in clearly understandable format for review by the Architect.

G. Set each photocell to 150 percent of electric-only lighting contribution.

H. After initial setpoint has been set, measure illuminance in 10 minute increments from 1 hour before to 1 hour after local sunset.

I. Submit recorded data to Architect for review.

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3.4 TESTING FOR SEASONAL VARIATIONS

A. Timing of Commissioning:
   1. Initial Commissioning:
      a. Perform to best suit the current time-of-year and cloud cover conditions.
      b. Conduct as done as soon as contract work is completed regardless of season.
   2. Seasonal Commissioning: Test under full sunlight and full overcast conditions during summer and winter solstice, as well as similar conditions at the spring or fall equinox.
   3. Subsequent Commissioning: Ascertain adequate performance during the four seasons.

3.5 PARTICIPATION IN COMMISSIONING

A. Provide skilled technicians to start up systems within Division 26, Electrical. The same technicians made available to assist the Test Engineer and Commissioning Agent in completing the commissioning program as it relates to each system and their technical specialty. Work schedules, time required for testing, etc., will be requested, and coordinated by the Test Engineer. Under Division 26, Electrical, ensure that the qualified technician(s) are available and present during the agreed upon schedules and for sufficient duration to complete the necessary tests, adjustments, and problem resolutions at no additional cost to the Owner.

B. System problems and discrepancies may require additional technician time, Test Engineer time, Commissioning Agent time, redesign, and reconstruction of systems and system components. The additional technician time made available for the subsequent commissioning periods until the required system performance is obtained at no additional cost to the Owner.

C. Commissioning Agent reserves the right to judge the appropriateness and qualifications of the technicians relative to each item of equipment or system. Qualifications of technicians include expert knowledge relative to the specific equipment involved, adequate documentation and tools to service the commission the equipment, and a willingness to work with the Test Engineer and Commissioning Agent to get the job done. Remove technicians from the project at the request of either the Test Engineer or Commissioning Agent.

3.6 RESOLUTION OF DEFICIENCIES

A. In some systems, misadjustments, misapplied equipment, and deficient performance will result in additional work required to commission the systems.

B. Complete work under the direction of the Architect, with input from the Contractor, equipment supplier, Test Engineer, and Commissioning Agent.

C. Whereas members will have input and the opportunity to discuss the work and resolve problems, the Architect will have final jurisdiction on the necessary work to be done to achieve performance.

D. Complete corrective work in a timely fashion to permit timely completion of the commissioning process.

E. Experimentation to render system performance is permitted. If the Commissioning Agent deems the experimentation work to be ineffective or untimely as it relates to the commissioning process, the Commissioning Agent will notify the Owner, indicating the nature of the problem, expected steps to be taken, and the deadline for completion of activities.

F. If deadlines pass without resolution of the problem, the Owner reserves the right to obtain supplementary services, equipment, or both, to resolve the problem.

G. Costs incurred to solve the problems in an expeditious manner will be the Contractor's responsibility.

3.7 TRAINING

A. Participate in the training of Owner's engineering and maintenance staff, as required in Divisions 01 through 28, on each system and related components.

B. Conduct training in a classroom setting, with system and component documentation, and suitable classroom training aids.

C. Training classroom sessions and file demonstrations will be videotaped and copies of this material will be provided as part of closeout requirements.

D. Training will be conducted jointly by the test engineer, commissioning agent, the contractor, and the equipment suppliers.

E. Test engineer responsible for highlighting system peculiarities specific to this project.

3.8 SYSTEMS DOCUMENTATION

A. In addition to the requirements of Division 01, General Requirements, update contract documents to incorporate field changes and revisions to system designs to account for actual constructed configurations.

B. Division 26, Electrical, record drawings include architectural floor plans and the individual daylight control systems in relation to actual building layout.

C. Provide in AutoCAD .dwg format for transmittal to the test engineer.

END OF SECTION

SECTION 26 27 26

WIRING DEVICES

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes:
   1. Line Voltage Wall Switches
   2. Receptacles
   3. Plates

1.2 RELATED SECTIONS

A. Division 01, General Requirements

B. Division 26, Electrical

C. Section 26 05 19, Low Voltage Electrical Power Conductors and Cables

D. Section 26 05 26, Grounding and Bonding for Electrical Systems

E. Section 26 05 33, Raceways and Boxes for Electrical Systems

F. Section 26 05 53, Identification for Electrical Systems

G. Section 26 09 23, Lighting Control Devices

1.3 SUBMITTALS

A. Product Data

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Line Voltage Wall Switches:
   1. Hubbell
   2. Leviton
   3. Arrow-Hart
   4. Pass & Seymour

B. Receptacles:
   1. Use same manufacture as the Line Voltage Wall Switches.
   2. Hubbell
   3. Leviton
   4. Arrow-Hart
   5. Pass & Seymour

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C. Plates:
   1. Hubbell
   2. Leviton
   3. Arrow-Hart
   4. Pass & Seymour

2.2 MATERIALS

A. Extra heavy duty grade wiring devices, with special devices as noted on the Drawings. Should the Drawings indicate a device other than those listed. Device of same grade and manufacture as specified below. Furnish a matching plug connector for special purpose devices that do not have the common 120V NEMA 5-20R configuration.

B. Lighting switches and duplex receptacles installed have similar appearance characteristics unless noted otherwise.

2.3 LINE VOLTAGE WALL SWITCHES

A. Line Voltage Switches:
   1. 20A rated, 277V, quiet type, extra heavy duty, heavy duty nylon toggle handle, back, and side wired with screw terminal connections.
   2. As noted on the drawings provide:
      a. Pilot light switch: lighted clear toggle.
      b. Momentary Contact Switches: 15A, SPDT, center off.
      c. Key Switches: 20A, 277V, back and side wired with screw terminal connections.

B. Except as noted herein, device exposed finish color as follows:
   1. Normal Power: as selected by Architect
   2. Emergency Power: Red
   3. Standby Power: Red

2.4 RECEPTACLES

A. Standard Straight Blade Duplex Receptacle:
   1. 3-wire, 2-pole with grounding, extra heavy duty, 20A rated, NEMA 5-20R configuration, back and side wired with screw terminal connections.
      a.
      b. Provide tamper-resistant as noted on the drawings or NEC required.
   2. Ground Fault Interrupting straight blade duplex receptacle:
      a. Heavy duty, 3-wire, 2 pole with grounding, self-testing, green “ON” LED to indicate power, red “ON” LED to indicate ground fault condition, 20A rated, NEMA 5-20R configuration, back and side wired with screw terminal connections.
      b. Provide tamper-resistant as noted on the drawings or where NEC required.
      c. Provide weather-resistant rating at exterior locations as required by NEC.

B. Exposed Device Color, unless otherwise noted, is as follows:
   1. Normal power: Gray or as selected by Architect.

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2.5 PLATES

A. Flush Finish Plates:
   1. Selected by Architect.
   2. Smooth nylon or polycarbonate] [0.04-inch thick, Type 302 stainless steel, brush finish.

B. Surface Covers:
   1. Galvanized or cadmium plated steel, 1/2-inch raised industrial type with openings appropriate for device installed.

C. Identification:
   1. Identify receptacle plates with a pre-printed label indicating serving panel and branch circuit number.
   2. Refer to Section 26 05 53, Identification for Electrical Systems.

PART 3 EXECUTION

3.1 INSTALLATION

A. Devices and finish plates installed plumb with building lines. Install wall mounted receptacles vertically at centerline height shown on the Drawings.

B. Finish plates and devices are not installed until final painting is complete. Scratched or splattered finish plates and devices will not be accepted.

C. Switches, receptacles and/or other devices ganged into a common enclosure provided with a separation barrier between devices where the combined circuit voltages within the enclosure exceeds 300V.

D. Provide GFCI receptacles as shown on the drawings or as NEC required. Provide a GFCI type duplex receptacle in each required location, do not sub-feed normal receptacles downstream of the GFCI receptacle to obtain the GFCI rating.

E. Provide receptacles with GFCI, tamperproof, weather-resistant or hospital grade ratings as shown on the drawings, appropriate for the installation or required by NEC.

3.2 CORD CAPS

A. Special plugs provided with the receptacles given to the Owner in their cartons with a letter stating the date and the Owner's representative that received the materials.

3.3 COORDINATION

A. Electrical Drawings indicate the approximate location of devices. Refer to Architectural elevations, sections, and details for exact locations.

B. Coordinate with equipment installer the locations and methods of connection to devices mounted in cabinets, counters, work benches, service pedestals, and similar equipment.

END OF SECTION

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SECTION 26 50 00

LIGHTING

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes:
1. Lenses
2. Reflector Cones
3. Housings
4. Finish
5. Suspension
6. Lamps and Sockets
7. Power Supplies
8. Emergency LED Drivers
9. Transformers
10. Track Lighting Systems
11. Custom Luminaires
12. Exterior Luminaires
13. Extra Material
14. Disposal and Replacement

1.2 RELATED SECTIONS

A. Division 01, General Requirements

B. Division 26, Electrical

C. Section 26 05 19, Low Voltage Electrical Power Conductors and Cables

D. Section 26 05 26, Grounding and Bonding for Electrical Systems

E. Section 26 09 23, Lighting Control Device

F. Section 26 27 26, Wiring Devices

1.3 DEFINITIONS

A.	BACNET	Protocol for integration with BAS/BMS/EMS
B.	BAS	Building Automation System
C.	BMS	Building Management System
D.	EMS	Energy Management System
E.	CCT	Correlated Color Temperature

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F. CRI Color Rendering Index

G. CS Control Station

H. D Dimming Wall Switch

I. DT Dual Technology (PIR + U)

J. FC Footcandles
   1. The metric for measuring illuminance light levels

K. GUI Graphic User Interface

L. LCP Lighting Control Panel

M. LED Light Emitting Diode

N. LonWorks Protocol for integration with BAS/BMS/EMS

O. MTBF Minimum Time Between Failures
   1. Total hours of testing / Number of failures

P. OS/VS Occupancy Sensor / Vacancy Sensor,
   1. Occupancy sensors provide automatic on and automatic shut-off.
   2. Vacancy sensors provide automatic shut-off only, and require manual-on.

Q. PC Photocell

R. PIR Passive Infrared Technology

S. Power Supply Ballasts and LED drivers

T. RS RS-232 Connection for AV Integration

U. SC Scene Control

V. TC Timeclock, or astronomical timeclock

W. U Ultrasonic Technology

X. WS Wall Switch

Y. WS/O Wallbox Occupancy Sensor Switch
   1. Wall Switch with integrated Occupancy Sensor

1.4 QUALITY ASSURANCE

A. The lighting design for this project was based on luminaire types and manufacturers as specified.

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B. Basis of Design manufacturers are pre-qualified to bid on products where specified. Inclusion of manufacturer and product series does not relieve specified manufacturer from providing product as described in luminaire schedule; modifications to standard product, if required, include with initial bid.

C. Alternate manufacturers listed in the Luminaire Schedule do not require prior approval but included with the shop drawing submittal. Inclusion of manufacturer and product series as an alternate does not relieve the manufacturer from providing product equivalent to the basis of design as described in luminaire schedule; modifications to standard product, if required, include with initial bid.

D. Or Approved or Pre-Bid Approved Equal:
   1. Submit Substitution Request prior to bid, complying with requirements of Division 01, General Requirements.
   2. Approval determined by review of the following luminaire characteristics where applicable. Lack of pertinent data on characteristic constitutes justification for rejection of the submittal.
      a. Performance:
         1) Distribution
         2) Utilization
         3) Average brightness/maximum brightness.
         4) Spacing to mounting height ratio.
         5) Visual comfort probability.
      b. Construction:
         1) Engineering
         2) Workmanship
         3) Rigidity
         4) Permanence of materials and finishes.
      c. Installation Ease:
         1) Captive parts and captive hardware.
         2) Provision for leveling.
         3) Through-wiring ease.
      d. Maintenance:
         1) Relamping ease.
         2) Ease of replacement of ballast and lamp sockets.
      e. Appearance:
         1) Architectural integration.
         2) Light tightness.
         3) Neat, trim styling.
         4) Conformance with design intent.

1.5 GENERAL REQUIREMENTS

A. Provide lighting outlets indicated on the Drawings with a luminaire of the type designated and appropriate for the location.

B. Where a luminaire type designation has been omitted and cannot be determined by the Contractor, request a clarification from the Architect in writing and provide a suitable luminaire type as directed.

C. Coordinate installation of luminaires with the ceiling installation and other trades to provide a total system that is neat and orderly in appearance.

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D. Luminaires located in fire rated assemblies rated for use in such assemblies or have assembly maintained by the installer through the use of appropriate construction techniques to maintain the assembly rating. It is the responsibility of the contractor to maintain the assembly rating and provide required components during construction. Coordinate luminaires impacted with Division 01, General Requirements, and life safety documents.

E. Install remote power supplies and transformers in enclosures as required by luminaire specified. Locate remote power supplies and transformers as shown on drawings; where no location is shown, provide recommendation for approval prior to commencing field installation. Locate remote mounted power supplies and transformers within the distance limitations specified by the manufacturer.

F. Coordinate voltage requirements to each luminaire as indicated on drawings.

G. Verify luminaires carry a valid UL or ETL listing. Luminaires located in outdoor locations to carry and appropriate wet or damp listing as required for the mounting application.

H. Procure luminaires through a distributor located within 200 miles of the project site with a valid business license in the state the project is located.

I. Upon request of the Architect, Engineer, or Owner, provide back-up pricing in a unit cost breakdown per luminaire. Back-up pricing includes distributor net pricing, contractor net pricing, final owner pricing and mark-ups and discounts (lot price or all-or-none) associated with the luminaires.

J. Lighting related change orders to include back-up pricing noted above for review by the Engineer and Lighting Designer.

K. Provide manufacturer's warranty covering 5 years on drivers from date of purchase. Luminaire manufacture to operate driver at or below the required driver warranty temperature. Luminaire manufacturers failing to operate the driver, at the project required ambient temperature and within the driver manufacturer warranty parameters, will be responsible for driver warranty related costs over the warranty period.

L. 80 percent of the luminaire material by weight at a minimum should be recyclable at end of life. Design luminaire for ease of component replacement and end-of-life disassembly.

1.6 SUBMITTALS

A. Submit the following in accordance with Section 26 05 00, Common Work Results for Electrical:
   1. Shop Drawings, to include:
      a. Product Data:
         1) Provide manufacturer's published product data information.
         2) This information is to be relevant to the specified product only.
         3) Submittals limited to not more than three sheets for each type specified.
         4) They are specifically not to have configurations available included for review.
         5) Submittals that contain information that is not relevant to the product specified will be rejected in total and resubmission will be required.
      b. Luminaire dimensions on a fully dimensioned line drawing.

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c. Lamp information, including array configuration:
   1) For LED lamps: proof of conformance with the following: ANSI C78.377-2015, IES LM 79-2008, IES LM 80-2008, IES LM 82-2012, IES LM 84-14, IES LM 85-14, IES TM 21-2011, IES TM 28-14 and special certifications required by the contract documents.
d. Lamp socket information.
e. Power supply and transformer information using ballast manufacturers published product data information. Multiple power supplies or transformers may be submitted for single luminaire if compatible with specification included in contract documents. Include certification of lamp and power supply and transformer compatibility for submitted.
f. Mounting details including clips, canopies, supports, and methods for attachment to structure. Provide equipment required for row configurations.
g. UL/ETL Labeling Information
h. Manufacturer's Warranty
i. Photometric Reports consisting of the following:
   1) Candlepower distribution curves: Provide five plane candlepower distribution data at no more than 5 degree vertical angle increments.
   2) Coefficient of utilization table.
   3) Zonal lumen summary including overall luminaire efficiency.
   4) Luminaire luminance: Provide measured maximum brightness data for luminaires with reflectors and average brightness data for luminaires with refractors.
   5) Spacing to mounting height ratio. If parallel and perpendicular ratios differ, provide data on each plane.
   6) Pole information to include maximum supported effective projected area (EPA) and weight for the design wind speed, as well as structural calculations for each pole proposed.
   7) VCP calculations (where applicable): For general office lighting luminaires, provide typical VCP calculations for ceiling heights between 9-feet and 12-feet at 1-foot increments, for room sizes 20-feet by 20-feet and 30-feet by 30-feet.
j. Special requirements of the specification.

2. Operation and Maintenance Data:
   a. Prepare two copies of a Lighting Systems Maintenance Manual consisting of the following in a hard-cover binder for review. After review, Architect will deliver one copy to Owner. Manual to include:
      1) One complete set of final submittals of actual product installed, including product data and shop drawings. Include product data for actual power supply and transformer installed where applicable.
      2) List of lamps used in Project, cross-referenced to fixture types, with specific manufacturer's names and ordering codes.
      3) Re-lamping instructions for lamps that require special precautions (LED, tungsten halogen, metal halide, etc.).
      4) Lighting fixture cleaning instruction, including chemicals to be used or avoided.
      5) Parts list of major luminaire components and ordering information for replacement
      6) Copies of manufacturer warranties on product.
3. Manufacturer's Installation Instructions:
   a. Indicate application conditions and limitations of use stipulated by product testing agency.
   b. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product.
4. Closeout Submittals:
   a. Project Record Documents: Record actual connections and locations of pole foundations, luminaires, and any pull or junction boxes.
   b. Operation and Maintenance Data: Instructions for each product including information on replacement parts.

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c. Maintenance Materials: Furnish for Owner's use in maintenance of project.

PART 2 PRODUCTS

2.1 GENERAL

A. Luminaires new and complete with mounting accessories, junction boxes, trims, and lamps.

B. Luminaire assemblies UL listed.

C. Luminaires UL listed appropriate to mounting conditions and application.

D. Install recessed luminaires in fire rated ceilings and use a fire rated protective cover thermally protected for this application and carry a fire rated listing.

E. Luminaires installed under canopies, roofs, or open areas and similar damp or wet locations to be UL listed and labeled as suitable for damp or wet locations.

2.2 LENSES

A. Mechanically secured from within the housing.

B. Interior linear prisms with smooth exterior.

C. Prismatic Acrylic:
1. 12-inch by 24-inches and Larger: Extruded of clear virgin acrylic plastic, 0.125-inch minimum overall thickness, 0.1-inch nominal unpenetrated thickness, Pattern 12 with flat sided female prisms running at 45 degrees off panel axis unless otherwise specified in the luminaire schedule. Concave prisms are not acceptable.
2. As specified in the Luminaire Schedule.

D. Opal Acrylic:
1. Extruded or injection molded of virgin acrylic plastic, 0.08-inch minimum overall thickness.
2. As specified in the Luminaire Schedule.

E. Opal Acrylic Overlay: High transmittance type, extruded of virgin acrylic plastic, 0.04-inch overall thickness, with minimum 80 percent light transmittance.

2.3 REFLECTOR CONES

A. Spun of uniform gauge aluminum, free of spinning marks or other defects.

B. Integral trim flange.

C. Color and finish as specified in Luminaire Schedule.

D. White Reflectors: Steel or aluminum, minimum 22 gauge, with hard baked white enamel finish with minimum 85 percent reflectance.

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E. Alzak Reflectors:
   1. Low iridescent semi-specular or as indicated in the luminaire schedule, Alzak or Coilzak with minimum reflectance of 90 percent.
   2. Supply luminaires using Alzak reflector cones by the same manufacturer unless directed otherwise in Luminaire Schedule.

2.4 HOUSINGS

A. Dimensions: Proper for the various wattage noted on the plans and as recommended by the luminaire manufacturer or as specified in the luminaire schedule.

B. Extruded Aluminum Housing:
   1. One piece housing of AA 6063 T5 extruded aluminum with 0.14 minimum thickness smooth and free of tooling lines in one uninterrupted section of 1-foot to 24-foot with the cross sectional dimensions as indicated in the Luminaire Schedule.
   2. Section lengths as shown on the drawings and able to be transported into and out of the installation location after final construction without building demolition being required.

C. Steel Housing:
   1. 20 gauge minimum, free of dents, scratches, or other defects.
   2. Fill and sand exposed weld marks, joints, and seams smooth before finishing. Clean and dress edges to remove sharp edges or burrs.
   3. Section lengths as shown on the drawings comprised of 1-foot to 12-foot lengths.

D. Sheet Metal Housings: Minimum 22 gauge cold-rolled steel, with welded joints. Exposed weld marks and seams filled and ground smooth.

E. Door Frames for lensed luminaires: White painted, flat aluminum with mitered corners, rotary cam or spring assisted latches to hinge from either side.

F. End Plates: Mechanical attach die cast end plates without exposed fasteners. End caps, minimum 0.125-inch thick.

G. Provide an internal alignment spline where housing sections are joined together to form a continuous row.

H. Recessed Luminaires:
   1. Rated for use in recessed applications.
   2. If required by the owner or design team, provide test data proving the product is rated for use in recessed applications.
   3. Equip with through wire junction box. Box, power supply, and replaceable components accessible from the ceiling opening of the luminaire.

I. For wet and damp use, LED-based luminaire to be sealed, rated, and tested for appropriate environmental conditions and may not be accomplished by using an additional housing or enclosure

2.5 FINISH

A. Visible surfaces to be of color and texture as directed in Luminaire Schedule.
   1. Baked white dry polyester powder, if not specified, with a minimum average reflectance of 85 percent on exposed and light reflecting surfaces.

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B. Concealed interior and exterior luminaire surfaces to be Matte black or as recommended by the luminaire manufacturer.

C. Exposed aluminum surfaces:
   1. Satin etched and anodized in the color as indicated in the Luminaire Schedule.
   2. Treat with an acid wash and clear water rinse prior to painting.
   3. Electrostatically paint or powder coat and oven bake in the color indicated in the Luminaire Schedule.

D. Exposed steel surfaces:
   1. Treat with acid wash and clear water rinse, then prime coat.
   2. Electrostatically paint or powder coat and oven bake in the color indicated in the Luminaire Schedule.

2.6 SUSPENSION

A. Suspension Devices, type as specified in the Luminaire Schedule:
   1. Aircraft Cable:
      a. Stainless steel type: 3/32-inch nominal diameter, stranded, with positive pressure, field adjustable clamp at fixture connection.
   2. Rigid Pendant:
      a. 1/2-inch nominal diameter or as specifically shown on drawings.
      b. Supplied by fixture manufacturer when available as standard product.
      c. At fixture end of stems, provide earthquake type swivel fitting to permit 45 degree swing in any direction away from vertical.
      d. Flat canopy to permit splice inspection after installation.
   3. Chain Hangers:
      a. Length to suit fixture mounting height if shown or as field conditions dictate.
      b. Use two heavy duty chains with S hooks at each suspension point.
      c. Length to suit mounting height as shown on Drawings.
   4. Suspension system must permit ±1/2-inch minimum vertical adjustment after installation.

B. Supports:
   1. Provide internal safety cable from fixture body to structure.
   2. Carry fixture weight to structure and provide horizontal bracing from suspension points to ceiling framing to prevent sideways shifting. Provide diagonal seismic restraint wires per code.

C. Feed Point:
   1. Flat-plate canopy to cover outlet box, with holes for support cable and power cord, concealed fasteners to permit splice inspection after installation.
   2. At the electrified connection provide straight cord feed. Provide a separate feed point where emergency feed is required.
   3. Power Cord: White multi-conductor cord, parallel to support cable (aircraft cable); within pendant (rigid pendant); or flexible conduit (chain hanger).
   4. Provide a separate fee point where emergency feed is required.

D. Non-feed Points:
   1. 1/2-inch OD polished chrome end sleeve, inside threaded 1/4-inch-20, with 2 –inch diameter. Flat white plate to cover hole in ceiling. Top of cable with ball swaged on end, to fit inside sleeve.
   2. Provide support above ceiling as required.

E. Suspension method allows adjustment to be made in hanging length to allow for variance in ceiling height.

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F. Exposed paintable suspension components have the same finish and color as the luminaire housing.

2.7 LAMPS AND SOCKETS

A. Lamp each luminaire with the suitable lamp cataloged for the specific luminaire type and as indicated by the manufacturer, or as specifically indicated in the Luminaire Schedule, or as specified herein.

B. Lamps to be field replaceable.

C. Lamp sockets to be of configuration and design to accept standard LED lamps and circuit boards.

D. LED lamps to meet or exceed 50,000 hours as defined by LM-80-08 based on both the ambient temperature listed and the LEDs B10L70 performance curve as published by the LED lamp manufacturer.

E. LED lamps to be high brightness and proven quality from established and reputable LED manufacturers, including:
1. Nichia
2. Osram-SemiOpto
3. Cree
4. Philips Lumileds
5. Seoul Semiconductor
6. Bridgelux
7. General Electric Gelcore
8. Xicato
9. Osram

F. Replacement Lamps:
1. Sorra
2. Toshiba

G. LED lamps that are integral into the housing; light bars, diodes, boards and other, to be rated and tested for use in the fixture specified and compatible with the driver tested and compatible with that fixture.

H. Screw-In Base Replacement LED Lamps:
1. Manufacturer to provide wattage restriction label on socket, equivalent to specified wattage on LED replacement lamp.
2. LED replacement lamps not to be placed in air-tight enclosures or in insulated air tight (ICAT) rated luminaire enclosures without dedicated heat dissipation and thermal management of the luminaire system.

I. Color Rendering Index (CRI):
1. As indicated in the luminaire schedule

J. Adjustable Lamp Mechanisms: Include aiming stops which can be permanently set to position lamp vertically and rotationally.

K. High power LED luminaire thermally protected using one or more of the following thermal management techniques: metal core board, gap pad, and/or internal monitoring firmware

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L. Operating Temperature:
   1. -22 degrees F to 115 degrees F.
   2. Operate below manufacturer's published die junction temperatures when operated at 1W at 350 mA in an elevated ambient of 46 degrees C.

M. Utilize quick-connect connections to replaceable boards to meet ANSI and UL/ETL and NEMA requirements.

2.8 POWER SUPPLIES

A. UL recognized under the component program and modular for simple field replacement.

B. Rate for use with the LED array specified:
   1. Warranty array and driver as an assembly.
   2. 5 year full replacement, non-pro-rated warranty is required on electronic components.

C. Luminaires requiring more than one driver are not permitted, unless specified in the luminaire schedule.

D. Power supplies used in enclosed and gasketed luminaires listed for use in wet locations, Type 1 construction.

E. Rate for the expected ambient temperature in which they are installed.
   1. Exterior installed power supplies rated to start the lamps at 0 degrees F.

F. Operate for a (+/- 10 percent) supply voltage of 120V at 60Hz.

G. Power Factor: 0.9 minimum

H. Lifetime minimum:
   1. 50,000 hours at full load and 77 degrees F ambient
   2. Ten-year expected life while operating at maximum case temperature and 90 percent non-condensing relative humidity.

I. Minimum time between failures (MTBF) greater than 300,000 hours at full load and 77 degrees F ambient, in accordance with MIL-HDBK-217.

J. Driver and luminaire electronics deliver illumination that is free from objectionable flicker as measured by flicker index (ANSI/IES RP-16-10).
   1. Flicker index to be less than 5 percent at frequencies below 1000 Hz.

K. Label systems using tandem wired luminaires be labeled accordingly. Locate label in the lamp compartment of each luminaire and identify the function of that luminaire. Do not make the label visible from room.

L. Total Harmonic Distortion less than 20 percent and meet ANSI C82.11 maximum allowable THD requirements at full output. Imbalance current is not allowed to exceed full output THD at any point in the dimming curve.

M. Meet or exceed $30mA^2s$ at 277VAC for up to 50Ws of load and 75A at 240us at 277VAC for 100 watts of load.

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N. Withstand up to a 1,000V surge without impairment of performance as defined by ANSI C62.41 Category A.

O. Housing have circuit diagrams and lamp connections applied thereto.

P. Reduction of Hazardous Substances (RoHS) compliant.

Q. Provide no light output when the analog control signal drops below 0.5 V, or the DALI/DMX digital signal calls for light to be extinguished and consume 0.5 watts or less in this standby. Control deadband between 0.5V and 0.65V included to allow for voltage variation of incoming signal without causing noticeable variation in fixture to fixture output.

R. Support automatic adaptation, allowing for future luminaire upgrades and enhancements and deliver improved performance:
   1. Adjustment of forward LED voltage, supporting 3V through 55V.
   2. Adjustment of LED current from 200mA to 1.05A at the 100 percent control input point in increments of 1mA
   3. Adjustment for operating hours to maintain constant lumens (within 5 percent) over the 50,000 hour design life of the system, and deliver up to 20 percent energy savings early in the life cycle.

S. Remote: Driver may be remote mounted up to 300-feet depending on power level and wire gauge.

T. Dimming Drivers:
   1. Dimming power supplies controlled by a common controller by the same manufacturer.
   2. Manufacturer to have minimum 5 years of experience in manufacturing dimmable electronic lighting drivers.
   3. LED dimming to be equal in range and quality to a commercial grade incandescent dimmer. Quality of dimming to be defined by dimming range, freedom from perceived flicker or visible stroboscopic flicker, smooth and continuous change in level (no visible steps in transitions), natural square law response to control input, and stable when input voltage conditions fluctuate over what is typically experience in a commercial environment.
      a. Demonstration of this compliance to dimming performance will be necessary for substitutions or prior approval.
   4. Provide step-free, continuous dimming to black from 100 percent to 0.1 percent and 0 percent relative light output, or 100 – 1 percent light output and step to 0 percent where indicated. Driver responds similarly when raising from 0 percent to 100 percent.
      a. Driver to be capable of 20 bit dimming resolution for white light LED drivers or 15 bit resolution for RGBW LED drivers.
   5. Track evenly across multiple fixtures at light levels, and provide input signal to output light level that allow smooth adjustment over the entire dimming range.
   6. Limit inrush current.
   7. No visible change in light output with a variation of plus/minus 10 percent line voltage input.
   8. Configure a linear or logarithmic dimming curve, allowing fine grained resolution at low light levels
   9. Basis of Design Product: eldoLED or subject to compliance and prior approval with specified requirements of this section, one of the following:
      a. eldoLED
      b. Philips
      c. Osram Sylvania
      d. Tridonic
      e. General Electric

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10. Dimming Protocols:
    a. If not otherwise noted on the luminaire schedule, dimming LED drivers to be 0-10V.
    b. 4-Wire (0-10V DC Voltage Controlled) Dimming Drivers:
        1) Meet IEC 60929 Annex E for General White Lighting LED drivers.
        2) Connect to devices compatible with 0 to 10V Analog Control Protocol, Class 2, capable of sinking 0.6 ma per driver at a low end of 0.3V. Limit the number of drivers on each 0-10V control output based on voltage drop and control capacity.
        3) Must meet ESTA E1.3 for RGBW LED drivers
        4) 0-10V input protected from line voltage miswire, and immune and output unresponsive to induced AC voltage on the control leads.
        5) .
    c. As indicated in the luminaire schedule.

2.9 EXTRA MATERIAL

A. Furnish extra materials described below. Match product installed and packaged with protective covering for storage and identified with labels describing contents.
    1. Glass and plastic lenses, covers, louvers, globes, guards, and other removable fixture parts: 5 percent or one dozen (whichever is less) of each type and rating installed. Furnish at least one of each type.
    2. Control gear: 5 percent or one dozen (whichever is less) of each field-replaceable control module, driver, ballast, or individual fixture transformer. For fixtures with non-easily replaceable control gear provide 5 percent or one dozen (whichever is less) extra fixtures. Confirm non-replaceable products during submittal process.
    3. For non-decorative LED lights: provide 2 percent additional fixtures, or minimum two fixtures.

2.10 DISPOSAL AND REPLACEMENT

A. LED manufacturer is responsible for the disposal of expired LED arrays and heat sinks. Clearly label fixture with return information, disposal procedures and manufacturer disposal contact information.

B. Owner will pay for shipping.

C. Manufacturer is required to inform the owner of new power requirements and /or lumen output values if new replacement components prior to shipping replacement parts.

D. Label disposal and replacement information inside the luminaire and in the project operation and maintenance manuals along with O&M requirements listed in Division 01, General Requirements.

PART 3 EXECUTION

3.1 INSTALLATION

A. Meet general requirements of NFPA 70, National Electric Code.

B. Mounting heights specified on drawings:
    1. Wall Mounted Luminaires: Centerline of luminaire.
    2. Pendant Mounted Luminaires: Bottom of luminaire unless specifically identified in the Luminaire Schedule or on drawings.

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C. Support:
   1. Support by separate means from the building structure and not from the ceiling system, ductwork, piping, or other systems.
   2. Final decision as to adequacy of support and alignment will be given by the Architect.

D. Power Supplies:
   1. Do not install equipment until following conditions can be maintained in spaces to receive equipment:
      a. Ambient temperature: -4 degrees to 122 degrees F.
      b. Relative humidity: Maximum 90 percent, non-condensing.
      c. Protected from dust and excess moisture during installation.
   2. Install per manufacturers prescribed methods.
   3. Located remote mounted power supplies and transformers within the distance limitations specified by the power supply manufacturer.

E. Level luminaires, align in straight lines, and locate as shown on the architectural elevations and reflected ceiling plan.

F. Manufacturer's labels or monograms not visible after luminaire is installed, but must be included for future reference.

G. Recessed Luminaires:
   1. Trims which fit neatly and tightly to the surfaces in which they are installed without light leaks or gaps.
   2. Install heat resistant non-rubber gaskets to prevent light leaks or moisture from entering between luminaires trim and the surface to which they are mounted.

3.2 COORDINATION OF WORK

A. Architectural Reflected Ceiling Plans take preference as to the exact placement of the luminaires in the ceiling.

B. Determine ceiling types in each area and provide suitable accessories and mounting frames where required for recessed luminaires. Luminaire catalog numbers do not necessarily denote specific mounting accessories for type of ceiling in which a luminaire may be installed.

3.3 PROJECT CLOSEOUT

A. Leave luminaires clean at the time of acceptance of the work. If luminaires are deemed dirty by the Architect at completion of the work, clean them at no additional cost. Protective plastic wrap is to be removed from parabolic luminaires just prior to owner acceptance.

B. Provide fixtures with new lamps operating at time of final acceptance. Exception: For fluorescent dimming fixtures, provide minimum 100 hour/maximum 200 hour, continuously lit lamps or per ballast manufacturer’s recommendations.

C. Where incandescent lamps are used for construction lighting, replace the lamps with new lamps just prior to occupancy by the owner.

END OF SECTION

KMS

SECTION 28 30 00

FIRE DETECTION AND ALARM

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes:
   1. Strobe Synchronization
   2. Detection Devices
   3. Manual Pull Stations
   4. Annunciation Devices
   5. Addressable Accessories
   6. Controlled Devices
   7. Cable

1.2 RELATED SECTIONS

A. Division 01, General Requirements

B. Section 26 05 19, Low Voltage Electrical Power Conductors and Cables

C. Section 26 05 33, Raceways and Boxes for Electrical Systems

D. Section 26 05 53, Identification for Electrical Systems

1.3 SUBMITTALS

A. Shop drawings produced in AutoCAD with Fire Marshal's stamp of approval.

B. Product data with wiring schematics.

C. AutoCAD wiring diagrams of each type of device.

D. AutoCAD riser diagram of the complete systems.

E. Battery and voltage drop calculations based on intended routing and wiring.

F. Prepare shop drawings of the system by the manufacturer in AutoCAD and submitted to the Fire Marshal for approval. The approved shop drawings will be utilized as the installation drawings. The shop drawings show actual conduit routing and conductors as to be installed. Update drawings to include revisions and changes to the system during construction and installation.

1.4 QUALITY ASSURANCE

A. Approve and install equipment in accordance with NFPA, ADA and IBC requirements and UL listed both in individual components and as a system. ISO-9000 certified; UL and FM listed and meet NFPA 72.

B. Furnish evidence that there is an experienced and efficient service organization which carries a stock of repair parts for the system to be furnished and that the organization is capable of providing repair service within 24 hours of a trouble call.

C. Install system by an electrical contractor experienced in the installation of addressable fire alarm systems and certified by the National Institute for Certification in Engineering Technologies (NICET) for fire alarm systems. Obtain services of the control equipment factory representative to provide engineered system floor plans and point-to-point drawings on AutoCAD. Representative to supervise the installation, system start-up, programming, make final adjustments and provide testing of the completed system. Factory representative to provide a letter of system certification to the Architect.

1.5 CONTRACTOR DESIGN

A. Equipment shown on the contract drawings indicate the general nature of the fire alarm system, but does not necessarily show components required. Provide a complete fire alarm and communications system as needed to meet applicable codes and requirements under this section.

B. Review various sets of drawings for initiating and notification devices, and add devices if needed to comply with the requirements of NFPA 72.

C. Raceway, routing, and wiring for field devices are not shown on the drawings except for a few specific design requirements.

1.6 SYSTEM DESCRIPTION

A. Automatic fire detection systems operate in a local, supervised non-coded fashion. Low voltage operating at 24V DC. Fully addressable with analog technology for sensors. Signal circuits either class A or B without changing modules. Design system Class B. Load circuits to 75 percent capacity maximum.

B. Signal, visual and audible alarms, flow and tamper module circuits supervised for opens, shorts and grounds. Open, short or ground causes a trouble on the system, sound the audible trouble sounder and annunciate at the control and remote annunciator: the device, location, and nature of the trouble condition.

1.7 SYSTEM OPERATION

A. Operation of manual or automatic initiating device cause an audible and visual alarm to sound, activate the control-by-event program and perform auxiliary functions.

B. Annunciate fault in the circuits at the control panel and the remote annunciators.

C. Utilize a single pair of wires to power, transmit, and receive data from the addressable analog initiating devices and to transmit commands to the remote control points. Size wire for the length of communications loop but in no event less than number 18-2 wire size.

1.8 SEQUENCE OF OPERATION

A. The system alarm operation subsequent to the alarm activation of manual station, automatic initiating device, or sprinkler flow/pressure switch is to be as follows:
   1. Audible alarm indicating appliances sound a digitized tone until silenced by the alarm silence switch at the control panel.
   2. Visual alarm indicating appliances (xenon strobes) display a continuous pattern until extinguished by the alarm silence switch.
   3. Doors normally held open by door control devices release. Signal door lock systems to unlock.
   4. A supervised signal to notifies an approved central station to activate.
   5. Combination fire/smoke dampers de-energizes to normally closed position.

B. Control panel has a dedicated supervisory service indicator and a dedicated supervisory service acknowledge switch.

C. The activation of standpipe or sprinkler valve tamper switch activates the system supervisory service audible signal and illuminate the indicator at the control panel.
   1. Activating the supervisory service acknowledge switch will silence the supervisory audible signal while maintaining the supervisory serviced LED on indicating the tamper contact is still in the off-normal state.
   2. Restoring the valve to the normal position cause the supervisory service indicator to extinguish thus indicating restoration to normal position.

D. The activation of sprinkler pre-action system pressure or low air switch activate the system supervisory service audible signal and illuminate the indicator at the control panel.
   1. Activating the supervisory service acknowledge switch will silence the supervisory audible signal while maintaining the supervisory service indicator on indicating the pressure/air contact is still in the off-normal state.
   2. Restoring the air pressure to the normal causes the supervisory service indicator to extinguish thus indicating restoration to normal position.

E. Immediately display alarm and trouble conditions on the control panel front alphanumeric display and of remote annunciators. If more alarms or troubles are in the system the operator may scroll to display new alarms.

F. Alarm list key that will allow the operator to display alarms, troubles, and supervisory service conditions with the time of occurrence.

G. In normal operation, fire alarm system close combination fire/smoke dampers when corresponding fan system is OFF. Fire alarm system open combination fire/smoke dampers when corresponding fan system is ON.

1.9 CONNECTION TO EXISTING NETWORK

A. General: Communication between peer-to-peer fire alarm control panels via TCP/IP over existing Ethernet, RS-485, RS-232 or other previously established panel system communication protocol.

B. Provide hardware, software and system integration to seamlessly integrate to the existing server for common system graphics, alarming, paging out of alarms via existing system.

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C. Provide upgrade to existing control monitoring to accept new alarm points.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Siemens

B. Edwards

C. Notifier

D. Simplex

E. Or approved equal.

2.2 GENERAL

A. Furnish labor, materials, and equipment required for a complete and operating system of manual and automatic initiating devices, control panels, auxiliary relays, power supplies with batteries and accessories necessary to accomplish the desired sequence of events.

B. Fully electronic and addressable systems as described below with monitoring and annunciation of system alarms and troubles.

2.3 STROBE SYNCHRONIZATION

A. Synchronize strobes to 1Hz flash to comply with the Americans with Disabilities Act (ADA).

2.4 DETECTION DEVICES

A. Analog photoelectric smoke detectors provide for individual addressing of each detector. Sensor is constantly monitored to measure change in its sensitivity due to the environment caused by dirt, aging, temperature, humidity, etc.

B. Give an advanced indication to the control panel of the need for maintenance and be specific as to where the maintenance is needed. It is to be mounted on a two wire standard device base. Photoelectric detectors located within the elevator shaft rated for installation within a pressurized shaft.

C. Duct smoke detector housing assemblies accommodate the mounting of an analog/addressable detector along with a standard, relay or isolator detector mounting base. Housing protects the measuring chamber from damage and insects. Utilize an air exhaust tube and an air sampling inlet tube that extends into the duct air stream up to twelve feet. Provide drilling templates and gaskets to facilitate locating and mounting the housing.
   1. Provide sampling tube length as required to accommodate air duct width.
   2. Provide remote status/alarm LED indicator and keyswitch test station for each duct smoke detector.
   3. Duct smoke detector air velocity range includes design air velocity of the ductwork in which the duct smoke detector is to be installed.

D. Analog thermal detectors consist of a dual thermistor sensing circuit for fast response. Sensor is continually monitored to measure changes in their sensitivity due to temperature. Advanced indication to the control panel of the need for maintenance and can be specific as to where the maintenance is needed. Mount on a two wire standard device base. Equip thermal detectors in elevator shafts and machine rooms with a set of auxiliary contacts for elevator equipment use. Rate thermal detectors located within elevator shaft for installation within a pressurized shaft.

E. Projected Beam Type Smoke Detectors:
1. 4-wire 24 VDC and powered from the control panel four-wire smoke power source.
2. Consists of a separate transmitter and receiver capable of being powered separately or together.
3. Operate in either a short range of 30-feet to 100-feet or a long range of 100-feet to 300-feet.
4. Feature a bank of four alignment LEDs on both the receiver and transmitter that are used to ensure proper alignment without the use of special tools.
5. The beam detector features automatic gain control that compensate for gradual signal deterioration from dirt accumulation on lenses. Ceiling or wall mount as shown on the drawings. Carry out testing out using calibrated test filters. Provide a key activated remote test station.
6. Provide monitor modules for alarm and trouble and control relay module for reset.

F. Provide addressable monitor modules an address for a single, normally open initiating device such as a waterflow switch, manual station, etc. UL approved to extend the sensor loop to lengths up to 2,500-feet.

2.5 MANUAL PULL STATIONS

A. Single action, addressable, constructed of metal construction with a key reset switch for positive authorized resetting action. The unit to be keyed the same as the control unit.

B. Covers for manual pull stations. Cover includes local audible notification powered by a replaceable battery.

2.6 ANNUNCIATION DEVICES

A. Horn and Combination Horn/Strobe:
1. Mount to a recessed box with an extension ring.
2. Front of the unit allows for candela light levels as required by ADA for the spacing as installed.
3. Horns provide a 100 dba peak sound output with field adjustable output level.
4. Finish [As selected by Architect.

B. Strobe Lights:
1. Triangular with FIRE on white plastic lens, polarized 24 VDC, mounting single gang on four square box.
2. Front of the unit allows for candela light levels as required by ADA for the spacing as installed.
3. Strobe candela level adjustable field from 15-110 CD.
4. Mount at 80-inches or as shown on drawings.
5. Finish: As selected by Architect.
6. The candela rating of each strobe installed apparent to the Fire Marshal and to qualified service personnel either as installed or with the removal of the faceplate. If faceplates are interchangeable between strobes of different ratings the indication of candela rating not on the faceplate.

2.7 ADDRESSABLE ACCESSORIES

A. Control Modules:
1. Connects to the same loop as the initiating devices and provides a form C relay contact.

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2. Program module to transfer from either a trouble or alarm input from any or combination of any addressable device.

2.8 CONTROLLED DEVICES

A. Mechanical control system for control of air handlers and smoke/fire rated dampers.

B. Fire protection tamper, flow, dry system and preaction system.

2.9 CABLE

A. Plenum rated as recommended by System Manufacturer and the building construction methods.

PART 3 EXECUTION

3.1 INSTALLATION

A. General:
1. Install in accordance with code, UFC, UBC, NFPA 72, 101 and the manufacturer's instructions.
2. Review proper installation of each type of device with manufacturer's agent.
3. Install wiring, raceway and outlet boxes required for a complete system as indicated in the Contract Documents.
4. Comply with applicable requirements of Section 26 05 33, Raceways and Boxes for Electrical Systems, for boxes and surface mounted raceways.

B. Typical Wiring:
1. Install manufacturer's recommended listed cable to connect devices as recommended by the manufacturer.
2. Run cable in conduit where exposed to physical damage.

C. Detectors:
1. Locate 48-inches clear of supply air vents and 12-inches clear of lights and sprinkler heads.
2. Install detector heads not more than two weeks prior to substantial completion.
3. Verify the design locations shown conform to the actual construction.
4. Do not locate detectors in close proximity to air supply vents.
5. Bring cases of uncertain applicability to the attention of the Architect for resolution prior to roughing in.

D. Duct Smoke Detectors
1. Provide/maintain working access to duct smoke detectors.
2. Locate duct smoke detectors in accordance with code requirements. Locations must ensure adequate airflow within the duct housing.
3. Locate remote status/alarm LED indicator and keyswitch test station at readily accessible location out of general viewdirectly below duct smoke detector location. Identify locations on fire alarm shop drawings prior to installation.

E. Provide auxiliary power supplies as required and extend the 120V power to the power supply as required and per NEC.

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F. Provide visual devices and alarm devices as required. Device locations are diagrammatic showing intent of area coverage. The exact placement, sound or light level is to be per the requirements and the listing of the manufacturer's equipment and NFPA 72 installation requirements for the device(s) installed and the building conditions at and adjacent to the device(s).

3.2 LABELING

A. Label alarm initiating devices with 1/2-inch by 1-inch lamicoid nameplates, indicating control panel point designation. Locate nameplates in the vicinity of the device as approved by the Owner.

B. Provide Brady type wire markers to identify conductors at each junction or terminal. Use numbers indicated on the wiring diagrams.

3.3 TESTS

A. Provide the service of a competent, factory-trained technician authorized by the manufacturer of the fire alarm equipment to technically supervise and participate during the programming, final connections, adjustments and tests for the system.

B. When the system is complete and prior to the substantial completion, furnish testing equipment and perform the following tests:

C. Before energizing system, check for correct wiring connections and test for short circuits, ground faults, continuity, and insulation.

D. Test the insulation on installed wiring by standard methods as recommended by the equipment manufacturer.

E. Open supervised circuits to see if the trouble signal activates.

F. Ground supervised circuits and verify response of trouble signals.

G. Check installation, supervision, operation, and sensitivity of smoke detectors as recommended by the manufacturer to ascertain that they will avoid false alarm signals yet provide the required automatic detection.

H. Test each device for proper operation and auxiliary function.

I. Submit a print out of the entire test procedure to the engineer with the letter of certification for the completed fire alarm system.

J. When defects in the work are detected, make repairs and repeat the tests as required.

K. Test system for NFPA standby and alarm runtime for the actual load on the system batteries and recharge time of system batteries.

L. Perform required and necessary verification of the system operating functions with the Architect and Owner's facility staff prior to turnover of the complete system for final test observed by the Fire Department. Perform tests in the presence of the Owner or the Owner's Representative. A System Certification verifying the proper system operation is required prior to acceptance. Instruct Owner's

personnel in system operation, maintenance and programming for a minimum of 20 hours. The cost of retesting as a result of the failure of the system to operate in accordance with these specifications, drawings, or applicable codes paid for by the contractor to the Owner.

3.4 WARRANTY SERVICE AND INSTRUCTION

A. The fire alarm system will be checked on a monthly basis by the fire alarm system service organization for a period of one year after beneficial occupancy. The monthly checks will consist of reviewing the operation of the system with the Owner's operating and maintenance personnel, providing additional hands on instruction, and assisting in execution of programming revisions. Each monthly visit will consist of not less than two hours of on-site time and no more than four hours. The monthly visits will be scheduled with the Owner not less than one week in advance.

3.5 EXTRA STOCK/SPARE PARTS

A. Provide the following equipment to be turned over to the owner with the operation and maintenance manuals.
   1. Two photoelectric smoke detector heads.
   2. Two thermal heat detector heads.
   3. One addressable dry contact modules.
   4. Two horns.
   5. Two horns/strobes.
   6. One manual pull stations.
   7. One complete set of fuses to match panel counts.

3.6 TRAINING

A. Provide operation and maintenance training for Owner's personnel.

B. Conduct a minimum of two maintenance training sessions upon completion of the work. Maintenance training sessions include the following:
   1. Walk-thru of the completed facilities identifying the location.
   2. Address\
   3. Means of access to every device monitored by the fire alarm system.

C. Conduct training sessions for two operator levels.

D. Operator training: Provide a minimum of three refresher and system update training sessions of on-the-job training.

E. Supervisor training: Provide a system update training session for supervisory functions.

F. Training sessions with fully qualified, trained representative, of the equipment manufacturer who is thoroughly knowledgeable of the specific installation.

END OF SECTION

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NORTH EUGENE HIGH SCHOOL IMPROVEMENTS TECHNICAL SPECIFICATIONS

SECTION 02 41 00
DEMOLITION

PART 1 – GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

A. Cutting and Patching
B. Temporary Facilities and Controls

1.2 EXTENT OF WORK

A. Perform demolition required for completion of new work as shown on drawings or specified. Remove existing construction at areas shown for new work. Remove loose material caused by or remaining from demolition work.

1.3 ALTERATIONS TO EXISTING CONSTRUCTION

A. Remove portions of existing work only as required to install new materials as specified and as shown on drawings. Repair or replace those portions of existing work outside of new work damaged as result of new work. Repairs or replacement work shall reinstate damaged areas to match original conditions.

1.4 REQUIREMENTS OF REGULATORY AGENCIES

A. Coordinate work with Utility companies, Municipal and State agencies as required.
B. Comply with applicable jurisdictional standards, including but not limited to:
   1. Occupational Safety and Health Administration (OSHA)
   2. Oregon Occupational and Health Administration (OR-OSHA)
   3. National Emission Standards for Hazardous Air Pollutants (NESHAPS)
   4. National Institute for Occupational Safety and Health (NIOSH)
   5. Department of Environmental Quality (DEQ)
   6. Lane Regional Air Pollution Authority (LRAPA)
C. Comply with Oregon Administrative Rules (OAR) Chapter 437, for hazardous material communication procedures. Post Material Data Safety Sheets (MSDS) on site in conspicuous location.
D. Dispose of materials contaminated with lead, asbestos, mercury and other heavy metals according to Federal, State and Local jurisdictional regulations.

1.5 CODES AND STANDARDS

A. Conform with applicable portions of National Electric Code, latest edition, and other applicable codes within the jurisdiction of the work.

1.6 PERMITS

A. Obtain and pay for necessary permits and inspections required by local and state authorities having jurisdiction. Make such tests as may be required by law.

1.7 ENVIRONMENTAL CONDITIONS

A. Conduct demolition to minimize interference with adjacent building areas.
B. Provide, erect and maintain temporary barriers and safety devices to ensure protection including ground protection to prevent soil contamination.

1.8 COORDINATION

A. Coordinate with other trades affecting or affected by Work of Section.
B. Coordinate demolition with Owner's Representative.

1.9 PROTECTION

A. Protect portions of existing building and facilities against damage and discoloration.
B. Protect active utilities and maintain in continuous operation.
C. Provide barriers as required to protect public from areas under demolition.

PART 2 – PRODUCTS

2.1 SALVAGE

A. All salvage except items specifically noted becomes property of Contractor. Salvage may be reused on Work if so specified or scheduled or if Architect judges it equal to new products specified, with the appropriate adjustment in contract sum. Remove material from site.

PART 3 – EXECUTION

3.1 REVIEW OF EXISTING CONDITIONS

A. Visit project site and review existing conditions affecting Work before submitting Bid Proposal.

3.2 PREPARATION

A. Erect and maintain temporary barriers to prevent spread of dust, fumes, noise, and smoke.
B. Protect existing items that are not indicated to be altered.

3.3 DEMOLITION

A. Demolish in orderly and careful manner.
B. Protect existing work to remain.
C. Except where noted otherwise, immediately remove demolished material from site.
D. Remove materials to be reinstalled or retained in manner to prevent damage.
E. Remove, store, and protect for reinstallation materials and equipment listed on the drawings accordingly.
F. Remove and promptly dispose of contaminated, vermin infested, or dangerous materials encountered.
G. Remove demolished materials from site as work progresses.
H. Do not burn or bury materials on site.
J. Leave areas of work in clean condition.

3.4 CLEANING AND REPAIRING

A. Do not allow debris to accumulate in building or on site - haul away from site as soon as removed and dispose of at Contractor's expense.
B. Clean, repair, touch up, or replace when directed, adjacent surfaces which have been soiled, discolored, or damaged by work of Section.

END OF SECTION 02 41 00

SECTION 03 20 00
CONCRETE REINFORCEMENT

PART I - GENERAL

1.1 SECTION INCLUDES

A. Reinforcing steel for cast-in-place concrete.
B. Supports and accessories for steel reinforcement.

1.2 RELATED SECTIONS

A. Section 03 30 00 - Concrete

1.3 REFERENCES

A. ACI 301 - Specifications for Structural Concrete for Buildings; American Concrete Institute International
B. ACI SP-66 & ACI 315 Detailing Manual; American Concrete Institute International;
C. ASTM A 82 - Standard Specification for Steel Wire, Plain, for Concrete Reinforcement;
D. ASTM A 615/A 61 SM - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement;
F. CRSI (DA4) - Manual of Standard Practice; Concrete Reinforcing Steel Institute

1.4 QUALITY ASSURANCE

A. Perform work of Section in accordance with ACI 301.

PART 2 - PRODUCTS

2.1 REINFORCEMENT

A. Reinforcing Steel: ASTM A 615/A 61 SM Grade 60 (420).
   1. Plain billet-steel bars.
   2. Unfinished.
B. Reinforcement Accessories:
   1. Tie Wire: Annealed, minimum 16 gage.
   2. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement.
C. Weldable bar #4 through #8 per ASTM A706, Grade 60.

2.2 FABRICATION

A. Fabricate concrete reinforcing in accordance with CRSI (DA4) - Manual of Standard Practice.
B. Welding of reinforcement is not permitted.

PART 3 - EXECUTION

3.1 PLACEMENT

A. Place, support and secure reinforcement against displacement.
B. Maintain 1½ inches concrete cover around reinforcing, with minimum 3 inches when placed against earth; 2 inches when concrete exposed to weather.
C. Conform to OSSC and ACI 301 for concrete cover over reinforcement.
D. Splices - maintain lap minimum of 48 bar diameters, for tension and other bar placements.
E. Field bending of bent bars requires approval by Architect.

END OF SECTION 03 20 00

SECTION 03 30 00
CONCRETE

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Concrete slabs and foundations.
B. Accessories such as joint devices and below-grade vapor barriers.
C. Concrete curing.

1.2 RELATED SECTIONS

A. Section 03 20 00, Concrete Reinforcing

1.3 REFERENCES

A. ACI 301 - Specifications for Structural Concrete for Buildings; American Concrete Institute International
B. ACI 302.1 R - Guide for Concrete Floor and Slab Construction; American Concrete Institute International
C. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete; American Concrete Institute International
D. ACI 306R - Cold Weather Concreting; American Concrete Institute International
E. ACI 308 - Standard Practice for Curing Concrete; American Concrete Institute International
F. ACI 318- Building Code Requirements for Reinforced Concrete and Commentary; American Concrete Institute International
G. ASTM C 33-Standard Specification for Concrete Aggregates
H. ASTM C 39/C 39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
J. ASTM C ISO-Standard Specification for Portland cement
K. ASTM C 260- Standard Specification for Air-Entraining Admixtures for Concrete
L. ASTM C 309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
M. ASTM C 494/C 494M - Standard Specification for Chemical Admixtures for Concrete; 1 999a.

1.4 SUBMITTALS

A. See Section 01 30 00- Administrative Requirements, for submittal procedures.
B. Concrete Mix Design
    1. Minimum 28 day compressive strengths.
    2. Proportioning Normal Weight Concrete: Comply with ACI 211.1.
    3. Concrete Strength: Establish required average strength for each type of concrete on basis of field experience or trial mixtures, as specified in OSSC 1905
    4. Provide concrete mix design along with recent test results indicating mix design exceeding specified performance strengths
    5. Admixtures: Add acceptable admixtures as recommended in ACI 211.1 at rates recommended by manufacturer.
    6. Supplier is responsible for achieving or exceeding concrete design strengths.
    7. Adjust cement ratio when mix calls for air entrainment.
    8. Maximum water to cement ration: 0.46
    9. Maximum slump interior mix: 4 inches. 7 inches with water-reducing agents.
    10. Maximum slump exterior mix: 5 inches.

1.5 QUALITY ASSURANCE

A. Perform work of this section in accordance with ACI 301 and ACI 318.
B. Follow recommendations of ACI 306R when concreting during cold weather.

PART 2 – PRODUCTS

2.1 CONCRETE MATERIALS

A. Cement: ASTM C 150, Type I - Normal Portland type.

B. Fine and Coarse Aggregates: ASTM C 33.
C. Water: Clean and not detrimental to concrete.

2.2 ADMIXTURES

A. Air Entrainment Admixture: ASTM C 260. Add 6% air entrainment for concrete exposed to freeze/thaw cycles.
B. Optional "Superplasticizer" Admixtures: ASTM C 494, Type A - Water Reducing.
C. Admixtures: Do not use calcium chloride admixtures.

2.3 CONCRETE ACCESSORIES

A. Liquid Curing Compound: ASTM C 309, Type 1, clear or translucent.
   1. Provide: Burke Sparten Coat; Horn Clearseal 20; Masco 12% Cure and Seal; Sonneborn Kure and Seal; or approved.

2.4 JOINT DEVICES AND MATERIALS

A. Joint Filler: ASTM 0 1751; Asphalt impregnated fiberboard or felt, ½ inch thick.

2.5 BELOW-GRADE VAPOR BARRIER

A. Sheet Vapor Barrier:
   1. Material: Polyolefin vapor retarder meeting ASTM E1745 Class A.
      a. Minimum Thickness: 15-mil.
      b. Perm Rating: 0.01 or less after conditioning, tested to ASTM E 154.
   2. Manufacturers:
      a. Stego Industries Stego Wrap, Fortifiber Corp. Moistop, Reef Industries Griffolyn, WR Meadows Perminator, or approved.

2.6 CONCRETE STRENGTHS

A. Exterior footings, retaining walls and slabs – 3,500 psi, minimum 28 day compressive strength.
B. Interior footings, stem walls, trenches and slabs - 3,000 psi min. 28 day compressive strength.
C. Non-structural concrete, including sidewalks and curbs - 2,500 psi - with no special inspection.

PART 3 – EXECUTION

3.1 PLACING CONCRETE

A. Place concrete in accordance with ACI 304R.
B. Place concrete for slabs in accordance with ACI 302.1 R.
C. Ensure reinforcement, inserts, waterstops, embedded parts, and formed construction joint devices will not be disturbed during concrete placement.
D. Do not interrupt successive placement; do not permit cold joints to occur.

3.2 CONCRETE FINISHING

A. Repair surface defects, including tie holes, immediately after removing formwork.
B. Unexposed Form Finish: Rub-down or chip off fins or other raised areas ¼ inch or more in height.
C. Concrete Slabs: Finish to requirements of ACI 302.1 R, and as follows:
   1. Exterior concrete slabs: heavy-broom, detectable warning.
D. Provide 1/4 inch radius at exposed outside concrete corners unless otherwise detailed.
E. Make sawn control joints when concrete will not be damaged by saw blade and before random shrinkage cracking begins. Hand-tool continuation of control joints at vertical surfaces or where conditions do not permit completion of machine sawing.

3.3 CURING AND PROTECTION

A. Comply with requirements of ACI 308. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
   1. Normal concrete: Not less than 7 days.
C. Surfaces Not in Contact with Forms:

1. Start initial curing as soon as free water has disappeared and before surface is dry. Keep continuously moist for not less than three days by water ponding, water-saturated sand, water-fog spray, or saturated burlap.
2. Begin final curing after initial curing but before surface is dry.

D. Protect retaining walls from heavy equipment vibration by maintaining horizontal no-traffic boundary equal to height of wall.

3.4 FIELD QUALITY CONTROL

A. Submit proposed mix design of each class of concrete to inspection and testing firm for review prior to commencement of concrete operations.

B. Tests of concrete and concrete materials may be performed at any time to ensure conformance with specified requirements.

C. Compressive Strength Tests: ASTM C 39/C 39M. For each test, mold and cure three concrete test cylinders. Obtain test samples for every 100 cubic yards, or less of each class of concrete placed.

D. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.

F. Perform one slump test for each set of test cylinders taken.

3.5 DEFECTIVE CONCRETE

A. Defective Concrete: Concrete not conforming to required lines, details, dimensions, tolerances, appearances, textures or specified requirements.

1. Repair or replacement of defective concrete will be determined by Architect. Cost of additional testing shall be borne by Contractor when defective concrete is identified.

END OF SECTION 03 30 00

SECTION 03 54 00

CAST UNDERLAYMENT

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Liquid-applied self-leveling floor underlayment.

B. Related Requirements:
   1. Section 01 70 00 - Execution and Closeout Requirements: Alteration project procedures; selective demolition for remodeling.

1.2 REFERENCE STANDARDS

A. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or (50-mm) Cube Specimens); 2013.

B. ASTM C348 - Standard Test Method for Flexural Strength of Hydraulic-Cement Mortars; 2014.

C. ASTM C472 - Standard Test Methods for Physical Testing of Gypsum, Gypsum Plasters and Gypsum Concrete; 1999 (Reapproved 2014).

D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2014.

1.3 SUBMITTALS

A. Product Data: Provide manufacturer's data sheets documenting physical characteristics and product limitations of underlayment materials. Include information on surface preparation, environmental limitations, and installation instructions.

B. Certificate: Certify that products meet or exceed specified requirements.

1.4 QUALITY ASSURANCE

A. Applicator Qualifications: Company specializing in performing the work of this section, and approved by manufacturer.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Keep dry and protect from direct sun exposure, freezing, and ambient temperature greater than 105 degrees F.

1.6 FIELD CONDITIONS

A. Do not install underlayment until floor penetrations and peripheral work are complete.

B. Maintain minimum ambient temperatures of 50 degrees F 24 hours before, during and 72 hours after installation of underlayment.

C. During the curing process, ventilate spaces to remove excess moisture.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Cast Underlayments, General:
   1. Conform to applicable code for combustibility or flame spread requirements.
   2. Provide certificate of compliance from authority having jurisdiction indicating approval of underlayment materials in the required fire rated assembly.

B. Gypsum-Based Underlayment: Gypsum based mix, that when mixed with water in accordance with manufacturer's directions will produce self-leveling underlayment with the following properties:
   1. Compressive Strength: Minimum 2500 psi, tested per ASTM C472.
   2. Density: Maximum 115 lb/cu ft.
   3. Final Set Time: 1 to 2 hours, maximum.
   4. Thickness: 3/4 inch to maximum 3-1/2 inch.
   5. Surface Burning Characteristics: Flame spread/Smoke developed index of 0/0 in accordance with ASTM E84.

C. Cementitious Underlayment: Blended cement mix, that when mixed with water in accordance with manufacturer's directions will produce self-leveling underlayment with the following properties:
   1. Compressive Strength: Minimum 4000 psi after 28 days, tested per ASTM C109/C109M.
   2. Flexural Strength: Minimum 1000 psi after 28 days, tested per ASTM C348.
   3. Density: 125 lb/cu ft, nominal.
   4. Final Set Time: 1-1/2 to 2 hours, maximum.
   5. Thickness: Capable of thicknesses from feather edge to maximum 3-1/2 inch.
   6. Surface Burning Characteristics: Flame spread/Smoke developed index of 0/0 in accordance with ASTM E84.

D. Aggregate: Dry, well graded, washed silica aggregate, approximately 1/8 inch in size and acceptable to underlayment manufacturer.

E. Reinforcement: Galvanized metal lath complying with recommendations of underlayment manufacturer for specific project circumstances.

F. Water: Potable and not detrimental to underlayment mix materials.

G. Primer: Manufacturer's recommended type.

H. Joint and Crack Filler: Latex based filler, as recommended by manufacturer.

2.2 MIXING

A. Site mix materials in accordance with manufacturer's instructions.

B. Add aggregate for areas where thickness will exceed 1/2 inch. Mix underlayment and water for at least two minutes before adding aggregate, and continue mixing to assure that aggregate has been thoroughly coated.

C. Mix to self-leveling consistency without over-watering.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify that substrate surfaces are clean, dry, unfrozen, do not contain petroleum byproducts, or other compounds detrimental to underlayment material bond to substrate.

3.2 PREPARATION

A. Concrete: Mechanically prepare steel troweled concrete to create a textured surface necessary to achieve the best bond; acceptable methods include bead blasting and scarifying. Do not use acid etching.

B. Remove substrate surface irregularities. Fill voids and deck joints with filler. Finish smooth.

C. Vacuum clean surfaces.

D. Prime substrate in accordance with manufacturer's instructions. Allow to dry.

E. Close floor openings.

3.3 APPLICATION

A. Install underlayment in accordance with manufacturer's instructions.

B. Pump or pour material onto substrate. Do not retemper or add water.
   1. Pump, move, and screed while the material is still highly flowable.
   2. Be careful not to create cold joints.
   3. Wear spiked shoes while working in the wet material to avoid leaving marks.

C. Place to indicated thickness, with top surface level to 1/8 inch in 10 ft.

D. For final thickness over 1-1/2 inches, place underlayment in layers. Allow initial layer to harden to the point where the material has lost its evaporative moisture. Immediately prime and begin application of the subsequent layer within 24 hours.

E. Place before partition installation.

F. Where additional aggregate has been used in the mix, add a top layer of neat mix (without aggregate), if needed to level and smooth the surface.

G. If a fine, feathered edge is desired, steel trowel the edge after initial set, but before it is completely hard.

3.4 CURING

A. Once underlayment starts to set, prohibit foot traffic until final set has been reached.

B. Air cure in accordance with manufacturer's instructions.

3.5 FIELD QUALITY CONTROL

A. An independent testing agency will perform field inspection and testing, as specified in Section 01 40 00.

B. Placed Material: Agency will inspect and test for conformance to specification requirements.

3.6 PROTECTION

A. Protect against direct sunlight, heat, and wind; prevent rapid drying to avoid shrinkage and cracking.

B. Do not permit traffic over unprotected floor underlayment surfaces.

END OF SECTION 03 54 00

SECTION 05 50 00
FABRICATED STEEL

PART 1 - GENERAL

1.1 SECTION INCLUDES
A. Steel shapes and sections.
B. Plates, angles, rod & bolts.
C. Epoxy and expansion anchors.

1.2 ABBREVIATIONS
A. AISC: American Institute of Steel Construction; 400 N. Michigan Ave., 8th Floor, Chicago, IL 60611, (312)670-2400.
B. ANSI: American National Standards Institute; 1430 Broadway; New York, NY 10018, (212) 354-3300.
C. ASTM: American Society for Testing and Materials; 100 Barr Harbor Dr., West Conshohocken, PA 19428 (610) 832-9500.

1.3 COORDINATION
A. Coordinate with other trades affecting or affected by work of this section.

1.4 SHOP DRAWINGS
A. Submit in accordance with Section 01 33 00.
B. Show each piece referenced to a plan location diagram, locations, critical dimensions, required clearances, construction details, installation methods including splices, attachments, and anchors.

1.5 PRODUCT DELIVERY
A. Include all required Bolts and other Fastening Devices.

1.6 PRODUCT STORAGE & HANDLING
A. Store Fabricated steel above ground on Platforms, Skids, or other approved supports.
B. Store other Materials in weather-tight and dry locations.
C. Store packaged Materials in original unbroken Containers.
D. Protect against damage and discoloration.

1.7 FIELD MEASUREMENTS
A. Verify prior to fabrication.
B. If field measurements differ slightly from Drawing dimensions modify Work as required for accurate fit. If measurements differ substantially, notify Architect prior to fabrication.

PART 2 - PRODUCTS

2.1 STEEL
A. Manufacturing Standard: ASTM A513
   1. Channels, Plates, Bars and Misc. Shapes: ASTM A36
   2. Steel Angles: ASTM A36
   3. Pipes: ASTM A53
   4. Wide Flange and Tee Sections: ASTM A992
   5. Moment Frame Column Base Plates: A572 Grade 50
   6. Welded Steel Bar Grating: ASTM A-1011
   7. HSS sections – ASTM A500 GR. B; Steel Pipe – ASTM A53 GR. B
   8. Cold Formed Steel: To conform with AISI S100 and the material strengths and sizes specified on the plans

2.2 THREADED FASTENERS & ANCHOR BOLTS (if required)
A. Manufacturing Standards:
   1. High Strength Bolts: ASTM A325-N (Snug Tight UON)
   2. Bolts & Nuts, Threaded Rods: ASTM A 307, Grade A
   3. Anchor Bolts: ASTM F1554 GR55 (Weldable)

4. Plain Washers: ANSI Standard B 27.2
5. Epoxy Anchors: Hilti HIT-RE 500 SD epoxy adhesive with stainless steel threaded rod or approved
6. Expansion Anchors: Hilti stainless steel Kwik Bolt TZ or approved

2.3 WELDING ELECTRODES

A. Manufacturing Standard: ASTM A-233, Series E-70 (FEXX+70ksi)
B. See Structural Drawings for additional requirements at Moment Frame Connections

2.4 SHOP TREATMENT (if required)

A. Rust-Inhibiting Primer: Zinc-rich., 3 mil coating, minimum.
B. Galvanize exposed steel.
C. Manufacturer: Contractor's choice.

2.5 FASTENERS

A. 8d: .131”x2 ½”; 10d: .148”x3”; 16d: .162”x3½”
B. Wood Screws: Simpson Strong-Tie SD or SDS (or equivalent); Screws shall comply with ASTM B695 Class 55 if in contact with pressure treated wood or exposed to weather.
C. Lag Bolts (or Lag Screws): ANSI/ASME Standard B18.2.1; hot dip galvanize if exposed to weather.

2.6 ANCHORS

A. Prefabricated anchors are to be Simpson Strong-Tie or equal.
B. Size: ½” or 5/8” anchors per ASTM A307; ¾” or larger per ASTM F1554.
C. Threaded rods: ASTM A36.
D. Expansion Bolts: Concrete: Simpson Strong-Tie Strong Bolt 2 (or equal for cracked and uncracked concrete); Masonry: Simpson Strong-Tie Wedge Anchors or equal. Install per ICC report.
E. PAF’s (Power Actuated Fasteners): ITW Ramset 1500 Series (ICC ESR-1799) or equal.
F. Epoxy: Concrete: Simpson Strong-Tie SET-XP Epoxy (or equal for cracked or uncracked concrete); Masonry: Simpson Strong-Tie SET Epoxy. Install per ICC report.

PART 3 - EXECUTION

3.1 EXISTING CONDITIONS

A. Prior to starting work, notify general contractor about defects requiring correction.
B. Do not start work until conditions are satisfactory.

3.2 PROTECTING WORK OF OTHER SECTIONS

A. Protect against damage and discoloration.

3.3 INSTALLATION

A. Follow approved Shop Drawings.
B. Install plumb and level.
C. At Unistrut P1000 and Drape Rail, install per manufacturer's and GE Drawings.

3.4 PRODUCT CLEANING AND REPAIRING

A. Remove debris from project site upon work completion or sooner if directed.

END OF SECTION 05 50 00

ROUGH CARPENTRY
SECTION 06 10 00

PART 1 – GENERAL

1.1 DESCRIPTION

A. Section specifies wood blocking, framing, sheathing, furring, nailers, rough hardware, and light wood construction.

1.2 RELATED SECTIONS

A. Finish Carpentry - Section 06 20 00
B. Composition Siding – Section 07 46 43.

1.3 PRODUCT DELIVERY, STORAGE & HANDLING

A. Protect lumber and other products from dampness both during and after delivery at site.
B. Pile lumber to provide air circulation around surfaces of each piece.
C. Stack plywood and other board products to prevent warping.
D. Locate stacks on well-drained areas, supported at least 6 inches above grade and cover with to protect lumber from moisture.

1.4 REFERENCES

A. WCLIB - West Coast Lumber Inspection Bureau
B. WWPA - Western Wood Products Association

PART 2 – PRODUCTS

2.1 LUMBER

A. Provide dimensional lumber of grades indicated according to American Lumber Standards Committee National Grading Rule provisions of grading agency indicated.
   1. Douglas Fir, 19% Maximum Moisture Content when installed.
B. Wall Studs and Plates
   1. No. 2 grade, S-Dry
C. Plates, Blocks, Light Framing and Misc.
   1. No. 2, S-Dry
D. Furring, blocking, nailers and similar items 2 inches nominal and narrower No. 2 grade; and, members 46 inches and wider nominal, Number 1 Grade.
E. Preservative Treated Lumber:
   1. No. 2 grade
   2. Hem-fir WCLIB, or WWPA
F. Moisture Content
   1. At time of delivery and maintained at site
   2. Boards and lumber 2 inches and less in thickness: 19 percent or less
   3. Lumber over 2 inches thick: 25 percent or less

2.2 PRESERVATIVE TREATMENT

A. Provide dry lumber with 19 percent maximum moisture content at time of dressing for 2-inch nominalthickness or less, unless otherwise indicated.
B. Application: Treat unless otherwise indicated:
   1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
   2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
   3. Wood floor plates installed over concrete slabs.

2.3 QUALITY ASSURANCE

A. Identify lumber with grade stamp of agency certified by Board of Review of American Lumber Standards committee in conformance with Product Standard PS-20.
B. Identify sheathing with grade stamp in conformance with PS 1-95.

2.4 CONNECTORS, FASTENERS AND ACCESSORIES

A. Nails and Spikes: Sizes and types as required suiting application. Common wire nails unless shown otherwise on Drawings. Refer to nailing schedule for connections not shown on Drawings.

B. Sheathing Nails: 10d, electroplate galvanized common (0.148 inches diameter) or hot-dipped galvanized box (.128 inches diameter) wire nails. Length as required for minimum 1-5/8 inches penetration into framing members.

C. Self-drilling Wood Screws: ¼ inch diameter: Simpson Strong Drive S-Series Wood Screw, length as noted, or approved. Simpson SD1.25 wood screws or approved where noted on drawings for strap and clip installations.

D. Staples: 16 gage, 7/16 crown galvanized staples having a minimum penetration of 1inch into wood decking. Use of staples is limited to applications shown on Drawings.

E. Bolt, Nuts, Washers, Lags, and Screws: Medium carbon steel; galvanized at exterior locations; self-tapping wood screws; sizes as scheduled or shown on Drawings. Cap nuts at exposed installations.

F. Framing Anchors: Simpson Strong-Tie Co., Silver Metal Products, or approved. Sizes and types as shown.

G. Compression (Drive) Pins: Size, type for intended use; Hilti DX series with washer or approved.

H. Building Paper: 100 percent Spunbonded olefin polyethylene sheet; Tyvek by DuPont Company, or approved.

I. Use special nails designed for use with ties, strap anchors, framing connectors, joists hangers, and similar items. Nails not less than 1½ inches long, 8d and deformed or annular ring shank

PART 3 – EXECUTION

3.1 INSTALLATION, GENERAL

A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.

B. Do not notch, bore or cut structural members for pipes, ducts, conduits or other reasons except as shown on Drawings or as approved by Architect.

C. Do not use materials with defects that impair quality of rough carpentry or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

D. Attach rough carpentry work securely to substrate by anchoring and fastening as indicated, comply with the following:

1. Published requirements of metal framing anchor manufacturer.
2. Nailing Schedule - refer to last page of Section
3. Use common wire nails, unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood; predrill if required. Replace or repair split or damaged blocking or framing, whether new or existing, if split, broken, or damaged by nailing or other connections made under Section at no additional cost to Owner.

E. Use hot-dip galvanized where exposed to weather or in-ground contact and for nailing to preservative treated lumber

3.2 WOOD FRAMING INSTALLATION - GENERAL

A. Framing Standard: Comply with AFPA "Manual for Wood Frame Construction," unless otherwise indicated.

B. Install framing connectors per manufacturer's instructions and requirement to achieve full capacity without adversely affecting existing construction.

3.3 GENERAL BLOCKING

A. Install blocking as shown on Drawings and as required to support items of finish, and to cut off concealed draft openings, vertical and horizontal, between ceiling and floor.

B. Fire-stop blocking to be two inches nominal thickness by width of opening being blocked. Install at:
   1. Stud walls at ceilings and floors and at 10-foot maximum intervals.
   2. Intersections of vertical and horizontal cavities such as soffits, drop ceiling cove ceilings.
   3. Openings around vents, pipes and ducts at penetrations of ceilings and floors.

3.4 PRESERVATIVE TREATMENT

A. Treat wood in contact with concrete or masonry, and as indicated.

B. Treat cut ends and holes through treated framing.

C. Flood area with preservative at remaining dry rot repair areas prior to enclosing or covering incidental decay

3.5 CLEANING

A. Upon completion of work of Section, promptly remove working area scraps, debris and surplus material of Section

3.6 NAILING SCHEDULE

A. Unless otherwise indicated on Drawings or required by OSSC, provide at least the following nailing with common nails:

Block to joist bearing:	Two 10d toenailed each side
Blocking to joist or stud:	Two 10d toenailed each side
One inch brace to stud:	Two 8d toenailed
Two inch brace to stud:	Two 16d face nailed
Bridging to joist:	Two 8d toenailed
Built-up beams:	16d @ 12inches on center, staggered
To support:	Two 16d toenailed each side
At laps (12inches minimum):	Four16d face nailed
Multiple joists:	16d @ 12inches on center, staggered
Joists to sill or girder:	Three 8d toenailed
Studs toenailed to plate:	Four 8d
Studs nailed together:	16d @ 12inches on center staggered
Plates:	1/4-inch nom. diameter drive pins @ 16inches on center
Upper to Lower:	16d @ 12inches on center staggered
At splices:	Two16d face nailed
Plate lap at corners:	Two16d face nailed

Box nails - increase to next larger size or increased quantity by 20%.

3.07 INSPECTION

A. Provide notice to Architect or Engineer 48 hours prior to installation of metal straps on roof and framing clips in concealed spaces.

B. Allow Architect or Engineer to observe installed items prior to concealment.

END OF SECTION 06 10 00

SECTION 06 20 00
FINISH CARPENTRY

PART 1 – GENERAL

1.1 RELATED SECTIONS

A. Section 06 10 00 – Rough Carpentry

1.2 DELIVERY AND STORAGE

A. Delivery when site conditions are adequate to receive work of Section. Protect materials from weather while in transit to site.

B. Adequately protect finish surfaces during delivery, handling and storage.

1.3 ENVIRONMENTAL CONDITIONS

A. Install interior materials only in areas with constant and minimum 50 degree F. temperature.

1.4 COORDINATION

A. Coordinate provision of concealed blocking or supports.

B. Ensure back-priming of finish carpentry surfaces concealed after installation, has been performed.

1.5 STANDARDS

A. Architectural Woodwork Institute Premium Grade.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Softwood lumber: average moisture content of 6% and maximum of 9% for interior work, an average of 12% and maximum of 15% for exterior work.

B. Fasteners: to suit size and nature of components being fastened.

2.2 EXTERIOR TRIM AND WINDOW FRAMING

A. Western Red Cedar, selected for appearance depending on location.
Grade: A or B

2.3 INTERIOR TRIM OR GLASS STOPS SCHEDULED FOR STAIN

A. Flat Grain KD Douglas Fir
Grade: Clear Select (Carefully select straight free of heart center grain materials).

2.4 INTERIOR TRIM OR GLASS STOPS SCHEDULED FOR PAINT

A. Douglas Fir, Grade Number One; Alder, selected for straightness, or approved.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Scribe and cut as required to fit abutting walls, and surfaces, to fit properly into recesses and to accommodate intersecting or penetrating objects.

B. Install trim in single lengths without splicing. Prep frames for Hardware specified.

C. Fit backs casing snugly to wall surfaces to eliminate cracks at junction of casing with walls.

D. Set and secure materials and components in place, rigid, plumb and square, with tight, hairline joints.

E. Form joints to conceal shrinkage.

F. Set finishing nails to receive filler. Where screws are used to secure components countersink screw in round cleanly cut hole and plug with wood plug to match material being secured.

G. Cut right angle joints of moldings.

H. After installation, adjust operating hardware to ensure correct operation.

J. Reset trim removed during Demolition.

END OF SECTION 06 20 00

SECTION 06 41 00
ARCHITECTURAL WOOD CASEWORK

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Specially fabricated cabinet units.
   2. Countertops.
   3. Cabinet hardware.

B. Related Requirements:
   1. Section 08 80 00 - Glazing: Glass for casework.
   2. Division 22 Plumbing, Division 23 HVAC and Division 26 Electrical. Provide for installation of concealed and semi-conceal electrical and mechanical cutouts and items into casework. Include coordination for electrical equipment into electrical equipment closets.

1.2 REFERENCE STANDARDS

A. Reference Standards: Current edition at date of Bid.

B. AWI (QCP) - Quality Certification Program, www.awiqcp.org; current edition at www.awiqcp.org.

C. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014.

D. BHMA A156.9 - American National Standard for Cabinet Hardware; Builders Hardware Manufacturers Association; 2010 (ANSI/BHMA A156.9).

E. NEMA LD 3 - High-Pressure Decorative Laminates; National Electrical Manufacturers Association; 2005.

1.3 DEFINITIONS

A. Terminology for Surface Visibility: As defined in AWS Section 10.

B. Exposed Exterior Surfaces: Defined as all exterior surfaces exposed to view, including:
   1. All surfaces visible when doors and drawers are closed, including knee spaces.
   2. Underside of cabinet bottom over 42 inches above the finish floor, including cabinet bottoms behind light valances and the bottom edge of light valances.
   3. Cabinet tops under 80 inches above the finish floor, or if 80 inches and over and visible from an upper building level or floor.
   4. Visible front edge of stretcher, ends, divisions, tops, bottoms, shelves, and nailers.
   5. Sloping tops of cabinets that are visible.

C. Exposed Interior Surfaces: Defined as all interior surfaces exposes to view in open casework or behind transparent doors, including:
   1. Shelves, including edge banding.
   2. Division and partitions.
   3. Interior face of ends (sides), backs and bottoms (including pull-outs). Also included are the interior surfaces of cabinet top members 36 inches or more above the finished floor.
   4. Interior face of door and applied drawer fronts.

D. Semi-Exposed Surfaces: Defined as those interior surfaces only exposed to view when doors or drawers are opened, including:
   1. Shelves, including edge banding.
   2. Division and partitions.
   3. Interior face of ends (sides), backs and bottoms (including bank of drawers). Also included are the interior surfaces of cabinet top members 36 inches or more above the finished floor.
   4. Drawer sides, sub fronts, backs and bottoms.
   5. The underside of cabinet bottoms between 24 inches and 42 inches above the finished floor.
   6. Security and dust panels or drawer stretchers.

E. Concealed Surfaces: Defined as those exterior or interior surfaces that are covered or not normally exposed to view, including:
   1. Toes space unless otherwise specified.

2. Sleepers, stretchers, and solid sub tops.
3. The underside of cabinet bottoms less than 24 inches above the finished floor.
4. The flat tops of cabinets 80 inches or move above the finished floor, except if visible from an upper floor or building level.
5. The three non-visible edge of adjustable shelves.
6. The underside of countertops, knee spaces, and drawer aprons.
7. The faces of cabinet ends of adjoining units that butt together.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a preinstallation meeting not less than one week before starting work of this section; require attendance by all affected installers.

1.5 SUBMITTALS

A. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.
   1. Minimum Scale of Detail Drawings: 1-1/2 inch to 1 foot.
   2. Provide the information required by AWI/AWMAC/WI (AWS).
   3. Include certification program label.
B. Product Data: Provide data for hardware accessories.
C. Samples: Submit three (3) actual samples of each finish specified, minimum 4” x 6” in size.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Product Handling: Do not deliver shop-fabricated items until installation areas are ready (including completion of painting, wet work, grinding, and similar operations that could damage, soil or deteriorate casework and millwork).
B. Store in areas meeting requirements for installation areas.
C. Protect units from moisture damage.
D. Protect finished surfaces from soiling and damage during handling and installation. Keep covered with polyethylene film or other protective covering.

1.7 FIELD CONDITIONS

A. During and after installation of custom cabinets, maintain temperature and humidity conditions in building spaces at same levels planned for occupancy.

1.8 FIELD MEASUREMENTS

A. Verify field dimensions indicated on shop drawings prior to beginning work of this Section.

1.9 COORDINATION

A. Section 06 10 00 for backing and attachments as necessary for casework and bracket supports at open casework.
B. Division 22 - Plumbing, Division 23 - HVAC and Division 26 - Electrical: Provide for installation of concealed and semi-concealed electrical and mechanical cutouts and items into casework.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Single Source Responsibility: Provide and install this work from single fabricator.

2.2 MATERIALS - GENERAL

A. Low-Emitting Materials: Provide manufactured wood casework, including countertops, made with adhesives and composite wood products containing no urea formaldehyde.

2.3 CABINETS

A. Quality Grade: Unless otherwise indicated provide products of quality specified by AWI//AWMAC/WI (AWS) for Custom Grade.
B. Plastic Laminate Faced Cabinets: Custom grade.
C. Cabinets:

NEHS

1. Finish - Exposed Exterior Surfaces: Decorative laminate.
2. Finish - Exposed Interior Surfaces: Decorative laminate.
3. Finish - Concealed Surfaces: Manufacturer's option.
4. Door and Drawer Front Edge Profiles: Square edge with thin applied band.
5. Door and Drawer Front Retention Profiles: Fixed panel.
6. Cabinet Design Series: As indicated on drawings.

2.4 WOOD MATERIALS

A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
   1. Do not use plain-sawn softwood lumber with exposed, flat surfaces more than 3 inches wide.
   2. Wood Moisture Content: 5 to 10 percent.

B. Composite Wood and Agrifiber Products: Comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
   1. Recycled Content of Medium-Density Fiberboard and Particleboard: Postconsumer recycled content plus one-half of pre-consumer recycled content not less than 20 percent.
   2. Medium-Density Fiberboard: ANSI A208.2, Grade 130 made with binder containing no urea formaldehyde.
   3. Particleboard: ANSI A208.1, Grade M-2, made with binder containing no urea formaldehyde.
   4. Veneer-Faced Panel Products (Hardwood Plywood): HPVA HP-1, made with adhesive containing no urea formaldehyde.
   5. Thermoset Decorative Panels: Particleboard or medium-density fiberboard finished with thermally fused, melamine-impregnated decorative paper and complying with requirements of NEMA LD 3, Grade VGL, for test methods 3.3, 3.4, 3.6, 3.8, and 3.10.

2.5 LAMINATE MATERIALS

A. Manufacturers:
   1. Formica Corporation: www.formica.com.
   2. Panolam Industries International, Inc./Nevamar: www.nevamar.com.
   3. Wilsonart, LLC www.wilsonart.com.
   4. Substitutions: See Section 01 60 00.

B. High Pressure Decorative Laminate (HPDL): NEMA LD 3, types as recommended for specific applications.

C. Provide specific types as scheduled.

D. Finish: As selected from manufacturer standards, unless otherwise noted.

2.6 COUNTERTOPS

A. Solid Laminated Surfacing: Custom quality hardwood; maple, plain sawn, exposed edge grain; laminated with waterproof adhesives; thickness as recommended by fabricator; suitable for transparent finish.

B. Plastic Laminate Countertops: Medium density fiberboard substrate covered with HPDL, conventionally fabricated and self-edge banded.

C. Moisture Resistant Countertop Core:
   1. Provide for countertops subject to moisture conditions, such as those with sink cutouts:
      a. Plywood: APA PSI-95, Marine Grade A-A or A-B.

2.7 ACCESSORIES

A. Adhesive: Type recommended by fabricator to suit application.

B. Plastic Edge Banding: Extruded PVC, flat shaped; smooth finish; self-locking serrated tongue; of width to match component thickness.

C. PVC Edge Banding:

NEHS

1. Manufacturer:
   a. Doellken Woodtape, specified for type and quality. www.doellken-woodtape.com.
2. Typical PVC Edge Banding: Provide at plastic laminated faced casework edges.
   a. Exposed and Semi-Exposed Edges: 3 mm (1/8 inch) thick.
   b. Semi-Exposed Edges: 0.02 inch thick.
   c. Concealed Edges: No banding, except at front and back face of shelves.
   d. Trim edges and corners and buff smooth, same thickness as edge.
3. PVC Upturned Edge Banding: 3mm by 1-3/16 inch. Provide at open athletic shelves and laboratory shelves.
4. Adhere with hot melt waterproof adhesive under heat and pressure.
5. PVC Edge Banding Color:
   a. Match color of adjacent plastic laminate from full selection of manufacturer's color selection, as accepted by Architect.
   b. Match melamine where not adjacent to plastic laminate.

D. Glass: As specified in Section 08 80 00.

E. Mirror: Manufacturer's standard glass mirror.

F. Fasteners: Size and type to suit application.

G. Bolts, Nuts, Washers, Lags, Pins, and Screws: Of size and type to suit application; galvanized or chrome-plated finish in concealed locations and stainless steel or chrome-plated finish in exposed locations.

H. Grommets: Standard plastic grommets for cut-outs, in color black.
1. Grommet with slotted cap, 2-3/8 inch diameter.
2. Design to accommodate plugs up to 2-1/4 inches such as computer peripheral and business machine plugs.

2.8 HARDWARE

A. Hardware: BHMA A156.9, types as indicated for quality grade specified.

B. Adjustable Shelf Supports: Standard side-mounted system using recessed metal shelf standards or multiple holes for pin supports and coordinated self-rests, polished chrome or satin chrome finish, for nominal 1 inch spacing adjustments.
1. Product:
   a. Pilaster Standards: Knape & Vogt, No. 255 ZC, 19 gauge steel by 5/8 inch wide, zinc plated.
   b. Support Clips: Knape & Vogt, No. 256 ZC, zinc plated.

C. Heavy Duty Storage Shelves: 12 gauge steel, 2 inch adjustment brackets. Capacity 1060 pounds at 12 inch shelf depth, with brackets at 16 inch on center.
1. Standards: Reeve 40 and K&V 87 ANO.
2. Brackets: Reeve 81 and K&V 187 ANO with 210 shelf rest.
3. Screws: Suitable for purpose, flat heads set flush into standards so as not to interfere with mounting of brackets. Screw head finish to visually match standards.

D. Wall Mounted Fixed Shelf Bracket: Welded construction, finished with powder coat or enamel coating matching color of PVC edge banding.
1. Minimum 1-1/2 inch wide by 1/4-inch thick cold rolled steel flatbar with minimum10 inch horizontal and vertical legs, braced with 1/4 inch diameter steel rod or flat bar welded at junctures.
2. Product:
   a. Knape & Vogt 208 L-Bracket, 0.20 inch by 1-3/16 inch cold rolled steel flatbar with 11-1/2 inch horizontal and vertical legs, braced with 0.20 inch thick flat bar welded at junctures, 1,000 pound load capacity at 16 inch centers per pair, tested ANSI A156.9.

E. Counter Support Bracket: Manufacturer's standard shelf angle, welded construction, minimum 15 gauge by 1-1/2 inch tube steel or 1/4 inch flat bar. Support counters exceeding 36-inch span.

NEHS

1. Horizontal Leg: Less 3-inch width of counter.
2. Vertical Leg: Minimum 18 inch deep.
3. Leg Brace: 1/4 inch thick by 1-1/2 inch flat bar gusset plate at 45 degree angle, 6 inch out.
4. Continuous blocking at back of support bracket.

F. Drawer and Door Pulls: Round Wire Pulls.
1. Manufacturer: Stanley, or approved.
2. Model: 5 inch wire pull, nickel color.

G. Cabinet Locks.
1. Manufacturer: Olympus, www.olympus-lock.com.
   a. Locks: Provide where shown on Drawings.
      1) Door Lock: Olympus 100 DR, 5 pin, 7/8" barrel.
      2) Drawer Lock: Olympus 200DW, 5 pin, 7/8" barrel.
   b. Keying: Master keyed to Owner's keying system.
      1) Single Doors: Keyed locks at each cabinet door and drawer.
         (a) See Drawings for locations.
      2) Double Doors:
         (a) One keyed lock at door noted on Drawings.
         (b) One interior catch at adjacent door.
   c. Six keys per Lock, each lock keyed separately, each key stamped with key code.
   d. Stamp Key Code on Lock Bolt, visible when lock is in "locked" position.
2. Elbow Catch: Ives No. 2 Elbow Catch.
   a. Install at inactive leaf of double doors where a lock is shown on the active leaf.

H. Drawer Slides:
1. Type: Extension types as required.
2. Static Load Capacity: As scheduled.
3. Mounting: Side mounted.
4. Stops: Integral type.
5. Features: Provide self-closing/stay closed type.
6. Medium Duty Standard Drawer Slides:
   a. Maximum 16 Inch Drawer Width: Lever disconnect side mounting, 90 pound load rating, 1 inch over travel extension slides.
      1) Accuride 3834
      2) Knape & Vogt No. 8400
   b. Maximum 24 Inch Drawer Width: Rail disconnect side mounting, 100 pound load rating, 1 inch over travel extension slides.
      1) Accuride 7434
7. Heavy Duty Lateral Drawer Slides and File Drawer Slides:
   a. Up to 24 inch Drawer Width: Rail disconnect side mounting, 150 pound load rating, 1-1/2 inch over-travel extension slides.
      1) Accuride 4034
      2) Knape & Vogt No. 8505
   b. Up to 42 Inch Drawer Width: Rail disconnect side mounting, 200 pound load rating, 1-1/2 inch over-travel extension slides.
      1) Accuride 3640

I. Cabinet Door Hinges:
1. Concealed, self-closing, wide angle with integrated side adjustment, 170 degree opening angle.
2. Opening Angle: 170 degrees.
3. Product:
   a. Blum, or approved.
4. Finish:

a. Nickel-plated.

J. Closet Hardware:
1. Closet Coat and Hat Hook: Double-prong robe hook, stainless steel, brushed mat finish.

K. Cafe Door Hinges:
1. McKinney Gravity Pivot Hinge 8007 or approved.

L. Mobile Casework Swivel Casters:
1. Steel ball bearing, minimum 5 inch diameter, non-marking neoprene tread wheels, minimum 200 to 300 pound load capacity.
a. Product: Faultless Caster, Series 400. www.faultlesscaster.com.

M. Mobile Storage Wheels:
1. Fixed Casters: Rigid plate, 6 inch diameter black rubber wheels, minimum 300 pound load capacity.
a. Product: Faultless, www.faultlesscaster.com.
2. Swivel Casters: Swivel, steel ball bearing, 6 inch black rubber wheels, minimum 300 pound load capacity.
a. Product: Häfele 663.25.921. www.hafele.com.

2.9 SHOP TREATMENT OF WOOD MATERIALS

A. Provide UL approved identification on fire retardant treated material.

B. Deliver fire retardant treated materials cut to required sizes. Minimize field cutting.

2.10 FABRICATION, GENERAL

A. Assembly: Shop assemble cabinets for delivery to site in units easily handled and to permit passage through building openings.

B. Edging: Fit shelves, doors, and exposed edges with specified edging. Do not use more than one piece for any single length.

C. Fitting: When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide matching trim for scribing and site cutting.

D. Plastic Laminate: Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arises. Locate counter butt joints minimum 2 feet from sink cut-outs.
1. Apply laminate backing sheet to reverse side of plastic laminate finished surfaces.
2. Cap exposed plastic laminate finish edges with material of same finish and pattern.

E. Matching Wood Grain: Comply with requirements of quality standard for specified Grade and as follows:
1. Provide center matched panels at each elevation.
2. Provide sequence matching across each elevation.
3. Carry figure of cabinet fronts to toe kicks.

F. Mechanically fasten back splash to countertops as recommended by laminate manufacturer at 16 inches on center.

G. Provide cutouts for plumbing fixtures. Verify locations of cutouts from on-site dimensions. Prime paint cut edges.

H. Shop glaze glass materials using the Interior Dry method specified in Section 08 80 00.

2.11 CASEWORK AND MILLWORK FABRICATION:

A. AWS Section 10, Custom Grade, Reveal Overlay construction.

B. Plastic Laminate Faced Casework: Shop fabricate conforming to AWS Section 10.

C. Hardwood Faced Casework: Shop fabricate conforming to AWS Section 10.

D. Casework Construction Joints:
1. Doweled: 6 minimum 10mm diameter hardwood, fluted dowels. Glued and clamped.
2. Lock Shoulder Joint: Glued and stapled or screwed.
3. Rabbeted Construction Joints: Glued and stapled or screwed.
4. Spline or Biscuit Joints: 3 per foot, glued under pressure.

5. Flush Butt Panel Joints: Accepted only at concealed backs. Glued and screwed. Not accepted at drawer bottoms.

2.12 COUNTERTOP AND BACKSPLASH FABRICATION

A. Plastic Laminate Countertop Fabrication:
   1. Core: 3/4 inch thick MDF or agrifiber with 3/4-inch thick buildup at edges and spans exceeding 36 inch.
      a. Moisture resistant MDF core at sink countertops and where subject to moisture.
      b. Fire-resistant MDF core at counters extending through fire-resistive rated wall construction.
   2. Plastic Laminate Face Sheet: Horizontal Grade HPDL.
      a. Post Forming Grade at countertops with integral backsplash.
   3. Backing Sheet: Liner Grade at countertops and backsplashes.
   4. PVC Edge Banding: 1-1/2 inch face exposure at countertop edge. Scribe to wall at top edge of back splash.
   5. Back Splash Fabrication: 4 inch high by 1/2 deep

2.13 CABINET FABRICATION

A. Wall and Base Cabinets:
   1. Panel Core: 3/4 inch thick MDF or agrifiber panels.
   2. Exposed Vertical Surface Finish: Vertical Grade HDPL. Include areas that will be exposed when movable appliances are removed.
   3. Semi-Exposed Surface Finish: Melamine laminate.
   4. Concealed Surface Finish: Liner Grade balancing sheet, including at concealed tops, bottoms, sides, and backs of casework.
   5. Edges: Specified PVC edge banding at horizontal and vertical edges.
   6. Underside Surfaces: Underside surfaces that might be exposed to moisture should have barrier seal.

B. Base Cabinet Subtops: Solid, except 4 inch wide front to back rails at each side of sink openings.

C. Toe Kicks: 4 inch high by 3/4-inch thick plywood or MDF panels set into 3-inch deep toe kick at front and open ends of base cabinets.

D. Base Cabinet Toe Kicks: 4 inch high by 3/4-inch thick veneer core plywood set into 3-inch deep toe kick at front and open ends of base cabinets. MDF and agrifiber not accepted.
   1. Base Cabinets Set on Continuous Bases: Build in place, level, and shim. Align with adjoining casework
   2. Base Cabinets Set Directly On Floor: Extend end and back panels to floor. Make level and aligned with adjoining cabinets.

E. Exposed MDF Cabinets:
   1. Exposed, Semi-Exposed, and Concealed Surfaces: 3/4 inch thick MDF panels.
   2. Edges: Exposed MDF. No edge banding.

F. Hardwood Veneer Plywood Panels:
   1. Core: 3/4 inch thick MDF panels.
   2. Faces: Hardwood veneer both sides.
   3. Edges: Exposed plywood edge laminations. No edge banding. Finish exposed edges smooth and free of voids and other visual imperfections.
   4. Fasteners: Concealed at locations exposed to view.

G. Hardwood Veneer Faced/Cross-Laminated Plywood Core Cabinets:
   1. Exposed, Semi-Exposed, and Concealed Surfaces: 3/4 inch thick cross-laminated hardwood veneer plywood panel. AWI Quality Standards as specified.
   2. Edges: Exposed plywood edge laminations. No edge banding.

H. Cabinet Backs:
   1. Concealed Backs Installed Against Walls:

a. 1/2 inch thick MDF or agrifiber panel.
b. Seal concealed panel face to prevent moisture intrusion.

2. Exposed Backs at Freestanding Casework: Vertical Grade HDPL face over 3/4 inch thick MDF or agrifiber panel [or hardwood veneer plywood panel, as applicable, exposed cabinet finish to match.
3. 3/4-inch thick MDF or cross-laminated hardwood veneer plywood panel, as applicable.

I. Hardwood Veneer Faced Casework:
1. Faces: Hardwood veneer at both door faces.
a. Edges: Exposed plywood edge laminations. No edge banding.

J. Hardware:
1. Pulls: One vertically mounted pull for each door and horizontally mounted for each drawer, except 2 pulls on drawers exceeding 30 inch width.
2. Keyed Locks: One lock for each door or double door opening.
3. Hinges: Two hinges per door, except three hinges on doors 48 inch high and over.

2.14 CABINET DOOR AND DRAWER FABRICATION

A. Cabinet Doors:
1. Plastic Laminated Casework:
a. Core: 3/4 inch thick MDF or agrifiber panels.
b. Faces: Vertical Grade HDPL at outside door face and melamine laminate at inside door face.
c. Edges: PVC edge banding.
2. Hardwood Veneer Faced Casework:
a. Front: Hardwood veneer face and back.
b. Edges:
1) Exposed plywood edge laminations. No edge banding.
3. Exposed MDF Casework:
a. Faces: 3/4 inch MDF panels.
b. Edges: Exposed MDF. No edge banding.
4. Hardware:
a. Pulls: One vertically mounted pull per door.
b. Keyed Locks:
1) Right Hand Door: One keyed lock.
2) Left Hand Door: One catch at interior side of door to hold door closed using single keyed lock.
c. Hinges: Two hinges per door, except three hinges on doors 36 inch high and over.
d. Magnetic Catches: One magnetic catch per door, two magnetic catches on doors 48 inch high and over.

B. Cabinet Drawers:
1. Plastic Laminate Faced Casework:
a. Front: 3/4 inch MDF or agrifiber core.
b. Face: Vertical Grade HDPL. Back with melamine laminate
c. Edges: PVC edge banding.
2. Exposed MDF Casework:
a. Front: 3/4 inch MDF panels.
b. Edges: Exposed MDF. No edge banding.
3. Hardwood Veneer Faced Casework:
a. Front: Hardwood veneer face and back.
b. Edges: Exposed plywood edge laminations. No edge banding.] [Hardwood edge trim matching face veneer.
4. Subfronts and Backs: 11/16 to 3/4 inch MDF or agrifiber, faced with melamine laminate.
5. Sides: 1/2 inch MDF or agrifiber faced with melamine laminate.

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6. Bottoms: 1/2 inch thick MDF, agrifiber, or marine grade plywood faced with melamine laminate.
   a. House into sides, front, and back with continuous dado or lock shouldered construction.
   b. Completely glued around perimeter with hot-melt or PVA adhesive.
7. Edges of Drawer Box: PVC edge banding.
8. Drawers Over 30 Inch Wide: MDF or agrifiber stiffeners or metal reinforcing.
9. Drawer Joints: Assemble true and square with doweled, lock-shoulder, or rabbeted joints.
10. Hardware:
    a. Drawer Slides: Mount with positive in and out stops for permanent alignment and quiet operation.
    b. Pull: One horizontally mounted pull for each drawer.
    c. Keyed Lock: One lock for each drawer.

2.15 SHELVING FABRICATION

A. Fixed and Adjustable Casework Shelves:
   1. Shelf Span:
   a. Spans up to 30 inches: 3/4 inch thickness MDF or agrifiber.
   b. Spans between 30 and 42 inches: 1 inch thickness MDF or agrifiber.
   c. 1-1/8 inch thick veneer core plywood over 42 inch span.
   2. Faces: Melamine cabinet liner both sides.
   3. Edges: PVC edge band at exposed face of fixed shelves and all four edges of adjustable shelves.
      a. Provide upturned PVC lip at edges of open athletic storage shelves and laboratory shelves.
   4. Hardwood Veneer Faced Casework:
      a. Faces: Hardwood veneer both sides.
      b. Edges: Hardwood edge trim.

2.16 SHOP FINISHING

A. General: Finish architectural wood cabinets at fabrication shop as specified in this Section. Defer only final touchup, cleaning, and polishing until after installation.
B. Sand work smooth and set exposed nails and screws.
C. For opaque finishes, apply wood filler in exposed nail and screw indentations and sand smooth.
D. On items to receive transparent finishes, use wood filler matching or blending with surrounding surfaces and of types recommended for applied finishes.
E. Finish work in accordance with AWI/AWMAC/WI (AWS), Section 5 - Finishing for grade specified and as follows:
   1. Transparent:
      a. As selected by Architect.
      b. Sheen: TBD.
   2. Opaque:
      a. Color: As selected by Architect.
      b. Sheen: TBD.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify adequacy of backing and support framing.
B. Verify location and sizes of utility rough-in associated with work of this section.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions and provisions of Contract Documents.

B. Set and secure custom cabinets in place, assuring that they are rigid, plumb, and level.
C. Use fixture attachments in concealed locations for wall mounted components.
D. Use concealed joint fasteners to align and secure adjoining cabinet units.
E. Carefully scribe casework abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim for this purpose.
F. Secure cabinets to floor using appropriate angles and anchorages.
G. Countersink anchorage devices at exposed locations. Conceal with solid wood plugs of species to match surrounding wood; finish flush with surrounding surfaces.
H. Close exposed joints, spaces, and openings to make tight hairline joints against adjacent construction to prevent papers and other materials from falling behind cabinets.
    1. Install scribes and fillers of same material and finish as casework.
    2. Secure with concealed screws.
I. Install minimum 3 inch deep by 4 inch high toe space at floor mounted casework.
J. Plastic Laminate Countertop:
    1. Install intermediate joints between corners in longest possible length for each top
    2. Maintain joint distance of minimum 24 inch clearance from sink cutout.
    3. Where joints cannot be avoided at knee spaces, install additional reinforcing without reducing knee space clearance.
    4. Apply acrylic latex adhesive at each field joint, and tighten together with 1/4 inch drawbolts set into routed bottom face as needed to make flush and hairline.
    5. Cut smooth, crack free holes and cutouts with minimum 1/4 inch diameter radiused inside corners.
    6. Seal exposed edges with waterproof sealant
    7. Install wall ledgers and counter support angles, secured to wall for support of counters spanning over 36 inch and as needed to eliminate deflection at knees pace.
K. Make cutouts using templates supplied by work of Division 22, 23 and Division 26 for mechanical and electrical fixtures and equipment installations into casework. Provide backing as required for secure attachment of fixtures and equipment.
L. Field Installed Backsplash: Fasten with concealed screws at 12 inch center into bed of acrylic resin along entire back edge of countertops.
M. Door and Drawer Hardware:
    1. Mount hardware using manufacturer’s templates, aligned, plumb, and true between adjacent doors and drawers.
    2. Mount with adjacent door and drawer reveals equally spaced, plumb, and square.
    3. Install operating hardware to act smoothly without hanging up or binding.
    4. Lubricate hardware in accordance to manufacturer's instructions.
N. Wall Shelves: Support shelves on standards and brackets at 36 inch maximum spacing.

3.3 ADJUSTING

A. Adjust installed work and test for rigidity and ability to support load.
B. Adjust moving or operating pars to function smoothly and correctly.

3.4 CLEANING

A. Clean casework, counters, shelves, hardware, fittings, and fixtures.

3.5 PROTECTION

A. Take applicable protection measures and maintain conditions in manner acceptable to manufacturer through completion of Project.
B. Protect countertops with polyethylene, kraft paper, or other protective covering.

END OF SECTION 06 41 00

SECTION 07 21 00
THERMAL INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   2. Batt insulation and vapor retarder in exterior wall, ceiling, and roof construction.
   3. Acoustic insulation in wall and ceiling construction.

B. Related Requirements:
   1. Section 06 10 00 - Rough Carpentry.
   2. Section 07 51 13 - Built-Up Roofing and Roof Insulation.
   5. Section 09 21 60 - Gypsum Board & Sheet Metal Framing.

1.2 REFERENCE STANDARDS

A. Reference Standards: Current edition at date of Bid.

B. American Society for Testing and Materials (ASTM) International:
   1. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2010.
   2. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2010.
   3. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2011.
   4. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation; 2014.
   5. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2012.
   6. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2014.
   7. ASTM E136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace At 750 Degrees C; 2012.

C. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components; 2012.

1.3 SUBMITTALS

A. See Section 01 33 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on product characteristics, performance criteria, and product limitations.
   1. Published R-Value for thickness of batt insulation, product characteristics, performance criteria, and limitations.
   2. Accessories including insulation hangers and other specified items.
   3. Sound Absorptive Coefficient for fiberglass sound blanket.

C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

D. Manufacturer's Installation Instructions: Include information on special environmental conditions required for installation and installation techniques.

E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.4 PERFORMANCE REQUIREMENTS

A. Provide thickness and R-Values shown on Drawings.

1.5 QUALITY ASSURANCE

A. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

B. Formaldehyde free binders: 3RD Party Certified with UL Environmental Validation.

1.6 FIELD CONDITIONS

A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

B. Protect foam-plastic board insulation as follows:
   1. Do not expose to sunlight except to necessary extent for period of installation and concealment.
   2. Protect against ignition at all times. Do not deliver foam-plastic board materials to Project site before installation time.
   3. Quickly complete installation and concealment of foam-plastic board insulation in each area of construction.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Insulation:
   1. CertainTeed Corporation: www.certainteed.com
   2. Dow Chemical Co. www.dow.com
   3 John Manville. www.jm.com
   4. Knauf Insulation. www.knaufinsulation.com
   5. Owens Corning. www.owencorning.com
   6. Roxul Inc. www.roxul.com
   7. R-Max: www.rmaxinc.com
   8. Substitutions: See Section 01 60 00.

2.2 APPLICATIONS

A. Batt Insulation:
   1. Insulation in Wood Framed Walls: Batt insulation with separate vapor retarder.
   2. Insulation in Wood Framed Ceiling Structure: Batt insulation with separate vapor retarder.

2.3 BATT INSULATION MATERIALS

A. Where batt insulation is indicated, either glass fiber or mineral fiber batt insulation may be used, at Contractor's option. Size insulation to friction fit between framing members.

B. Thermal Resistance Values: Conform to ASTM C518.
   1. Provide High Density blanket insulations, except Normal Density insulation is accepted in thickness as required to meet Thermal Resistance Values shown on Drawings.

C. Glass Fiber Batt Insulation: Flexible preformed batt or blanket, complying with ASTM C665; friction fit.
   1. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.
   2. Smoke Developed Index: 50 or less, when tested in accordance with ASTM E84.
   3. Combustibility: Non-combustible, when tested in accordance with ASTM E136, except for facing, if any.
   4. Formaldehyde Content: Zero.
   5. Facing: Aluminum foil, flame spread 25 rated; one side.

D. Mineral Fiber Batt Insulation: Flexible or semi-rigid preformed batt or blanket, complying with ASTM C665; friction fit or fastened with insulation fasteners; unfaced flame spread index of 0 (zero) when tested in accordance with ASTM E84.
   1. Smoke Developed Index: 0 (zero), when tested in accordance with ASTM E84.

2.4 ACCESSORIES

A. Vapor Retarder at Concealed Conditions: Typically in walls between gypsum board and stud:
   1. Manufacturer/Product: CertainTeed, MemBrain, Smart Vapor Retarder, or approved.
      a. 2 mil thick polyamide (Nylon) sheet.
      b. Fire Testing: Tested to ASTM E84.
         1) Flame Spread Index: 20.
         2) Smoke Developed Index: 55.
      c. Permeance: Tested to ASTM E96
         1) 1 perm or less using dry cup method (Procedure A - Desiccant Method).
         2) Increases up to 10 perms using wet cup method (Procedure B - Water Method).

B. Vapor Retarder at Exposed Conditions, including above suspended ceiling assemblies:
   1. Manufacturer/Product: Johns Manville FSK-25 Cap Sheet, or approved.
      a. Flame retardant insulation facing vapor barrier from lightweight aluminum foil, fiberglass yarn reinforcing, and natural kraft paper laminated with flame retardant adhesive.
         1) Flame Spread: Less than 25
         2) Smoke Developed: Less than 50

C. Insulation Fasteners: Impaling clip of unfinished steel with washer retainer and clips, to be adhered to surface to receive insulation, length to suit insulation thickness and substrate, capable of securely and rigidly fastening insulation in place.

D. Nails or Staples: Steel wire; electroplated or galvanized; type and size to suit application.

E. Batt Insulation Support: Provide as necessary to support insulation in ceiling and floor assembly.
   1. Install between joists.
   2. Length to suit spacing as required.
   3. Made from carbon steel, spring wire for optimum flexibility and strength, 14 gage wire.

F. Adhesive: Type recommended by insulation manufacturer for application.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation and adhesive.

B. Verify substrate surfaces are flat, free of honeycomb, fins, irregularities, or materials or substances that may impede adhesive bond.

C. Clean construction cavities prior to installation.

3.2 BATT INSTALLATION

A. Install insulation and vapor retarder in accordance with manufacturer's instructions.

B. Install in exterior wall and roof spaces without gaps or voids. Do not compress insulation.

C. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.

D. Fit insulation tightly in cavities and tightly to exterior side of mechanical and electrical services within the plane of the insulation.

E. At wood framing, place vapor retarder on warm side of insulation by stapling at 6 inches on center. Lap and seal sheet retarder joints over member face.

F. At metal framing, place vapor retarder on warm side of insulation; lap and seal sheet retarder joints over member face.

G. Tape seal tears or cuts in vapor retarder.

H. Extend vapor retarder tightly to full perimeter of adjacent window and door frames and other items interrupting the plane of the membrane. Tape seal in place.

3.3 INSTALLATION OF VAPOR RETARDERS

A. Place vapor retarders on side of construction indicated on Drawings. Extend vapor retarders to extremities of areas to protect from vapor transmission. Secure vapor retarders in place with adhesives or other anchorage system as indicated. Extend vapor retarders to cover miscellaneous voids in insulated substrates, including those filled with loose-fiber insulation.

B. Seal vertical joints in vapor retarders over framing by lapping no fewer than two studs.
   1. Wood Framing:
      a. Fasten vapor retarders to wood framing at top, end, and bottom edges; at perimeter of wall openings; and at lap joints. Space fasteners 16 inches o.c.

C. Seal joints caused by pipes, conduits, electrical boxes, and similar items penetrating vapor retarders with vapor-retarder tape to create an airtight seal between penetrating objects and vapor retarders.

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

3.4 PROTECTION

A. Do not permit installed insulation to be damaged prior to its concealment.

END OF SECTION 07 21 00

SECTION 07 51 13
BUILT-UP ROOFING AND ROOF INSULATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Roofing system for nailable wood deck

B. Roofing system over insulated, wood deck.

C. Insulation board.

D. Roofing accessories and incidentals.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 02 05 00 - Demolition

B. Section 06 10 00 - Rough Carpentry

C. Section 07 21 00 - Thermal Insulation

D. Sect ion 07 62 00 - Sheet Metal Flashing & Trim

1.3 QUALITY ASSURANCE

A. Applicator Qualifications

B. Company specializing in built-up bituminous roofing application, with minimum experience of three years. Provide documentation, if requested.

1. Installer approved by roofing materials manufacturer

1.4 REGULATORY REQUIREMENTS

A. Comply with local, state and federal regulations, safety standards and codes. Conform to most stringent regulation.

B. Underwriters Laboratories, Inc. (UL); Class A Fire Hazard Classification

C. Uniform Building Code, Factory Mutual

1.5 SUBMITTALS

A. Submit in accordance with Section 01 33 00

B. Manufacturers' product data

C. Confirmation of Applicator Qualifications

D. Material Safety Data Sheets (MSDS) including roofing components, related accessories and materials

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in unbroken packages, with manufacturers' original labels intact

B. Store materials in accordance with manufacturer's recommendations, and as directed by Owner's Representative.

C. Protect materials from sun and weather-related extremes.

D. Ensure protection from incidental damage from work activities of other trades.

E. Select and handle materials and equipment to avoid damage to materials, existing construction, or applied roofing.

1.7 PROJECT CONDITIONS

A. Use special precautions when installing roof system at temperatures below 45^0F to ensure satisfactory application and performance.

B. Apply no roofing materials during inclement weather

C. Apply no roofing materials over damp substrate.

D. Apply no roofing materials unless proper asphalt application temperatures (EVT) can be maintained.

1.8 WARRANTY

A. Warrant roofing, flashings, and deck insulation for two (2) years, as stipulated in Section 00 80 00 – Supplementary Conditions. Warranty period commences after date of Substantial Completion.

B. Roofing Contractor shall warrant metal work in contact with roofing; metal work as provided by other trades.

C. Warranty includes minimum of two (2) annual inspections and necessary repairs for warranty period.

D. Repair defects occurring within warranty period. Failure to make proper repairs within warranty period shall extend period until acceptable completion of applicable repair items.

1.8 REFERENCES

A. American Society for Testing and Materials (ASTM)

B. D41 Specification for asphalt primer used in roofing, dampproofing and waterproofing.

C. D312 Specification for asphalt used in roofing.

D. D2178 Specification for asphalt glass felt used in roofing and waterproofing.

E. D3909 Specification for asphalt roofing (glass felt) surfaced with mineral granules.

F. D4586 Specification for asbestos-free asphalt roof cement.

G. D4601 Specification for glass fiber base sheet.

H. E108 Fire Tests of roof covering.

I. Underwriter's Laboratories (U.L.)

PART 2 - PRODUCTS

2.1 APPROVED MANUFACTURERS & ROOF SYSTEMS

A. Manufacturers' Systems using Modified SBS Surfacing on Nailable Deck. Roof system consists of base sheet, three type VI plies, SBS cap sheet, and DFE base flashing.

1. Mansville: 5GNC GLASBASE, Three GLASPLY Premier; GLASKAP PLUS cap sheet; DFE flashing system: GLASKAP PLUS.

2. GAF: N-B-3-601/P6 375 base sheet, Three GAFGLAS ply VI, Rubberoid No. 601 SBS Modified cap sheet. DFE Flashing system: Rubberoid No. 601 SBS.

3. Malarkey: M5-WU-AIB-H FibreGlas base sheet #515, Three type VI Plies #506, No. 601 Premium Polyglass SBS mineral surface cap sheet. DFE flashing system: No. 601 Premium Polyglass SBS.

4. Conglas: ND-36A-CMBH CONBASE base sheet, Three CONPLY HT60 Type VI plies, MB CAP 100 modified cap sheet. DFE flashing system:MB CAP 100

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5. U.S. Intec, Inc: BF170-B5UP-N; Ultra base sheet, Three type VI Ultra Ply, Brai-Flex 170 cap sheet.DFE flashing system:Brai-Flex 170.

6. Tamko: 214M Tamko Glass Base, Three TamkoTam Premium Type VI Ply, AWAPLAN Premium SBS cap sheet. DFE Flashing System: AWAPLAN Premium SBS cap sheet

7. Certainteed: GMS-N-B5 Glasbase, Three Flintglas Premium Ply Type VI, Flintlastic GMS Mineral Surface cap sheet. DFE Flashing System: Flintlastic GMS

B. Manufacturers' Systems using Modified SBS Surfacing over Insulation with Nailable Deck. Roof system consist of four type VI plies, SBS cap sheet, and DFE base flashing.

1. Mansville: 5GIC, Four GLASPLY premier type VI plies; GLASKAP PLUS cap sheet; DFE flashing system: GLASKAP PLUS.

2. GAF: I-4-I-60/PR, Four GAFGLAS type VI plies, Rubberoid No. 601 SBS Modified cap sheet. DFE Flashing system: Rubberoid No. 601 SBS.

3. Malarkey: M5-WI-XIB-H, Four No. 506 super 6 type VI plies; Premium Polyglass SBS mineral surface cap sheet. DFE flashing system: No. 601 Premium Polyglass SBS.

4. Conglas: RI-46 (none) CMBH, Four CONPLY HT60 Type VI plies, MB CAP 100 modified cap sheet. DFE flashing system:MB CAP 100

5. U.S. Intec, Inc.: BF170-5UP-RI; Four type Ultra type VI plies, Brai-Flex 170 SBS cap sheet. DFE flashing system:Brai-Flex 170.

6. Tamko: 2108M, Four TamkoTam Premium Type VI Ply, AWAPLAN Premium SBS cap sheet. DFE Flashing System: AWAPLAN Premium SBS cap sheet

7. Certainteed:GMS-C-P4-IN, Four Flintglas Premium Ply Type VI, Flintlastic GMS Mineral Surface cap sheet. DFE Flashing System: Flintlastic GMS

2.2 INSULATION BOARD

A. Retro-Fit Board

1. Non-tapered high-density board of expanded perlite and cellulose fibers meeting requirements of ASTM C728. Size: 4 x 8 feet x ½ inch thickness, alternate sizes as may be required to suit installation. Top surface sealed with Top-Loc coating. Retro-Fit Board as manufactured by Johns Manville; Sealskin by International Permalite, Atlas Roofing Corp. or approved.

B. Insulation

1. Non-tapered, and tapered polyisocyanurate foam core, closed cell insulation with fiberglass reinforced felt face. 4 x 4 feet and 4 x 8 feet sheet sizes in 1-inch thickness with 6.0 "R" value. ASTM C1289 type II, Class I by Atlas Roofing Corp.; Johns Manville; Isoperl by International Permalite, or approved.

C. Vapor Barrier System below Insulation

1. Vapor retarder same product manufacturer as roofing system. On nailable deck, include the following minimum materials per 100 square feet of area:
   a. Modified Base Sheet mechanically fastened to deck – 28 pounds
   b. Ply sheet asphalt mopped to Base Sheet per ASTM D2178, Type VI – 11 pounds
   c. Asphalt to embed Insulation – 33 pounds
   d. Total Weight (approximately) – 72 pounds

2.3 COMPONENTS & ACCESSORIES

NEHS

A. Slope less than 2:12 ratio – Bitumen Primer ASTM D41; Bitumen – ASTM D-312, Type III; Asphalt emulsion – ASTM D-1227, Type I

B. Slope greater than 2:12 ratio – Bitumen Primer ASTM D41; Bitumen – ASTM D-312, Type IV; Asphalt emulsion – ASTM D-1227, Type II.

C. Fiber cants – 5 and 4 inch size as per requirements of conditions of installation. Johns Manville, International Permalite, or approved.

E. Fasteners
1. Tape and Staple system – Senco base sheet tape system with divergent tape 7/8-inch leg staples, or approved.
2. Nails – galvanized annular ring shank nails through flat tin discs, 7/8 inch (¾ inch penetration).

F. Primer – Asphalt primer ASTM D41; Fed Spec SS-A-701B.

G. Flashing Cement – Fiberglass plastic cement Fed Spec SS-C-153, Type 1.

H. Mastic – Neoprene base material.

I. Reuse or provide new, replacement steel clamping rings and strainers at cast-iron sumps, matching existing.

J. Pre-made flashings at pipe penetrations through parapet cap flash: EPDM rubber pipe flashing with aluminum gasket, secured with 304 stainless steel fasteners. Manufacture: Dektite, or approved.

K. Tapered edge strip: 1½ inch – 0 inch x 12 inch width.

L. Pitch Pocket Material: Elastomeric sealant; Goodyear, Firestone, Gaco or approved.

M. Red rosin paper protective base sheet. 3 ounces psf weight. Continuous coverage.

PART 3 – EXECUTION

3.1 GENERAL

A. Precautions:
1. Storage on Roof - Store minimum of materials on existing roof. Ensure materials stored on existing roof are sufficiently space to protect roof and structure from overloading. Store materials minimum of 8 feet from roof edges.
2. Fire Protection – Exercise extra care and observe fire safety precautions when torch applications are in process.
3. Maintain sufficient number of fire extinguishers on roof at areas of work.
4. Exercise caution with combustibles and utility lines at roof.

B. Prior to installation, inspect wood decking for loose or unsatisfactory plywood sheathing, lack of bearing; loose or popped edges and raised fasteners; or otherwise deteriorated material which will adversely affect roofing installation. Notify General Contractor for repair of such conditions and re-inspect to determine suitability prior to application. Commencement of work constitutes acceptance of substrate and responsibility for repair of unsatisfactory conditions.

C. Cover voids in sheathing greater than 3 inches and open knotholes with sheet metal secured to plywood.

D. Ensure that surfaces to receive roofing materials are dry and free from ridges, warps and voids; and slope to drains.

E. Coordinate installation of roof mounted components or work projecting through roofing materials. Verify that roof openings are framed and completed prior to application.

F. Follow procedures of Section 01 01 00 if hazardous materials are uncovered.

G. Complete areas of roofing activity in their entirety each day. Protect incomplete sections from moisture infiltration into completed work and into existing building envelope.

H. Prevent interior leakage, materials falling into interior, or other such like occurrences. Accomplish material installation in such a manner that bitumen spillage does not occur.

3.2 BOARD INSULATION INSTALLATION

A. Remove debris from roof deck.

B. Apply board insulation as per manufacturer's instructions over areas designated on Drawings.

C. Install tapered edge strips and cant strips as required for smooth transition between varying roof planes and exposed insulation edges.

D. Embed insulation board into vapor barrier and underlying layers in minimum of 33 pounds per 100 square feet hot asphalt. Ensure that temperature of asphalt is sufficient to obtain positive adhesion.

E. Install rigid insulation in thickness shown

F. Thoroughly "walk-in" individual insulation boards to ensure maximum adhesion.

G. Offset and stagger joints. Stagger end and edge joints at minimum 24 inch offset.

H. Install insulation square to building lines, with no gaps. Fill gaps greater than ½ inch.

I. Install tapered edge strips and cants where shown.

J. Install tapered edge strips as required for smooth transitions between differing roof planes and at exposed insulation edges.

K. Install only as much insulation as can be covered with roof membrane in same workday.

L. Leave surfaces prepared and ready for specified bituminous roofing installation.

3.3 BITUMINOUS ROOFING & CAP SHEET INSTALLATION

A. Apply asphalt, roofing and base flashing systems in strict accordance with manufacturer's published instructions.

1. At roof penetrations, use details shown for conduit risers, vent pipes, curb extensions, ventilators, roof edges, walls, and roof drains.

B. Apply asphalt between temperatures of 375 and 450^0 F.

C. Cover felts exposed overnight or during inclement weather. Glaze coat at end of work period.

D. Roll-out base sheet and allow to relax; mechanically attach base sheet with 2-inch side laps and 6 inch end laps and as per manufacturer's specifications. Embed membrane plies or felts in shingle fashion with uniform solid mopping of asphalt using 23 pounds per 100 square feet between plies.

E. Turned-up roof membrane is unacceptable. Install reinforcement base sheet at vertical roofing transitions; mop base sheet over end tails and cover laterally with 6-inch header over roof membrane.

F. Install membrane to top of curb at cants and walls. Install reinforcement base strip to top of curb, down, over cant with 6-inch minimum lap onto roof membrane.

G. Cut out and remove voids in roof membrane. Install two-ply sheets steeped in hot asphalt over repaired voids.

H. Remove debris and access asphalt prior to application of cap sheet. Apply roofing material to dry roof deck surface.

I. Build-in sheet metal flashings and counter flashings.

J. Repair loose ply laps with hot bitumen and roof assembly surfacing.

K. Repair fish-mouths by cutting plies. Secure and repair area by using manufacturer's recommendations for repairing test cuts.

L. Install tapered edge strip at roof drains. Sump drains back to ease transition and roofing. Install lead flashings prior to cap sheet installation. Roll lead flashings down into drains minimum of 1 inch. Set flashing in mastic, prime top surface, and install two stripping plies. Install drain ring and compress clamping ring with evenly spaced stainless steel fasteners. Install cap sheet and curl around drain; seal cut edge with plastic cement.

M. Install modified cap sheet in solid, uniform asphalt mopping. Install cap sheet in shingle fashion with asphalt at rate of 23 pounds per 100 square feet onto roof membrane. Embed 12-foot maximum lengths in solid mopping of hot asphalt.

N. Install cap sheet at vertical roof intersections and at inclined transitions to top of cant strips. Install and fasten base flashing from minimum height down, over cant strip onto roof and cap sheet at minimum of 4 inches.

O. Affix embedded flashings into roof system with plastic cement. Prime top of exposed with asphalt primer and two reinforcement plies solidly mopped over flashings prior to modified cap sheet surfacing.

3.5 BLENDING NEW TO EXISTING

A. Overlap new, mechanically fastened base sheet by 6 inches, minimum, beyond edge of existing roof system. Apply roof membrane in asphalt, overlapping each successive new play an additional 6 inches beyond ply below. Broom and press felts together tightly, resulting in smooth and wrinkle free surface.

B. 24 hours prior to blending, prime existing surfaces with asphalt primer. Install cap sheet uniformly steeped in hot asphalt adhesive to existing.

C. Extend roofing minimum 3 feet each way onto existing roofing.

3.6 BASE FLASHING

A. Provide modified base flashing ply where roof intersects at vertical transition or at incline transition. Install base flashing to reinforce transition. Install reinforcement flashing in lengths not exceeding nine (9) feet.

3.7 REPAIR

A. Mark and remove wet, damaged or defective material same day as when identified. Replace material at no cost to Owner. No exceptions.

B. Clean patched area(s) thoroughly of debris; prepare following appropriate manufacturer's instructions.

C. Overlap work in layers 18 inches at minimum, unless directed otherwise.

3.8 TESTING

A. Roof cut-out samples, site repairs and remedial roofing at no additional cost to Owner.
   1. Make two samples in locations as directed.
   2. Cut 4 x 48 inch sample at 90^0 to direction of roofing

3. Install temporary protection needed to prevent moisture penetration through roof until final patches or new roofs are installed. Repair roof sample area to like-new condition.
4. Apply additional felts and bitumen or replace entire area of roof, if sample fails to meet manufacturer's minimum standards.
5. Replace cut areas to avoid depression in membrane. Build up plies and feather out onto adjacent membrane, extend succeeding plies 4 inches, minimum, beyond previous ply in all directions.

3.9 CLEANING

A. Remove bituminous residue from finished surfaces. At areas where finished surfaces are soiled by work of this Section, follow instructions of manufacturer of soiled product.

B. Promptly remove scraps, debris and surplus material from job-site upon completion of work of this Section

END OF SECTION 07 51 00

SECTION 07 60 00
FLASHING & GENERAL SHEET METAL

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Coping and miscellaneous flashings.

B. Counterflashings over miscellaneous roof penetrations.

1.2 RELATED SECTIONS

A. Section 07 61 13 - Standing Seam Metal Roofing.

1.3 QUALITY ASSURANCE

A. Fabricator Qualifications
   1. Company specializing in sheet metal fabrications, with minimum experience of five years. Provide documentation, if requested by Architect.

B. Perform work in accordance with SMACNA standard details and requirements.

1.4 REFERENCES

A. American Iron & Steel Institute - Stainless Steel Data Manual. AISI.

B. SMNACA Architectural Sheet Metal Manual.

C. American Society for Testing and Materials standards as referenced herein. ASTM.

1.5 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Shop Drawings indicating: material profiles, jointing pattern, jointing details, fastening methods, flashings, terminations, types and locations of fasteners, color sample and other pertinent installation details.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Section 01 60 00.

B. Ensure protection from incidental damage from work activities of other trades.

C. Select and handle materials and equipment to avoid damage to materials, existing construction, or applied roofing.

D. Prevent contact with materials which may cause staining or discoloration.

E. Store finished materials to prevent twisting, bending, or abrasion. Provide ventilation and slope materials to ensure drainage.

1.7 WARRANTY

A. Warrant sheet metal work for two (2) years. Warranty period commences after date of Substantial Completion. Provide written warranty at Substantial Completion.

B. Include minimum of two (2) annual inspections and necessary repairs for warranty period. Provide inspection schedule at project Close-out.

C. Repair defects occurring within warranty period. Failure to make proper repairs within warranty period shall extend period until acceptable completion of applicable repair items.

1.8 COORDINATION

A. Coordinate with other trades affecting or affected by work of this Section.

PART 2 - PRODUCTS

2.1 SHEET MATERIALS

A. Galvanized Steel: ASTM A525, G90; 24 gauge core steel, typical

B. General sheet metal: Galvanized iron copper-bearing base metal with commercial weight zinc coating. 24 gauge or as indicated on Drawings.

C. Prefinished sheet metal: 24 gauge. Color as selected from manufacturer's standards. Match project standard sheet metal roof panel.

D. Clear anodized aluminum: .060" thick sheet.

2.2 ACCESSORIES

A. Screws and Nails: Match with connecting materials complete with neoprene washers.

B. Fasteners: Galvanized steel with soft neoprene washers.

C. Nylon Fasteners: Mushroom head, Tap-It by U.S. Expansion Bolt Company.

D. Self-Drilling Fasteners: Cadmium-plated, with 2-piece neoprene and steel sealing washer, in appropriate thickness and length for materials being fastened; Buildex Teks, or approved.

E. Cleats: Same material and thickness as sheet metal.

F. Protective Backing Paint: Zinc chromate alkyd.

G. Sealant: Products as approved by roofing system manufacturer

H. Caulking: Products as approved by roofing system manufacturer and as per Fed. Spec. FS-TT-230, non-staining and non-bleaching.

J. Protective Coating for Dissimilar Metals: Asphalt plastic cement

K. Bedding Compound: Butyl.

L. Butyl Tape: width as required

2.3 COMPONENTS

A. Flashings: Material compatible with adjacent; no dissimilar metals in direct contact creating electrolysis; separation membrane or coated material.

2.4 FABRICATION

A. Form sections true to shape, accurate in size, square, and free from distortion or defects.

B. Fabricate cleats of same material as sheet, minimum 3 inches wide, interlock with sheet.

C. Form pieces in longest possible lengths.

D. Hem exposed edges on underside 2 inch; miter and seam comers.

E. Form cap material with standing seam joints.

F. Fabricate comers from one piece with minimum 18 inch long legs; solder for rigidity, seal with sealant

G. Fabricate vertical faces with bottom edge formed outward ¼ inch; hem to form drip.

H. Fabricate flashings to allow toe to extend. Return and brake edges.

I. Lap joints 6 inch minimum, seal and pop rivet.

PART 3 - EXECUTION

3.2 EXAMINATION

A. Verify openings, curbs, steel plates are solidly set, reglets in place, and nailing strips located.

B. Do not start work until conditions are satisfactory.

C. Verify termination and base flashings are in place, sealed, and secure.

3.3 PREPARATION

A. Install starter and edge strips, and cleats before starting installation.

3.4 FABRICATION - GENERAL

A. Fabricate new or required cap metal, edge metal, wall counterflashings with sharp and true edges and bends; reinforce as required for stiffness, free of waves and buckles. Form to dimensions and profiles duplicating existing where indicated.

B. Hem exposed edges.

C. Provide necessary anchors, anchor strips, receivers and clips as shown on drawings and as required to complete work.

3.5 INSTALLATION

A. General
   1. Secure flashings using concealed fasteners. Use exposed fasteners only where permitted.
   2. Apply plastic cement compound between metal and felt flashings
   3. Fit flashings tight in place. Make comers square, surfaces true and straight in planes, and lines accurate to profiles.
   4. Seal joints watertight.

B. General Sheet Metal
   1. Make proper allowance for expansion and contraction due to temperature variations, settlement, and shrinkage or swelling.
   2. Cope or flange intersection to fit accurately.
   3. Caulk sheet metal work at locations as required to complete watertight installation.

C. S-Lock Seams
   1. Form 1¼ inch wide shaped seam at one edge of flashing sheet for concealed fastening.

D. Miscellaneous Flashings
   1. Install flashing around openings in exterior walls in area of work, where indicated on Drawings, or where necessary to make building watertight.

3.6 FIELD QUALITY CONTROL

A. Inspection to ascertain compliance with specified requirements.

3.7 CLEANING

A. Remove residue from finished surfaces. At areas where finished surfaces are soiled by work of Section, follow instructions of manufacturer of soiled product.

B. Promptly remove scraps, debris and surplus material from job-site upon completion of work of Section

END OF SECTION 07 60 00

SECTION 07 72 00
ROOF ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Manufactured curbs, equipment rails, access ladders, and pedestals.

B. Related Requirements:
   1. Section 07 62 00 - Sheet Metal Flashing and Trim: Roof accessory items fabricated from sheet metal.

1.2 REFERENCE STANDARDS

A. 29 CFR 1910.23 - Guarding floor and wall openings and holes; current edition.

B. Reference Standards: Current edition at date of Bid.

C. American Society for Testing and Materials (ASTM) International:
   1. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; current edition.
   2. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; current edition.
   3. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes [Metric]; current edition.

1.3 SUBMITTALS

A. See Section 01 33 00 for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used.
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.
   4. Maintenance requirements.

C. Shop Drawings: Submit detailed layout developed for this project. Show dimensioned location and number for each type of roof accessory.

D. Warranty Documentation:
   1. Submit manufacturer warranty.
   2. Ensure that forms have been completed in Owner's name and registered with manufacturer.
   3. Submit documentation that roof accessories are acceptable to roofing manufacturer, and do not limit the roofing warranty.

1.4 QUALITY ASSURANCE

A. Manufacturer:
   1. Design, fabricate, and furnish roof curbs and equipment supports to accurate dimensions, configuration, and structural rigidity to meet requirements for watertight systems.
   2. Accommodate loading capacity and connections of roof equipment, configuration of and watertight connections to roofing system, and configuration and spanning capacity between structural members at openings in roof deck.

1.5 QUALIFICATIONS

A. Manufacturer:
   1. Able to document minimum 10 years continuous experience designing, manufacturing, and supplying work of this Section.
   2. Maintain engineering and design capabilities to furnish customized curbs, expansion joints, and equipment supports.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store products under cover and elevated above grade.

1.7 WARRANTY

A. See Section 01 77 00 - Closeout Procedures, for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURED CURBS

A. Manufactured Curbs, Equipment Rails, and Other Roof Mounting Assemblies: Factory-assembled hollow sheet metal construction with fully mitered and welded corners, integral counterflashing, internal reinforcing, and top side and edges formed to shed water.
   1. Sheet Metal: Hot-dip zinc coated steel sheet complying with ASTM A653/A653M, SS Grade 33 ; G90 coating designation.
   2. Sheet Metal Thickness:
      a. Minimum 18 gauge, and as engineered by manufacturer.
      b. Minimum 14 gauge for curbs supporting HVAC units
      c. Minimum 20 gauge for expansion joint curbs.
   3. Insulation: Factory installed 1-1/2 inch thick three-pound density semi-rigid fiberglass blanket.
   4. Roofing Cants: Provide integral sheet metal roofing cants dimensioned to begin slope at top of roofing insulation; 1:1 slope; minimum cant height 4 inches.
   5. Manufacture curb bottom and mounting flanges for installation directly on roof deck, not on insulation; match slope and configuration of roof deck.
   6. Height Above Finished Roof Surface: 8 inches, minimum.
   7. Provide the layouts and configurations shown on the drawings.

B. Curbs Adjacent to Roof Openings: Provide curb on all sides of opening, with top of curb horizontal for equipment mounting.
   1. Provide preservative treated wood nailers along top of curb.
   2. Insulate inside curbs with 1-1/2 inch thick fiberglass insulation.
   3. Height Above Finished Roof Surface: 8 inches, minimum.
   4. Height Above Roof Deck: 14 inches, minimum.

D. Pipe, Duct, and Conduit Mounting Pedestals: Vertical posts, minimum 8 inches square unless otherwise indicated.
   1. Provide sliding channel welded along top edge with adjustable height steel bracket, manufactured to fit item supported.
   2. Height Above Finished Roof Surface: 6 inches, minimum.
   3. Height Above Roof Deck: 14 inches, minimum.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

A. General: Install in accordance with manufacturer's instructions, in manner that maintains roofing weather integrity.

B. Roof Hatches and Curbs:
   1. All curb height to be minimum 6 inches at step flashing and 8 inches at upslope cricket flashings, above finished roof system surface.
   2. Include sheet metal step flashings, apron flashings, and saddle/cricket flashings.
   3. See Section 07 62 00 for sheet metal flashing section.

3.4 CLEANING

A. Clean installed work to like-new condition.

3.5 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION 07 72 00

SECTION 07 90 00
SEALANTS

PART 1 – GENERAL

1.1 RELATED WORK SPECIFIED IN OTHER SECTIONS

A. Section 09 20 00 – Gypsum Board.
B. Section 09 30 00 – Tiling.
C. Section 09 90 00 – Painting.
D. Section 10 21 13 – Plastic Toilet Compartments.
E. Division 22 – Plumbing.

1.2 SUBMITTALS

A. Furnish two copies of manufacturer's specifications and installation instructions and three pieces of 4-inch-long sealant samples of each color and type specified prior to application.

1.3 GUARANTEE

A. Application shall be guaranteed for water-tightness of exterior sealant, covering materials and labor, for a period of two (2) years. Repairs made at Contractor's expense. This guarantee extends one (1) year guarantee stated in General Conditions, Section 00 72 00.

1.4 PRODUCT DELIVERY, STORAGE, AND PROTECTION

A. Deliver materials in original containers with labels intact. Store and handle in a manner and at temperatures not detrimental to material and per manufacturer's instructions.

PART 2 – PRODUCTS

2.1 GENERAL

A. Verify that sealant is compatible with adjacent, contact materials.
B. Sealants, Joint Backup, and Primer shall be as approved by sealant manufacturer.
C. Select manufacturer's standard color closest to predominant surface color except where otherwise specified.

2.2 POLYURETHANE SEALANT (ONE-PART)

A. Non-sag, one-part type conforming with ASTM C920, Type S, Grade NS; recommended by manufacturer for application shown. Primer as recommended by sealant manufacturer for condition of use. PRC, "6000"; Sika, "Sikaflex 1A"; Sonneborn, "Sonolastic NP-I"; or approved.

2.3 POLYURETHANE SEALANT (TWO-PART)

A. Self-leveling, two-part type conforming with ASTM C920, Type M, Grade P; recommended by manufacturer for application shown.
Primer as recommended by sealant manufacturer for condition of use. A.C. Horn, "Daraseal"; Gibson-Homans, "Two-Part Polyurethane"; Sonneborn, "Sonolastic Paving Joint Sealant"; or approved.

2.4 POLYURETHANE SEALANT (TWO-PART)

A. Non-sag, two-part type conforming with ASTM C920, Type M, Grade NS; recommended by manufacturer for application shown. Primer as recommended by sealant manufacturer for condition of use. A.C. Horn, "Daraseal U-NS"; PRC, "270"; Sonneborn, "Sonolastic NP-II"; or approved.

2.5 SILICONE SEALANT

A. One-part, silicon type conforming to ASTM C920, Type S, Grade NS; recommended by manufacturer for application shown. Primer recommended by manufacturer for condition of use. Dow Corning, #790; General Electric, "Silpruf"; Sonneborn, "Omniseal"; or approved.

2.6 ACRYLIC LATEX SEALANT

A. One-part, non-sag sealant. Pecora, "AC-20"; Sonneborn, "Sonolac Acrylic Latex Caulk"; or approved.

2.7 JOINT BACK-UP & COMPRESSIBLE TUBE (EXPANSION JOINT)

A. Closed cell polyethelene rod conforming to ASTM D1622 and recommended by sealant manufacturer. Size as indicated on drawings.

PART 3 – EXECUTION

3.1 PREPARATION

A. Clean and otherwise prepare joint as recommended by sealant manufacturer and in a manner to allow sealant to achieve high early bond strength, internal cohesive strength and surface durability.

3.2 INSTALLATION

A. General
   1. Comply with sealant manufacturer's printed instructions except where more stringent requirements are shown or specified.
   2. Prime or seal joint surfaces wherever shown or recommended by sealant manufacturer.
   3. Do not allow primer sealer to spill or migrate onto adjoining surfaces.
   4. Install bond breaker tape where shown and where required by manufacturer's recommendation.
   5. Install sealants to depth as shown or as recommended by sealant manufacturer, but in no instance shall depth of joint exceed width of joint.
   6. Prevent sealants or compounds from overflowing, spilling or migrating into voids of adjoining surfaces.
   7. Use masking tape or other precautionary devices to prevent staining of adjoining surfaces.

B. Interior
   1. Seal joints on interior surfaces as required for air, sound, and light seals where caulked joints specified or shown.

C. Joint Backup
   1. Install where shown, when depth of joint exceeds maximum recommended thickness of sealant, or when recommended by sealant manufacturer.

3.4 SEALANT SCHEDULE

A. Locations in Contact with Water: Silicone Sealant.

B. All Other Joints: Either One or Two-Part Polyurethane Sealant.

3.5 CLEANING

A. Remove excess and spillage of compounds as work progresses. Clean adjoining surfaces to eliminate evidence of spillage.

B. Do not damage adjoining surfaces or finish.

3.6 CURE AND PROTECTION

A. Cure sealants and caulking compounds in compliance with manufacturer's instructions and recommendations to obtain high early bond strength, internal cohesive strength and surface durability.

B. Advise Contractor of procedures required for protection of sealants and caulking compounds during construction.

3.7 FIELD TESTS

A. After nominal cure of exterior joint sealants exposed to weather, test for water leaks. Flood joint exposure with water directed from ¾ inch water hose held perpendicular to wall face, two feet from joint. Provide minimum water pressure of 30 PSI. Move stream of water along joint at approximate rate of 20 feet per minute.

B. Conduct tests where directed by Architect.

C. Remove and replace sealant evidencing leakage or failure.

END OF SECTION 07 90 00

STEEL DOORS & FRAMES

SECTION 08 11 00

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Steel Doors

B. Steel Frames

C. Steel Frame Reconditioning

1.2 RELATED SECTIONS

A. Section 08 71 00 – Hardware.

B. Section 08 80 00 – Glazing

C. Section 09 90 00 – Painting.

1.3 REFERENCES

A. Steel doors and frames shall comply with or exceed standards listed. Latest published edition of each reference applies.

1. ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
2. ASTM E 90 - Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions.
3. ASTM E 413 - Classification for Rating Sound Insulation.
4. ANSI/DHI A115 - Specifications for Hardware Preparations in Standard Steel Doors and Frames.
5. ANSI A156.7 - Hinge Template Dimensions.
6. ANSI A 250.3 - Test Procedure and Acceptance Criteria for Factory Applied Finish Painted Steel Surfaces for Steel Doors and Frames.
7. ANSI A250.4 – Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors and Hardware Reinforcing.
8. ANSI A 250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.
9. ANSI A 250.11 – Recommended Erection Instructions for Steel Frames.
10. SDI 105 - Recommended Erection Instructions for Steel frames.
11. SDI 112 - Zinc-Coated (Galvanized/Galvannealed) Standard Steel Doors and Frames.
12. SDI 117 - Manufacturing Tolerances for Standard Steel Doors and Frames.
13. SDI 118- Basic Fire Door Requirements
14. NFPA 80- Standard for Fire Doors and other Opening Protectives
15. NFPA 105-Standard for the Installation of Smoke Door Assemblies and other Opening Protectives
16. NFPA 252 – Standard Method of Fire Tests of Door Assemblies
17. ANSI/UL 10C- Standard for Safety for Positive Pressure Fire Tests od Door Assemblies
18. UL 1784 - Air Leakage Tests of Door Assemblies
19. UL - Building Materials Directory; Underwriters Laboratories Inc
20. WH - Certification Listings; Warnock Hersey International Inc.
21. State and Local codes including Authority Having Jurisdiction

1.4 SUBMITTALS

A. Submit for review hollow metal shop drawings covering complete identification of items required for project. Include manufacturer's names and identification of product. Include catalog cuts and/or technical data sheets and other pertinent data as required to indicate compliance with specifications.

NEHS

1. Shop Drawings: submit complete and detailed with respect to quantities, dimensions, specified performance, and design criteria, materials and similar data to enable Architect to review information as required.

B. Indicate frames' configuration, anchor types and spacing, location of cutouts for hardware, reinforcement, to ensure doors and frames are properly prepared and coordinated to receive hardware.

C. Indicate door elevations, internal reinforcement, closure method, and cutouts for glass lights and louvers.

D. Manufacturer's installation instructions.

E. Shop drawings, product data, and samples: stamp with Contractor's stamp verifying they have been coordinated and reviewed for completeness and compliance with the contract documents.

F. Shop drawings submitted without above requirements will be considered incomplete, will NOT be reviewed, and will be returned.

G. Follow same procedures for re-submittal as initial submittal with revised dates.

H. Provide evidence of manufacturer's membership in Steel Door Institute.

1.5 QUALITY ASSURANCE

A. Certification of label construction: For components exceeding Underwriters Laboratories, Inc. (UL), furnish inspection certificate stating that component construction conforms to UL rating requirements only if Architect is aware of limitation and has allowed the non-labeled unit.

B. Hollow metal supplier shall be qualified direct distributor of products to be furnished and have an A.H.C., C.D.C., or equivalently certified employee available to consult with Architect, Contractor and Owner regarding matters affecting door and frame openings.

C. Conform to applicable codes for fire ratings. Door hardware and its application shall comply or exceed standards for labeled openings. In case of conflicts in required fire protection ratings, provide fire ratings as required by NFPA and UL.

1. Affix physical label or approved marking to fire doors and fire door frames, at authorized facility as evidence of compliance with procedures of labeling agency. Labels shall be metal, paper or plastic. Stamped or die cast labels are not permitted. Labels shall not be removed, defaced or made illegible while door is in service as covered in NFPA Pamphlet 80.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver doors and frames cardboard wrapped, crated, palletized or otherwise protected during transit and site storage.

B. Inspect doors and frames upon delivery for damage. Minor damages may be repaired, provided refinished items are equal to new work and accepted by Architect. Otherwise, remove and replace damaged items.

C. Store doors and frames at building site in dry, secure location.

1. Place units on wood blocking.
2. Avoid use of non-vented plastic or canvas shelters
3. Remove wet cardboard packaging materials immediately.
4. Provide ¼ inch air circulation space between stacked doors.

1.7 SEQUENCING AND COORDINATION

A. Deliver supplies to jobsite in timely manner.

B. Coordinate with trades affected by work.

C. Verify field dimensions prior to fabrication.

1.8 WARRANTY

A. Supply hollow metal doors with one (1) year warranty against defects in materials and workmanship.

B. Warranty commences with Substantial Completion of Project.

PART 2 - PRODUCTS

2.1 DOORS

A. Cold-rolled steel, A 1008, 16 gage cold rolled or galvannealed steel.
1. Insulated Polystyrene Core (optional Polyurethane Core)
2. 1-3/4 Inches Thick
3. Polyurethane R-Factor - 10.04 Minimum
4. 16 Gauge Top & Bottom Channels
5. Manufacturers Lite Kits sized per Hardware Schedule

B. Factory painted door.

C. Hardware reinforcements:
1. Hinge reinforcements for full continuous hinge.
2. Lock reinforcements: minimum 16 gage [0.053"].
3. Closer reinforcements: minimum 14 gage [0.067"], 20” long.
4. Galvannealed doors: include galvannealed hardware reinforcements.
5. Projection welded hinge and lock reinforcements to edge of door.
6. Provided adequate reinforcements for other hardware as required.

D. Full Flush Type doors
1. ANSI-A250.4 criteria and tested to 5,000,000 operating cycles.

E. Galvannealed door at exterior applications.

2.2 FRAMES

A. Frames:
1. 14 gage cold rolled steel.
2. Factory die-mitered corner connections with integral interlocking tabs.
3. Ratings as indicated on drawings.

B. Floor anchors: Angle clip type
1. 16 ga. Minimum
2. To receive 2 fateners per jamb.

C. Preparation for New Hardware:
1. Reinforce components for hardware installation per ANSI A250.4.
   a. Lock and closer reinforcements to be “box” or “channel” type.
   b. Channel type hinge and lock reinforcing on doors, continuous from top to bottom of door, weld to face sheets.
   c. Prep every frame for closers if specified or not.
2. Punch door frames to receive inserted type door mutes (3) per strike jamb on single doors. Adhesive-applied mutes are unacceptable
3. Factory-prepared hardware locations shall be per “Recommended locations for Builders’ Hardware for Standard Steel Door and Frames”, as adopted by SDI.

D. Galvannealed frame at exterior applications.

2.3 ACCESSORIES

A. Hollow metal frame repair
   1. Filler: Bondo Ultimate, or approved.

PART 3 - EXECUTION

3.1 SETTINGS

A. Install doors in accordance with SDI 105 and ANSI A250-11.

B. Install label doors and frames in accordance with NFPA 80.

C. Remove temporary steel spreaders prior to installation of frames

D. Set anchors for frames as work progresses. Install anchors at hinge and strike levels.

E. Set doors accurately; plumb and aligned with frame.

F. Set frames accurately in position; plumb, align and brace until permanent anchors are set.

3.2 RECONDITIONING EXISTING FRAMES

A. Remove rust and decay completely in accordance with SSPC for “Hand-Tool” and “Power-Tool” Cleaning

B. Prepare frame to receive new work. Pre-prime newly exposed metal with Rustolem Rust Stop or Approved.

C. Repair and fill holes, depressions, abandoned fasteners, and pitted or deteriorated surfaces. Finish exposed surfaces smooth.

D. Seal open joints (do not seal weeps).

E. Prime and paint frame in accordance with section 09 90 00.

3.3 ADJUSTMENT AND CLEANING

A. Remove dirt and excess sealants, mortar or glazing compounds from exposed surfaces.

B. Adjust moving parts for smooth operation. Use shims if necessary for proper closing.

END OF SECTION 08 11 00

SECTION 08 14 16

FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Flush, solid-core wood doors

1.2 RELATED SECTIONS

A. Section 06 20 00 – Finish Carpentry

B. Section 08 71 00 - Door Hardware.

1.3 QUALITY ASSURANCE & REFERENCES

A. Company specializing in wood door fabrication.

B. Windows and Door Manufacturers Association (WDMA).

C. ANSI/NWWDA I.S. 1A SERIES, latest edition, Industry Standard for flush wood doors.

D. AWI – Architectural Woodwork Institute.

1.4 SUBMITTALS

A. Submit under provisions of Section 01 33 00

B. Provide sufficient detail to show full compliance with specification:

C. Fabrication drawings with dimensions and details for solid core doors, veneer and hardware preparation.

D. Finish samples: Two (2) 4”x4” samples indicating manufacturer’s standard stain colors for each veneer type specified.

1.5 WARRANTY

A. Provide ‘Interior Use - Life of Installation” warranty against manufacturing defects, warp, and delamination.

B. Include repair or replacement in Warranty

1.6 DELIVERY, STORAGE & HANDLING

A. Package doors with slip sheets, poly-wrapped, or in individual cartons

B. Comply with requirements of AWI section 1300-G-23 and NWWDA I.S. 1A. Protect from moisture within confined area.

PART 2 – PRODUCTS

2.1 DOORS

A. Type: Veneer-Grade solid, non-rated, 1¾ inch lumber core, AWI section 1300, PC-5, Plain sliced, Red Oak veneer, factory finished. Edge band with hardwood face material.

B. Top and bottom rails minimum of 2¼ inches before trimming.

C. Stain as selected from Manufacturer’s standards.

2.2 PREPARATION

A. Bevel door stiles 1/8 inch in 2 inches and undersize doors ¼ inch in width to allow free swing and no hinge bind.

2.3 MANUFACTURERS

A. Oregon Door, Vancouver Door, Marshfield, or approved.

PART 3 – EXECUTION

3.1 GENERAL

A. Install in framed openings and maintain operating clearances and tolerances.

B. Verify Finish Hardware in accordance with approved hardware schedule and approved Shop Drawings.

C. Install hardware and accessories and make adjustments at completion of finish painting.

D. Make final adjustments for proper door operation, smooth and balanced door movement.

END OF SECTION 08 14 16

DOOR HARDWARE

SECTION 08 71 00

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Hardware for steel and wood doors.
B. Thresholds.
C. Weatherstripping, seals and door gaskets.

1. 2 RELATED SECTIONS

A. Section 08 11 00 –Steel Doors and Frames.
B. Section 08 14 16 – Flush Wood Doors.

1.3 REFERENCES

A. ADA - Americans with Disabilities Act, Accessibility Guidelines for Buildings and Facilities.
B. NFPA 80 - Fire Doors and Windows.
C. NWWDA Industry - Quality Standards.
D. NFPA 101 - Code for Safety to Life from Fire in Buildings and Structures.
E. NFPA 252 - Fire Tests of Door Assemblies.
F. UL lOB - Fire Tests of Door Assemblies.
G. UL 305 - Panic Hardware.

1.4 SUBMITTALS

A. Submit under provisions of Section 01 30 00.
B. Shop Drawings: Indicate locations and mounting heights of each type of hardware, and electrical characteristics and connection requirements.
C. Submit manufacturer's parts lists, and templates.

1.5 QUALITY ASSURANCE

A. Perform work in accordance with the following requirements:
   1. ANSI 117.1 2003 Accessible and Usable Buildings and Facilities.
   2. NFPA 101, 80 and 252.

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing Products specified with minimum three years documented experience.
B. Hardware Supplier: Company specializing in supplying commercial door hardware with three years documented experience.
C. Hardware Supplier Personnel: Employ an Architectural Hardware Consultant (AHC) to assist in the work of this section.

1.7 REGULATORY REQUIREMENTS

A. Conform to applicable code for requirements applicable to fire rated doors and frames.
B. Products Requiring Electrical Connection: Listed and classified by Underwriters' Laboratories, Inc., as suitable for the purpose specified and indicated.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Section 01 60 00.
B. Package hardware items individually; label and identify each package with door opening code to match hardware schedule.

1.9 COORDINATION

A. Coordinate work under provisions of Section 01 31 00.
B. Coordinate the work with other directly affected sections involving manufacture or fabrication of internal reinforcement for door hardware.

NEHS

1.10 WARRANTY

A. Provide Manufacturer's ten-year warranty for door closers under provisions of Section 01 77 00.

1.11 MAINTENANCE MATERIALS

A. Provide maintenance materials under provisions of 01 77 00.
B. Provide special wrenches and tools applicable to each different or special hardware component.
C. Provide maintenance tools and accessories supplied by hardware component manufacturer

PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Butt Hinges: Ives
B. Continuous Geared Aluminum Hinges: Ives
C. Lock Sets: Schlage ND Series, Rhodes Lever
D. Latch Sets: Schlage ND Series, Rhodes Lever
E. Closers: LCN
F. Panic Devices: Von Duprin
G. Stops: lves
H. Stop/Holder: Trimco
I. Thresholds: Pemko.
J. Smoke Seal: NGP
K. Louvers: Anemostat.
L. Kick Plates: Ives.
M. Overhead Stops: Glynn Johnson
M. Door Pivot: Rixson.
P. Weather Stripping: NGP.
Q. Auto. Door Bottom: NGP
R. Cylinders: Schlage Everest Primus Level 9
S. Push-Pulls: Ives
T. Relite Frames: Anemostat, unless otherwise noted

2.2 KEYING

A. Door Locks: Grand master keyed. Keyed to Owner's instructions.
B. Supply keys in the following quantities:
    1. Two (2) grand master keys.
    2. Two (2) construction keys.
    3. Additional keys or quantities as requested by Owner.
C. Manufacturer's Installation Instructions: Indicate special procedures, and perimeter conditions requiring special attention.

2.3 FINISHES

A. Finishes: See Door and Hardware Schedules.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify site conditions under provisions of Section 01039.
B. Verify that doors and frames are ready to receive work and dimensions are as indicated on shop drawings.
C. Verify that electric power is available to power operated devices and of the correct characteristics.

3.2 INSTALLATION

A. Install hardware in accordance with manufacturer's instructions.
B. Use templates provided by hardware item manufacturer.
C. Mounting heights for hardware from finished floor to center line of hardware item:

1. Locksets: 40-5/16 inches or match existing frame condition.
2. Push/Pulls: 45 inches.
3. Dead Locks: 48 inches.
4. Exit Devices: 40-5/16 inches or match existing frame condition.

3.3 ADJUSTING

A. Adjust work under provisions of Section 01 70 00 - Closeout.
B. Adjust hardware for smooth operation.

3.4 PROTECTION OF FINISHED WORK

A. Protect finished Work under provisions of Section 01 50 00.

END OF SECTION 08 71 00

SECTION 08 73 01
DOOR HARDWARE TYPES

MANUFACTURERS
SEL – SELECT
CAM – CAMDEN
GLY – GLYNN JOHNSON
PHI – PRECISION
LCN – LCN
SCH – SCHLAGE
PEM – PEMKO
VD – VON DUPRIN
IVE – IVES
MCK – MCKINNEY
HES – HES
ALV – AIR LOUVERS
RIX – RIXSON

HARDWARE SET 1: DOOR N600A, N600AA

Qty	Description	Catalog Number	Finish	Mfr
3	HINGE	T4B3386 5½X4 NRP	626	MCK
1	LOCKSET	ND75PD	626	SCH
1	CLOSER	4111 EDA WMS	ALUM	LCN
1	KICKPLATE	8400 10”X2”LDW B4E CS	626	IVE
1	WALL STOP	WS407CCV	626	IVE
3	SILENCERS	SR 64	GRAY	IVE

HARDWARE SET 2: DOOR N206A, N209GA – 90 Minute Fire Rating

Qty	Description	Catalog Number	Finish	Mfr
3	HINGE	T4B3386 5½X4 NRP	626	MCK
1	LOCKSET	ND75PD	626	SCH
1	KICKPLATE	8400 10”X2”LDW B4E CS	626	IVE
1	WALL STOP	WS407CCV	626	IVE
1	SEAL	S88	GRAY	PEM

HARDWARE SET 3: DOOR N305A, N305B

Qty	Description	Catalog Number	Finish	Mfr
3	HINGE	T4B3386 5½X4 NRP	626	MCK
1	LOCKSET	ND50PD	626	SCH
1	WALL STOP	WS407CCV	626	IVE
3	SILENCERS	SR 64	GRAY	IVE

HARDWARE SET 4: DOOR E305A

Qty	Description	Catalog Number	Finish	Mfr
1	ELECT STRIKE	8000	626	HES
1	SEAL	S88	D	PEM
1	SWITCHING MODULE	CX-12	BLK	CAM
1	DOOR CONTACT	679-05	BLK	SCH

SECTION 08 80 00

GLAZING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Glass.
B. Glazing compounds and accessories.

1.2 RELATED SECTIONS

A Section 06 20 00 – Finish Carpentry.
B. Section 07 92 00 – Sealants.
C. Section 08 71 00 – Hardware.

1.3 REFERENCES

A. ASTM C 864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers; 1999.
B. ASTM C 1036 - C85 Standard Specification for Flat Glass; 1991 (Re-approved 1997).
C. ASTM C 1048088
D. ASTM F 1300 - Standard Practice for Determining Load Resistance of Glass in Buildings; 1998.
E. ANSI Z.97.1 Safety Glazing Impact Standards.
F. FS DD-G-1403 - Glass, Plate (Float), Sheet, Figured, and Spandrel (Heat Strengthened and Fully Tempered).
G. Uniform Building Code, Standard 24-2, Category 2 for safety glazing.
H. ASTM C1172 - Specification for Laminated Architectural Flat Glass.
I. UL (Underwriters' Laboratories) 972 - Burglary Resistant Glazing.

1.4 PERFORMANCE REQUIREMENTS

A. Provide glass and glazing materials for continuity of building enclosure and air barrier
B. Select type and thickness of exterior glass to withstand dead loads and wind loads acting normal to plane of glass at design pressures calculated in accordance with Oregon Structural Specialty code.
    1. Use procedure specified in ASTM F 1300 to determine glass type and thickness.
    2. Limit glass deflection to 1/200 or flexure limit of glass, whichever is less, with full recovery of glazing materials.
    3. Design to resist seismic forces in OSSC Zone 3.
    4. Thickness shall be as per opening loading and safety requirements and safety standards, but shall be no less than 1/8 inch.

1.5 SUBMITTALS

A. Product Data on Glass Types: Provide structural, physical and environmental characteristics, size limitations, and special handling or installation requirements.
B. Product Data on Glazing Compounds: Provide chemical, functional, and environmental characteristics, limitations, special application requirements. Identify available colors.
C. Two 12”x12” samples of each glazing material.

1.6 QUALITY ASSURANCE

A. Perform Work in accordance with GANA Glazing Manual and FGMA Sealant Manual for glazing installation methods.
B. Installer Qualifications: Company specializing in performing the work of this section with minimum ten years documented experience.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Do not install glazing when ambient temperature is less than 50^{O} F.

B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.8 WARRANTY

A. See Section 01 70 00 – Contract Closeout, for additional warranty requirements.

B. Warranty: Submit manufacturer's standard warranty. Include labor and materials to repair or replace defective materials.

1. Insulating Glass: Manufacturer's 10-year warranty.

PART 2 - PRODUCTS

2.1 BASIS OF DESIGN

A. Glass product selections are based upon primary glass manufacturer below. Provide basis of design product or comparable product of listed manufacturer approved.

1. PPG Industries, Inc. Pittsburg, PA

2. Color: Match Existing.

2.2 INSULATED GLASS

A. Insulated glazing units. 1-inch nominal unit thickness with air or argon.

B. Provide hermetically sealed units with dehydrated airspace, dual sealed with primary seal of polyisobutylene (PIB), or thermo plastic spacer (TPS) and a secondary seal of silicone

C. Solar Control Low-E Insulating-Glass Units, Solarban 60, or approved.

D. Safety glazing or tempered where indicated on Drawings and Schedules.

2.3 TEMPERED GLASS

A. Tempered Glass

1. Single layer
2. Surface Finish: Fully polished.
3. Conforming to Safety Regulations: ANSI Z97.1 and 16CFR 1201 Cat. II.
4. "Tempered Glazing" logo - each lite shall bear permanent, clearly visible, and non-removable label certifying it for use.
5. Transparency: Match existing.

B. Manufacturers:

1. Oregon Glass Co., Wilsonville, OR
2. Arch Aluminum & Glass/Armalite, Portland, OR
3. Pacific Tempered Glass Corporation, Wilsonville, OR, or approved

2.4 LAMINATED GLASS

A. Laminated Glass

1. Double layer of glass panes with plastic interlayer between each pane.
2. Laminate with plastic interlayer to ASTM C1172.
3. Conforming to Safety Regulations: ANSI Z97.1 and 16CFR 1201 Cat. II.
4. Transparency: match existing.

2.5 GLAZING ACCESSORIES

A. Setting Blocks: Neoprene, 80 to 90 Shore A durometer hardness, ASTM C 864 Option I Length of 0.1 inch for each square foot of glazing or minimum 4 inch x width of glazing rabbet space minus 1/16 inch x height to suit glazing method and pane weight and area.
B. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness, ASTM C 864 Option I. Minimum 3 inch long x one half height of glazing stop x thickness to suit application, self adhesive on one face.
C. Glazing Tape: Preformed butyl compound with integral resilient tube spacing device; 10 to 15 Shore A durometer hardness; coiled on release paper; black color.
D. Aluminum Window replacement Vinyl Snap-in Glazing Stop or Bead, Swisco or approved

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that openings for glazing are correctly sized and within tolerance.
B. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement; weeps are clear, and ready to receive glazing.
C. Schedule removal and replacement activities to complete all installations each day. Provide Secure Openings with acceptable material in lieu of daily completion, if necessitated by circumstances beyond contractor's control. Coordinate such measures with Owner.

3.2 PREPARATION

A. Remove existing glazing material
B. Clean contact surfaces completely removing sealant, gaskets, etc. down to a clean surface.
C. Seal porous glazing channels or recesses with substrate compatible primer or sealer.
D. Prime surfaces scheduled to receive sealant.
E. Install sealant in accordance with manufacturer's instructions.
F. Install new glazing material with safety identification logo at bottom of opening.
G. Replace wood glazing stops damaged by removal with new stops of same profile; set new fasteners slightly below surface of wood stops; dap fastener depressions with fill compound, prime wood in preparation for finish painting.

3.3 CLEANING

A. Remove glazing sealant materials from finish surfaces.
B. Remove commercial labels and identification markings after Work is complete.
C. Wash glass on both faces not more than four days prior to date scheduled for inspections intended to establish date of substantial completion. Wash glass by method recommended by glass manufacturer.

END OF SECTION 08 80 00

SECTION 09 21 60
GYPSUM BOARD & WALL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Description of Work: Work of this Section includes, but is not limited to, the following:
   1. Gypsum board, backer board, and accessories.
   2. Metal studs and furring.
   3. Sound-rated construction and accessories.
   4. Gypsum board finishing.
   5. Trim and accessories.

1.2 RELATED SECTIONS

A. Section 06 41 00 – Casework.

B. Section 09 22 26 – Suspended Systems.

C. Section 09 51 00 – Acoustical Ceilings.

D. Section 09 30 00 – Tiling.

E. Section 09 90 00 – Painting & Coating.

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's specifications and installation instructions with Project conditions and materials clearly identified or detailed for each required system.

1.4 SYSTEM REQUIREMENTS

A. Performance Requirements: Fabricate and install systems as indicated but not less than that required to comply with ASTM C754 under the following conditions:
   1. Gypsum board partitions:
      a. Standard systems: Maximum deflection of l/240 of partition height.
      b. Systems to receive water resistant gypsum board or backer board: Maximum deflection of l/360 of partition height.
   2. Interior suspended ceilings and soffits: Maximum deflection of l/360 of distance between supports.

B. Fire Resistance Ratings: Where fire resistance classifications are indicated, provide materials and application procedures identical to those listed by UL or tested according to ASTM E119 for type of construction shown.

C. Acoustical Ratings: Where sound ratings are indicated, provide materials and application procedures identical to those tested by manufacturer to achieve Sound Transmission Class (STC) scheduled or indicated in accordance with ASTM E90.

1.5 QUALITY ASSURANCE

A. Reference Standards:
   1. Applicable requirements of ASTM C754 for installation of steel framing.
   2. Install gypsum board in accordance with applicable requirements and recommendations of Gypsum Association GA 216, "Recommended Specifications for the Application and Finishing of Gypsum Board", except for more stringent requirements of manufacturer.
   3. Apply acoustical sealant in accordance with applicable requirements of ASTM C919.

1.6 DELIVERY, STORAGE AND HANDLING

A. Delivery:

1. Deliver material to site promptly, without undue exposure to weather, in manufacturer's unopened containers or bundles, fully identified with name, brand, type and grade.

B. Storage:
1. Store above ground in dry, ventilated space.
2. Protect materials from soiling, rusting and damage.
3. Store board to be directly applied to masonry walls at 70° degrees F for 24 hours prior to installation.

1.7 PROJECT CONDITIONS

A. Environmental Requirements:
1. Do not install gypsum board when ambient temperature is below 40° degrees F.

1.8 CONSTRUCTION WASTE DISPOSAL

A. Recycle:
1. Separate clean waste drywall pieces from contaimants for landfilling or reuse. Working with local waste hauler and local drywall manufacturer, provide proper storage of waste for pickup and return. Protect scraps material from moisture and contamination.

PART 2 - PRODUCTS

2.1 PRODUCTS AND MANUFACTURERS

A. Gypsum Board and Accessories: Listed products establish standard of quality and are manufactured by United States Gypsum Company, or approved equal.

B. Steel Framing and Furring: Commercial grade, contractor choice**.**

2.2 BOARD MATERIALS

A. Gypsum Board:
1. ASTM C36, Type X fire-resistant.
2. Edges: Tapered.
3. Thickness: 5/8 inch, unless otherwise indicated.
4. Acceptable products:
a. Typical partitions and ceilings: Equivalent to Sheetrock Brand SW, Firecode or Firecode "C" Gypsum Panels by USG.

B. Water-Resistant Gypsum Board:
1. ASTM C630, regular type except where Type X fire-resistant type is indicated or required to meet UL assembly types.
2. Edges: Tapered.
3. Thickness: 5/8 inch, unless otherwise indicated.
4. Acceptable products:
a. Equivalent to Sheetrock Brand W/R, W/R Firecode "C" or W/R Firecode Type X Gypsum Panels by USG or equal

C. Veneer Plaster Base board:
1. ASTM C588, Type 'X' fire-resistant.
2. Thickness: 5/8 inch, unless otherwise noted.
3. Manufacturer: USG Imperial Gypsum Base, or approved.

D. Impact Resistant Gypsum Board:

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1. Surface Abrasion: Level 3, minimum, when tested in accordance with ASTM C1629/C1629M.
2. Hard Body Impact: Level 3, minimum, when tested in accordance with ASTM C1629/C1629M.
3. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
4. Paper-Faced Type: Gypsum wallboard as defined in ASTM C1396/C1396M.
5. Type: Fire resistance rated Type X, UL or WH listed.
6. Thickness: 5/8 inch.
7. Edges: Tapered.
8. Manufacturer: USG, Mold Tough VHI Firecode Core, or approved.

E. Glass-Mat Gypsum Sheathing Board:
1. ASTM C 1177, Type X, 5/8 inch thick with fiberglass mat laminated to both sides and with manufacturer's standard edges.
   a. Core: Silicone treated water-resistant gypsum.
   b. Facing: Inorganic glass mat both sides.
   c. Thickness: 5/8 inch.
   d. Manufacturer: USG, Sheetrock Brand Glass-Mat Panels Mold Tough AR Firecode X, or approved.

F. Backing Board For Wet Areas:
1. Application: Surfaces behind tile in wet areas including tub and shower surrounds and shower ceilings.
2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
3. ANSI Cement-Based Board: Non-gypsum-based; aggregated Portland cement panels with glass fiber mesh embedded in front and back surfaces complying with ANSI A118.9 or ASTM C1325.
a. Thickness: 5/8 inch.

2.3 METAL FRAMING AND FURRING MATERIALS

A. Metal Studs and Runners:
1. ASTM C645, "C" or C-H shape; gage:
   a. Provide as indicated or specified. Provide heavier gage if required.
   b. At door and other openings, provide 2 - studs at each jamb.
   c. Provide runner gage as recommended by stud manufacturer.
2. Depth of sections: As indicated.
3. Corrosion protection: G40 hot-dip galvanized coating per ASTM A525.

2.4 ACCESSORIES

A. Metal Trim for Gypsum Board:
1. Conform to profile and dimensions indicated.
2. Material for interior Work: Galvanized steel, 26 gage minimum.
3. Corner beads: Equivalent to Dur-A-Bead No. 103 by USG.
4. Casing beads: Equivalent to 701-B by USG.
5. Control joints:
   a. Roll-formed zinc with perforated flanges.
   b. Size: 1-3/4 inch wide, with ¼ inch wide center channel.
   c. Provide with removable tape strip over channel.
   d. Acceptable product: Equivalent to No. 093 by USG.

B. Backer Plates:

1. Steel, galvanized; 6 inches wide x 20 gage minimum x lengths to suit size of items to be attached; fastened to studs for attachment of surface mounted fittings and accessories.
2. Elimination of backer plates or direct attachment of accessories or equipment to studs will not be allowed.

C. Adhesives and Joint Treatment Materials: Adhesives and Joint Treatment Materials:
1. Conform to requirements of ASTM C475.
2. Joint compounds:
   a. Drying-type (ready-mixed): Equivalent to SHEETROCK Taping Joint Compound and Topping Joint Compound, or SHEETROCK All Purpose Joint Compound by USG.
   b. Setting (chemically-hardening) type: Equivalent to SHEETROCK Setting-Type Joint Compound by USG.
   c. Primer-Surfacer, TUFF-HIDE™: Finish Level 4 (GA-214/ASTM C-840) drywall surface with vinyl acrylic latex-based coating to achieve Level 5 gypsum board finish.
   d. Laminating adhesive for direct application: Special adhesive or joint compound specifically recommended for laminating gypsum boards and for adhering gypsum boards to solid substrates.
   f. Reinforcing joint tape:
      1. ASTM C475, 2 inch nominal width.

D. Gypsum Board Screws: Self-drilling, self-tapping steel screws.
1. For steel framing less than 0.03 inch thick: Comply with ASTM C1002.
2. For steel framing from 0.033 inch thick to 0.112 inch thick: Comply with ASTM C954.
3. Provide Type S or Type S-12 screws.

E. Backer Board Accessories: Provide accessories and corrosion-resistant-coated steel screws as recommended by backer board manufacturer and required for complete installation.

F. Acoustical Sealant: Equivalent to Acoustical Sealant by USG.

G. Sound Attenuation Blankets:
1. Mineral fiber, conforming to ASTM C665, Type I.
2. Surface burning characteristics per ASTM E84:
   a. Flame spread: 15 or less.
   b. Smoke developed: 0.
3. Thicknesses: As indicated.
4. Acceptable product and manufacturer: Equivalent to Thermafiber Sound Attenuation Fire Blankets SAFB by USG.[Fire Safety FS-15 Blankets].

H. USG Tuff Hide Primer-Surfacer

I. Flush Panel Steel Access Doors:
1. Type: Milcor DW or equal.
2. Material: 16-gauge steel frame with 14-gauge door panel. Galvanized steel drywall bead.
3. Hinge: Double-acting concealed spring type, 175 degree opening.
4. Lock: Flush, screwdriver-operated with steel cam.
5. Factory Finish: Baked-on electrostatic powder.

J. Miscellaneous Accessories: Provide as required for complete installations.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and adjoining construction and conditions under which Work is to be installed. Do not proceed with Work until unsatisfactory conditions are corrected.

3.2 GENERAL INSTALLATION REQUIREMENTS

A. Install in accordance with reference standards and manufacturer's instructions.

B. Tolerances:
1. Do not exceed 1/8 inch in 8'-0" variation from plumb or level in exposed lines of surface, except at joints between gypsum board units.
2. Do not exceed 1/16 inch variation between planes of abutting edges or ends.
3. Shim as required to comply with specified tolerances.

C. Install framing to comply with ASTM C754 and with ASTM C840 requirements that apply to framing installation.

D. Install supplementary framing, blocking and bracing at terminations in gypsum board assemblies to support fixtures, equipment, heavy trim, grab bars, toilet accessories, furnishings or similar construction.

3.3 BOARD INSTALLATION

A. Single Layer Gypsum Board on Metal Studs:
1. Loosely butt gypsum board joints together and neatly fit.
2. Do not place butt ends against tapered edges.
3. Maximum allowable gap at end joints: 1/8 inch.
4. Stagger joints on opposite sides of partitions.
5. Apply ceiling boards first where gypsum board ceilings and wall occur.
6. Cut openings in gypsum board to fit electrical outlets, plumbing, light fixtures and piping snugly and small enough to be covered by plates and escutcheons. Cut both face and back paper.
7. Screw board in place securely with screws spaced according to manufacturer's recommendations.

B. Single Layer Gypsum Board on Furring:
1. Apply gypsum board with long dimension at right angles to furring channel.
2. Center end joints over channel web; stagger end joints from those in adjacent rows of board.
3. Fasten boards to furring channels with screws spaced according to manufacturer's recommendations.

C. Water-Resistant Gypsum Board:
1. Complete plumbing rough-in before gypsum board panels are erected.
2. Separate gypsum panels from rough-in and fixtures by 1/4 inch space.
3. Install water-resistant board horizontally.

3.4 SOUND-RATED CONSTRUCTION

A. Insulation:
1. Install sound attenuation blankets in sound-rated partitions and ceilings where indicated.
2. Completely fill space between studs and framing to full height of partition wall or full area of ceiling.

3. Fit carefully behind electrical outlets and other Work penetrating sound-rated construction.

B. Gypsum Board:
1. Install gypsum board same as for interior partitions and ceilings.
2. Coordinate with installation of perimeter sealants.

C. Acoustical Sealant:
1. At partition walls, provide continuous beads of acoustic sealant at juncture of both faces of runners with floor and ceiling construction, and wherever gypsum board abuts dissimilar materials, prior to installation of gypsum board.
2. At ceilings, provide continuous beads of sealant wherever gypsum board abuts dissimilar materials.
3. Provide continuous bead of sealant behind faces of control joints prior to installation of control joint accessories.
4. After installation of gypsum board base layers, cut face layer sheets ½ inch less than floor-to-ceiling height and position with 1/4 inch open space between gypsum board and floor, ceiling and dissimilar vertical construction. Fill 1/4 inch open space with continuous sealant beads after installation of face layer.
5. At openings and cutouts, fill open spaces between gypsum board and fixtures, cabinets, ducts and other flush or penetrating items, with continuous bead of sealant.
6. Seal sides and backs of electrical boxes to completely close off openings and joints.

D. Sound Flanking Paths:
1. Where sound-rated partition walls intersect non-rated gypsum board partition walls, extend sound-rated construction to completely close sound flanking paths through non-rated construction.
2. Seal joints between face layers at vertical interior angles of intersecting partitions.

3.6 ACCESSORY INSTALLATION

A. Trim:
1. Use same fasteners to anchor trim accessory flanges as required to fasten gypsum board to supports, unless otherwise recommended by trim manufacturer.
2. Install metal corner beads at external corners.
3. Install metal casing bead trim whenever edge of gypsum board would otherwise be exposed or semi-exposed.

B. Control Joints:
1. Install control joints at junction of gypsum board partitions with walls or partitions of other finish material.
2. Where gypsum board is vertically continuous, as at stairwells, provide horizontal control joints at each floor level.

3.7 FINISHING

A. Provide levels of gypsum board finish for locations as follows, in accordance with Gypsum Association GA 214, "Recommended Specification: Levels of Gypsum Board Finish".

Level 1: Ceiling plenum areas and concealed areas, except provide higher level of finish as required to comply with fire resistance ratings and acoustical ratings.

Level 2: Gypsum board substrate at tile, except remove tool marks and ridges.

Level 3: Gypsum board surfaces, where textured finishes will be used or heavy vinyl wall papering (High-build Primer required Coat primer).

Level 4: Gypsum board surfaces, except where another finish level is indicated (High-build Primer required or USG First Coat primer).

NEHS

Level 5: Gypsum board surfaces requiring extra smooth surface for critical light, where indicated using Primer-Surfacer, TUFF-HIDE. Surface Preparation: Complete gypsum board surface to Level 4 before applying Primer-Surfacer, TUFF-HIDE.
Primer-Surfacer, TUFF-HIDE Application: Machine apply with airless sprayer in conformance with USG application instructions to a wet film thickness of 15 to 20 mils (9-12 mils dry film thickness). Surfaced may be painted after overnight drying.

B. Water-Resistant Gypsum Board: Treat fastener heads and joints with setting-type joint compound.
1. Do not crown joints or leave excess compound on panels.
2. Remove tool marks and ridges.
3. For fastener heads to be covered with tile, apply one coat of joint compound.

C. Joint Compound:
1. After skim coat sets, apply finish coat of compound feathering 3 to 4 inches beyond tape edges.
2. Feather coats onto adjoining surfaces so that camber is maximum 1/32 inch.
3. Allow joint compound to completely set before applying veneer plaster finish.

D. Trim:
1. Use same fasteners to anchor trim accessory flanges as required to fasten gypsum board to supports, unless otherwise recommended by trim manufacturer.
2. Install metal corner beads at external corners.
3. Install metal casing bead trim whenever edge of gypsum base would otherwise be exposed or semi-exposed, and where gypsum base terminates against dissimilar material.

E. Control Joints: Install where indicated and specified.

F. Special Trim and Reveal Joints: Install as indicated on Drawings and in accordance with manufacturer's instructions.

3.9 PATCHING EXISTING WALLS

A. Where new or replacement wall base is scheduled on existing walls, patch existing wall to achieve uniform finish surface.

B. Where demolition occurs, patch existing wall to achieve uniform finish surface.

3.10 ADJUSTING

A. Correct damage and defects which may telegraph through finish Work.

B. Leave Work smooth and uniform.

3.11 SCHEDULE OF FINISHES

A. unseen areas above ceiling, – Level 1.

B. Walls – Match existing project standard, unless otherwise known.

END OF SECTION 09 21 60

SECTION 09 22 26

SUSPENSION SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general conditions of Contract, including General and Supplementary Conditions and Divisions-1 Specification sections apply to work of this section.

1.2 SUMMARY

A. Section Includes:
   1. Suspension System Framing and Furring for Gypsum Board and Wood Plank Assemblies.
   2. Wire hangers, fasteners, main runners, cross tees, and wall angle moldings.

B. Related Sections:
   1. Section 06 20 00 – Finish Carpentry
   2. Section 07 62 00 – Flashing & General Sheet Metal
   3. Section 09 51 00 – Acoustical Ceilings
   4. Section 09 90 00 – Painting & Coating
   5. Division 23 – HVAC
   6. Division 26 – Electrical

1.3 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. ASTM A 641 Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
2. ASTM A 653 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.
3. ASTM A 1008 Standard Specification for Steel, Sheet, Cold Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability"
4. ASTM B 117 Standard Practice for Operating Salt Spray (Fog) Apparatus
5. ASTM C 635 Standard Specification for Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.
6. ASTM C 636 Recommended Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels.
7. ASTM C 645 Standard Specification for Nonstructural Steel Framing Members
8. ASTM C 754 Installation of Steel Framing Members to Receive Screw-Attached Gypsum Board.
9. ASTM C1002 Standard Specification for Steel Drill Screws for the Application of Gypsum Board or Metal Plaster Bases.
10. ASTM E 119 Standard Test Method for Fire Tests of Building Construction and Material (if applicable).

1.4 SUBMITTALS

A. Product Data: Submit manufacturer's technical literature.

B. Samples: 8 inch long samples of suspension system components, including main runner, cross tees and angle molding.

C. Certifications: Manufacturer's certifications that products comply with specified requirements, including laboratory reports showing compliance with specified tests and standards.

1.5 QUALITY ASSURANCE

A. Single-Source Responsibility: To ensure proper interface, all drywall furring components shall be produced or supplied by a single manufacturer.

B. All accessory components from other manufacturers shall conform to ASTM standards.

C. Fire Resistance Ratings: As indicated by reference to design designations in UL Fire Resistance Directory, for types of assemblies in which drywall ceilings function as a fire

protective membrane and tested per ASTM E 119. Installation in accordance with the UL Design being referenced.

D. Coordination of Work:
   1. Coordinate work with installers of related work including, but not limited to finish carpentry, sheet metal, acoustical ceilings, building insulation, gypsum board, light fixtures, electrical systems, and A/V systems.
   2. All work above the ceiling line should be completed prior to installing the finish material. There should be no materials resting against or wrapped around the suspension system, hanger wires, or ties.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination, and other causes.

1.7 WARRANTY

A. Suspensions System: Submit a written limited warranty executed by the manufacturer, agreeing to repair or replace grid components that are supplied with a hot-dipped galvanized coating or aluminum base material. Failures include, but are not limited to: The occurrence of 50% red rust as defined by ASTM B 117 test procedures as a result of defects in materials or factory workmanship.

B. Warranty Period: grid: Ten years from date of installation.

C. The Warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Suspension Systems: Armstrong World Industries, Inc., or approved.

2.2 SUSPENSION SYSTEMS

A. Components:
   1. Main Beam: Shall be double-web construction (minimum 0.0179 inch prior to protective coating), hot dipped galvanized (per ASTM A653).
      a. HD8901: 1-1/2 inch web height, prefinished 15/16 inch flange with minimum G40 hot dipped galvanization.
      b. HD8906: 1-11/16 inch web height, 1-1/2 inch flange, available with G40 or G90 hot dipped galvanization.
      c. HD8906F08: 1-11/16 inch web height with pre-cut facets (8 inches on center) for radius installations, 1-1/2 inch flange.
      d. HD8906F16: 1-11/16 inch web height with pre-cut facets (8 inches from ends, then 16 inches on center) for radius installations, 1-1/2 inch flange.
   2. Primary Cross Tees: Shall be double-web steel construction (minimum 0.0179 inch prior to protective coating), hot dipped galvanized (minimum G40 or G90 per ASTM A653), web height 1-1/2 inch with rectangular bulb and prefinished 1-1/2" knurled flange.
   3. Edge molding shall be hot dipped galvanized (minimum G40 per ASTM A653):
      a. HD 7859: Hemmed angle molding
      b. 7838: Unhemmed channel molding
   4. Screws for wallboard application shall be bugle head screws in accordance with thickness of material used.
   5. Metal Trim:

a. Corner bead: Minimum #26 gauge, zinc alloy or plastic square edge type with expanded flanges.
b. Casing bead: Minimum #24 gauge, zinc alloy or plastic square edge type with expanded flanges.
c. Control Joints: Minimum #26 gauge, roll-formed zinc alloy, extruded aluminum or plastic with expanded flanges.
d. Special Trim Shapes: As detailed on plans, extruded aluminum with acrylic coating by Fry Reglet or approved equal.
e. Metal Lath: 3.4 lbs/square yard, galvanized 3/8 inch diamond mesh or flat rib lath; security lath for applications requiring high degree of security.

B. Structural Classification:
1. Main Beam shall be heavy duty per ASTM C 635.
2. Deflection of fastening suspension system supporting light fixtures, ceiling grilles, access doors, verticals and horizontal loads shall have a maximum deflection of 1/360 of the span for both furring and lathing work.

C. Finish:
1. Finish paint suspension system flat black where supporting wood plank ceiling assembly.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install suspension system and panels in accordance with the manufacturer's instructions, in compliance with ASTM installation standard, and with applicable codes as required by the authorities having jurisdiction.
B. Fasteners/Upper Attachment: Attach hanger wire directly tied to structure, or with proper fasteners (such as galvanized steel clips) sized and spaced to carry expected ceiling load. A pigtail knot with three tight wraps shall be used at all wire supporting locations and at top and bottom fastening conditions.
C. Use additional hanger wire at all perimeter locations, as required. Take care to conceal hangers and bracing above suspended framing assembly.
D. Provide additional components, as necessary, to frame openings for light fixtures, access doors, sprinkler systems, etc. Coordinate support framing with other trades. Support cut ends of finish material as required for uniform appearance.
E. Install access doors per manufacturer's instructions.
F. Main beams shall be suspended from the overhead construction with hanger wire, spaced as required along the length of the main beams for interior applications, exterior applications, or wind load applications.
G. Install cross tees spaced as required for interior applications, exterior applications, or wind load applications.
H. Install diamond mesh or flat ribbed lath with wafer head self-drilling screws spaced as required to cross tees.
I. Install perimeter hot dipped galvanized channel molding or angle at wall/ceiling junctures to support main runners and cross tees in an isolation manner. Isolation is mandatory when installing any plaster system.
J. Isolation: Do not fasten main runners or cross tees to perimeter masonry or concrete construction. Allow clearance between such construction at the ends of main runners and cross tees.
1. Channel molding is permitted when screws are attached to main runner flange for isolation.
K. Expansion Joints: Provide expansion joints where shown on drawings.
L. Control Joints: Install as shown on drawings, provide discontinuous laps over joints. Do not bridge joints.

M. Plaster stops, grounds, and corner pieces are attached to system with wafer head screws and/or #18 gauge tie wire.

N. Plaster mixture and thickness to be in accordance with manufacturer's recommendations and applied in the same manner as when using channel iron for suspension, per American National Standards Institute (ANSI) Specifications.

END OF SECTION 09 22 26

SECTION 09 26 05

VENEER PLASTER REPAIR

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section specifies veneer plaster patching and repair where demolition or new work may require patching to restore finish and texture of the existing veneer plaster system.

1.2 RELATED WORK

A. Section 06 10 00 – rough carpentry.

B. Section 09 20 00 – gypsum board

B. Section 09 90 00 – painting & coating.

1.3 TERMINOLOGY

A. Definitions and description of terms in accordance with ASTM C11, C843, C844, and as specified.

1.4 APPLICABLE PUBLICATIONS

A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced in the text by the basic designation only. Most current version applies.

B. American Society for Testing and Materials (ASTM):

C587-04	Gypsum veneer plaster.
C588-03	Gypsum base for veneer plasters.
C631-95	Bonding compounds for interior plastering.
C843-99	Application of gypsum veneer plaster.
C1002-04	Steel drill screws for the applications of gypsum panel products board or metal plaster bases.
C1047-05	Accessories for gypsum wallboard and gypsum veneer base.

1.5 ALTERNATES

A. Refer to Section 01 23 00 for possible effect upon Work of Section.

PART 2 - PRODUCTS

2.1 JOINT REINFORCING TAPE

A. ASTM C475.

B. Paper tape.

2.2 LAMINATING ADHESIVE

A. ASTM C475.

B. Joint compound chemical setting type or as recommended by veneer base manufacturer.

2.3 FASTENERS

A. Screws: ASTM C1002 OR C954.

2.4 BONDING COMPOUND

A. ASTM C631.

2.5 BASE GYPSUM PANELS

a. Refer to section 09 21 60.

B. Provide single or multiple base layers of such thickness that repair will be flush with existing surface.

NEHS

PART 3 - EXECUTION

3.1 INSTALLATION CRITERIA

A. Inspect area of repair for suitability for installation. Report unsatisfactory conditions to architect prior to work.

B. Commencement of work indicates acceptance of conditions.

C. Repair, mix, and apply veneer plaster in accordance with ASTM C843.

3.2 CRACK REPAIR

A. Draw-in cracked and sagging surfaces with corrosion-resistant plaster washers and screws, or equivalent, until surface is flush and level and area is made sound.

B. Rake-out wide, deep cracks and cracks with uneven adjoining surfaces. Dampen full depth and fill with setting-type compound.

C. Repair cracks using paper joint tape embedded in prepared joint compound. Cover fasteners used to refasten loose and cracked areas in similar fashion.

D. After embedding coat has set, apply additional coat of prepared joint compound to completely cover paper tape and feather out repair.

E. Incorporate repair into existing veneer plaster finish according to requirements of this Section.

3.3 HOLE REPAIR

A. Repair damaged, missing, or demolished substrates with materials suitable for repair. Provide framing, backing, and base gypsum panels as required at larger holes.

B. Coat existing plaster edges with plaster bonder.

C. Trowel plaster product suitable for repair into holes, filling flush with adjacent surfaces.

D. Reinforce edges of patched area with joint tape and prepared joint compound.

E. Incorporate repair into existing veneer plaster finish according to requirements of this Section.

3.4 VENEER PLASTER REPAIR

A. Mix and apply veneer plaster in accordance with ASTM C843.

B. Apply plaster bonder to dry surfaces in uniform fashion.

C. Joint reinforcement: ASTM C843.

C. Apply finish to match existing texture.

D. Seal and reinforce all joints and fastener heads.

E. Remove lumps, abrasions and imperfections which will telegraph through paint finishes.

F. Spot patch existing hairline cracks and other imperfections in texture to blend existing and patch work.

3.5 CLEANUP AND PATCHING

A. Remove any plaster debris from adjacent surfaces. Repair defects in veneer plaster. Plaster surfaces shall be clean, and in condition to receive finish paint materials.

END OF SECTION 09 26 05

SECTION 09 30 00
TILING

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Tile for floor applications.
   2. Tile for wall applications.
   3. Ceramic accessories.
   4. Ceramic trim.
   5. Non-ceramic trim.

B. Related Requirements:
   2. Section 09 21 60 – Gypsum Board & Wall Framing.

1.2 REFERENCE STANDARDS

A. Reference Standards: Current edition at date of Bid.

B. American National Standard:
   1. ANSI A108/A118/A136.1 - American National Standard Specifications for the Installation of Ceramic Tile - Version; 2013.1.

C. American Society for Testing and Materials (ASTM) International:
   1. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2011.
   2. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride; 2011.

D. TCNA (HB) - Handbook for Ceramic, Glass, and Stone Tile Installation - Version; 2013.1.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by all affected installers.

1.4 SUBMITTALS

A. Product Data: Provide manufacturers' data sheets on tile, mortar, grout, and accessories. Include instructions for using grouts and adhesives.

B. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

C. Maintenance Data: Include recommended cleaning methods, cleaning materials, stain removal methods, and polishes and waxes.

1.5 QUALITY ASSURANCE

A. Maintain one copy of and ANSI A108/A118/A136.1 and TCNA (HB) on site.

B. Manufacturer Qualifications: Company specializing in manufacturing the types of products specified in this section, with minimum 5 years of documented experience.

C. Installer Qualifications: Company specializing in performing tile installation, with minimum of 5 years of documented experience.

1.6 PERFORMANCE REQUIREMENTS

A. Dynamic Coefficient of Friction: Provide flooring materials with the following values as determined by testing according to ANSI 137.1 DCOF Standard:
   1. On wet interior surface to be walked on when wet:
      a. On level surface: DCOF > 0.42.
      b. On incline surface: DCOF > 0.45.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.

1.8 FIELD CONDITIONS

A. Maintain ambient and substrate temperature of 50 degrees F during installation of mortar materials.

1.9 COORDINATION

A. Coordinate with Section 03 30 00 for sloping of concrete slab to floor drains or concrete depression for tile setting beds.

B. Coordinate with Division/Section 22 for plumbing penetrations and installations.

1.10 EXTRA MATERIALS

A. Submit extra materials to Owner. Obtain Owner's signed receipt from authorized representative.

B. Provide minimum one full carton for each tile type, color and size. Label containers to show manufacturer/product and where used.

C. Tile Penetrating Sealer: Minimum one gallon in manufacturer's container, unopened, clearly labeled with manufacturer's logo and instructions for use.

D. Maintenance Cleaning Agent: 5 gallons in manufacturer's unopened container, clearly labeled with manufacturer's logo and instructions for use.

1.11 WARRANTY

A. Systems Warranty: Manufacturer’s 10 year Systems Warranty for mortars and grouts.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from single manufacturer and each aggregate from single source or producer.
   1. Obtain setting and grouting materials, except for unmodified Portland cement and aggregate, from single manufacturer.
   2. Obtain waterproof membrane and crack isolation membrane, except for sheet products, from manufacturer of setting and grouting materials.

2.2 PRODUCT, GENERAL

A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.
   1. Provide tile complying with Standard grade requirements.

B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCNA installation methods specified in tile installation schedules, and other requirements specified.

C. Factory Blending: For tile exhibiting color variations within ranges, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.

D. Factory-Applied Temporary Protective Coating: Where indicated under tile type, protect exposed surfaces of tile against adherence of mortar and grout by precoating with continuous film of petroleum paraffin wax, applied hot. Do not coat unexposed tile surfaces.

2.3 TILE

A. CT-1 Glazed Ceramic Tile – Daltile Natural Hues, 2”x2” Color to match existing.

2.4 TRIM AND ACCESSORIES

A. Ceramic Accessories: Glazed finish, same color and finish as adjacent field tile; same manufacturer as tile.

B. Ceramic Trim: base, and cove ceramic shapes in sizes coordinated with field tile.
   1. Applications:
      a. Inside Corners: Jointed.
      b. Floor to Wall Joints: Cove base at Restrooms, match existing.
      c. Windowsill: Bullnose
   2. Manufacturers: Same as for tile.

2.5 SETTING MATERIALS

A. Provide setting materials made by the same manufacturer as grout.

B. Latex-Portland Cement Mortar Bond Coat (Thinset): ANSI A118.4.
   1. Applications: Use this type of bond coat where indicated and where no other type of bond coat is indicated.
   2. Products:
      a. Bostik Tile-Mate 760 with Hydroment 447 Flex-A-Lastic Mortar Admixture; www.bostik.com.
      b. Custom, MegaLite Modified Thin-Set Mortar; www.custombuidingproducts.com..
      c. LATICRETE International, Inc.; LATICRETE 254 Platinum: www.laticrete.com.
      d. Mapei; KERABOND Dry Set Mortar with MAPEI 300 KERALASTIC Liquid Polymer Additive, www.mapei.com.
      e. Substitutions: See Section 01 60 00 - Product Requirements.

C. Medium Bed Mortar: Pre-packaged mix of Portland cement, sand, latex additive, and water.
   1. Products:
      a. Custom Building Products, www.custombuildingproducts.com:
         1) Marble Granite, & Travertine Premium Mortar
         2) Custom Building Products - Complete Contact
      b. LATICRETE 220 Medium Bed Mortar mixed with LATICRETE 3701 Mortar Admix or LATICRETE 255 MultiMax; www.latricrete.com.
      c. MAPEI, Granirapid Mortar mixed with Granirapid Liquid or Ultraflex LFT, www.mapei.com.
      d. Substitutions: See Section 01 60 00 - Product Requirements.

D. Medium Bed Mortar for Large Format Tiles and Natural Stone:
   1. Products:
      a. Custom, Marble & Granite Fortified Premium Mortar, www.custombuildingproducts.com.
   2. Substitutions: See Section 01 60 00 - Product Requirements.

E. Mortar Bed Materials (Thickset): Pre-packaged mix of Portland cement, sand, latex additive, and water.
   1. Products:
      a. Bostik Multi-Purpose Acrylic Latex Mortar Admixture with Hydroment 425, Grout Additive; www.bostik.com.
      b. Custom-Custom Float with ThinSet Mortar Additive; www.custombuildingproducts.com.
      c. LATICRETE International, Inc.; LATICRETE 3701 Fortified Mortar Bed: www.laticrete.com.
      d. Substitutions: See Section 01 60 00 - Product Requirements.

2.6 GROUTS

A. Epoxy Grout: ANSI A118.3 chemical resistant and water-cleanable epoxy grout.
   1. Applications: Where indicated.
   2. Products:
      a. Bostik Inc.; EzPoxy 100% Solids Commercial Epoxy, Colored Epoxy Setting and Grout System: www.bostik-us.com.
      b. Custom, CEG-Lite 100% Solid Commercial Epoxy Grout (water cleanup); www.custombuildingproducts.com.
      c. LATICRETE International, Inc.; LATICRETE SPECTRALOCK PRO Premium Grout: www.laticrete.com.
      d. Mapei, Heavy Commercial and Industrial, Kerapoxy IEG; www.mapei.com.
      e. Substitutions: See Section 01 60 00 - Product Requirements.

C. Tile Sealant: Gunnable, silicone, siliconized acrylic, or urethane sealant; moisture and mildew resistant type.

NEHS

1. Applications: Between tile and plumbing fixtures.

D. Tile and Grout Cleaner: For stained tile and grout. A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.
   1. Manufacturer/Product: Aqua Mix, Heavy Duty Tile & Grout Cleaner.
   2. Substitutions: See Section 01 25 00.

E. Grout Sealer: Liquid-applied, moisture and stain protection for existing or new Portland cement grout.
   1. VOC Requirements: Meet the VOC requirements of South Coast Air Quality Management District, SCAQMD, Rule 1113.
   2. Composition: Water-based formula.
   3. Products:
      a. Aqua Mix Inc., Sealer's Choice Gold, water-based penetrating sealer (47 g/l).
      b. Custom Building Products, TileLab Grout & Tile Sealer (33 g/l.
      c. TEC Guard All – Invisible Penetrating Sealer.
      d. Substitutions: See Section 01 25 00 .

2.7 ACCESSORY MATERIALS

A. Mesh Tape: 2-inch wide self-adhesive fiberglass mesh tape.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify that sub-floor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive tile.

B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive tile.

C. Verify that sub-floor surfaces are dust-free and free of substances that could impair bonding of setting materials to sub-floor surfaces.

D. Verify that concrete sub-floor surfaces are ready for tile installation by testing for moisture emission rate and alkalinity; obtain instructions if test results are not within the following limits:
   1. Moisture Emission Rate: Not greater than 3 lb per 1000 sq ft per 24 hours, test in accordance with ASTM F1869.
   2. Alkalinity (pH): Verify pH range of 5 to 9, test in accordance with ASTM F710.

E. Verify that required floor-mounted utilities are in correct location.

3.2 PREPARATION

A. Protect surrounding work from damage.

B. Vacuum clean surfaces and damp clean.

C. Seal substrate surface cracks with filler. Level existing substrate surfaces to acceptable flatness tolerances.

3.3 INSTALLATION - GENERAL

A. Install tile, thresholds, and stair treads and grout in accordance with applicable requirements of ANSI A108.1A thru A108.13, manufacturer's instructions, and TCNA (HB) recommendations.

B. Lay tile to pattern indicated. Maintain pattern continuous around corners and wall ends. Do not interrupt tile pattern through openings.

C. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly. Align floor joints.

D. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make grout joints without voids, cracks, excess mortar or excess grout, or too little grout.

E. Form internal angles coved and external angles bullnosed.

F. Install ceramic accessories rigidly in prepared openings.

G. Install non-ceramic trim in accordance with manufacturer's instructions.

H. Sound tile after setting. Replace hollow sounding units.

I. Keep control and expansion joints free of mortar, grout, and adhesive.

J. Keep expansion joints free of adhesive or grout. Apply sealant to joints.

K. Prior to grouting, allow installation to completely cure; minimum of 48 hours.

L. Grout tile joints unless otherwise indicated. Use standard grout unless otherwise indicated.

M. At changes in plane and tile-to-tile control joints, use tile sealant instead of grout, with either bond breaker tape or backer rod as appropriate to prevent three-sided bonding.

N. Apply sealant to junction of tile and dissimilar materials and junction of dissimilar planes.

O. Apply grout sealer to grout after approval by Owner.

3.4 INSTALLATION –THIN-SET METHODS

A. Over interior floor slabs, install in accordance with TCNA Method F131 (current edition), epoxy mortar & grout.

B. Match existing cement mortar bed assembly where patching occurs.

3.5 INSTALLATION - WALL TILE

A. Over cementitious backer units install in accordance with TCNA Method W244C (current edition), cementitious backer unit.

B. Match existing cement mortar bed assembly where patching occurs.

3.6 EXPANSION JOINTS AND JOINT SEALANTS

A. Conform to TCNA EJ171 for expansion joint, isolation joint, perimeter joint construction joint, contraction joint, and generic movement joint systems, and provisions of Contract Documents.

B. Install joint sealant and backer rod or bond breaker tape conforming to TCNA EJ171 guidelines.

C. Install continuous control joint around floor perimeters between tile at floor and wall and where tilework abuts other restraining surfaces as necessary to allow independent differential expansion and contraction between floor and wall planes.

D. Install continuous control joint at inside corners of tile faced abutting walls to allow independent differential movement between wall planes.

E. Install sealant at joints at built-in plumbing fixture perimeters of meeting tile.

F. Seal around pipes and other penetrations through tile.

G. Provide expansion/control joints where indicated on Drawings, and as follows:
   1. Interior: 20 feet to 25 feet in each direction.
   2. Exterior: 8 feet to 12 feet in each direction.
   3. Interior tilework exposed to direct sunlight or moisture: 8 feet to 12 feet in each direction.

3.7 CLEANING

A. Clean tile and grout surfaces.

3.8 PROTECTION

A. Do not permit traffic over finished floor surface for 4 days after installation.

END OF SECTION 09 30 00

SECTION 09 51 00

ACOUSTICAL CEILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general conditions of Contract, including General and Supplementary Conditions

B. Section 09 21 60 – Gypsum Board & Wall Framing.

C. Section 09 22 26 – Suspension System.

1.2 SUMMARY

A. Section Includes:
   1. Suspended acoustical ceiling panels.
   2. Exposed grid suspension system.
   3. Wire hangers, fasteners, main runners, cross tees, and wall angle moldings.

1.3 REFERENCES

A. American Society for Testing and Materials (ASTM):

B. ASTM A 1008 Standard Specification for Steel, Sheet, Cold Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.

C. ASTM A 641 Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire. ASTM A 653 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.

D. ASTM C 423 Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.

E. ASTM C 635 Standard Specification for Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.

F. ASTM C 636 Recommended Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels.

G. ASTM E 84 Standard Test Method for Surface Burning Characteristics of Building Materials.

H. ASTM E 1414 Standard Test Method for Airborne Sound Attenuation Between Rooms Sharing Ceiling Plenum.

J. ASTM E 1264 Classification for Acoustical Ceiling Products.

K. ASTM E 1477 Standard Test Method for Luminous Reflectance Factor of Acoustical materials by use of Integrating-Sphere Reflectometers.

L. ASTM D 3273 Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.

M. ASTM E 119 Standard Test Methods for Fire Tests of Building Construction and Material.

N. ASHRAE Standard 62.1-2004, "Ventilation for Acceptable Indoor Air Quality"

1.4 SUBMITTALS

A. Product Data: Submit manufacturer's technical data for each type of acoustical ceiling unit and suspension system required.

B. Samples: Minimum 6 x 6 inch samples of specified acoustical panel; 8 inch long samples of exposed wall molding and suspension system, including main runner and cross tees.

C. Certifications: Manufacturer's certifications that products comply with specified requirements.

1.5 QUALITY ASSURANCE

A. Handle acoustical ceiling units carefully to avoid chipping or damage.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical ceiling units to project site in original, unopened packages and store in fully enclosed space where protected against damage from moisture, direct sunlight, and surface contamination. Permit material to reach room temperature and stabilized moisture content prior to installation.

1.7 WARRANTY

A. Acoustical Panel: Submit manufacturer's warranty agreeing to repair or replace acoustical panels that fail within warranty period. Failures include, but are not limited to:
   1. Acoustical Panels: Sagging and warping as a result of defects in materials or factory workmanship.
   2. Grid System: Rusting and manufacturer's defects

1.8 MAINTENANCE

A. Provide one box of extra panels of each type to Owner. Package with protective covering for storage and identified with appropriate labels.

1.9 ALTERNATES

A. Refer to Section 01 23 00 for possible effect upon Work of Section.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Ceiling Panels: Armstrong World Industries, Inc., or approved

2.2. ACOUSTICAL CEILING UNITS

A. ACT-1: Lay-In Acoustical Panels, Armstrong Cortega 769 or approved

B. ACT-2: Glue On 12” x 12” Acoustical Panels, Armstrong 741 Fine Fissure, or approved

2.3 GRID

A. Armstrong World Industries, 15/16 inch, White, lay-in system Prelude XL, or approved.

2.4 SUSPENSION SYSTEMS

A. Provide seismic bracing as required by IBC/OSSC.

B. Provide materials and main beams and cross tees in accordance with IBC/OSSC:
   1. Attachment Devices, Hanger and Tie Wire, and Wall Moldings: In accordance with International Building Code, OSSC for Category D, E, and F.
   2. Accessories: BERC2 - 2 inch Beam End Retaining Clip, 0.034 inch thick, hot-dipped galvanized cold-rolled steel per ASTM A568 - used to join main beam or cross tee to wall molding.; SJCG - Seismic Joint Clip, 5 inches x 1½ inches, hot-dipped galvanized cold-rolled steel per ASTM A568.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Begin installation after completion of work which may damage quality of installation.

B. Inspect conditions affecting installation of work and report unsatisfactory areas to General Contractor. Commencement of work constitutes acceptance of conditions.

3.2 PREPARATION

A. Conform to layout shown on reflected ceiling plan. Coordinate layout, incorporating fire sprinkler and alarm devices, HVAC mechanical registers and electrical fixtures and devices.

B. If requested, furnish concrete inserts and similar devices to other trades for installation well in advance of time needed for coordination of other work.

3.3 ADJUSTING AND CLEANING

A. Replace damaged and broken panels prior to Substantial Completion.

B. Thoroughly clean exposed surfaces of existing runners, trim, edge moldings, and suspension members. Comply with manufacturer's instructions for cleaning and touch up of minor finish damage.

C. Remove and replace work that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

3.4 COMPLETION

A. Provide two boxes of tiles for attic stock materials to designated Owner's representative. Obtain written, signature receipt of transfer and furnish to General Contractor.

END OF SECTION 09 51 00

SECTION 09 65 00

RESILIENT FLOORING AND BASE

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Resilient tile flooring.
   2. Resilient base.
   3. Installation accessories.

B. Related Requirements:
   1. Section 03 30 00 - Cast-In-Place Concrete: Restrictions on curing compounds for concrete slabs and floors.
   2. Section 03 54 00 - Cast Underlayment.

1.2 REFERENCE STANDARDS

A. Reference Standards: Current edition at date of Bid.

B. American Society for Testing and Materials (ASTM) International:
   1. ASTM F1066 - Standard Specification for Vinyl Composition Floor Tile; 2004 (Reapproved 2010) e1.
   2. ASTM F1861 - Standard Specification for Resilient Wall Base; 2008 (Reapproved 2012)e1.

1.3 SUBMITTALS

A. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.

B. Shop Drawings: Indicate seaming plan.

C. Selection Samples: Submit two (2) each 12”x12” color samples of each color selected.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Store all materials off the floor in an acclimatized, weather-tight space.

B. Maintain temperature in storage area between 55 degrees F and 90 degrees F.

C. Protect roll materials from damage by storing on end.

1.5 FIELD CONDITIONS

A. Store materials for not less than 48 hours prior to installation in area of installation at a temperature of 70 degrees F to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F.

B. Owner will remove portions of base to ensure proper installation. Contractor to advise at early install so issues are discovered prior to completion of entire project.

1.6 WARRANTY

A. Manufacturer’s standard 5 year defect and wear warranty including labor costs for first 3 years and material costs for full 5 years.

1.7 EXTRA STOCK

A. Maintenance Materials: Obtain written receipt when delivered to Owner’s Representative. Vinyl Composition Tile: Furnish one carton for each color specified plus one additional carton for each additional 5,000 sf of each color.

PART 2 – PRODUCTS

2.1 TILE FLOORING

A. Vinyl Composition Tile: Homogeneous, with color extending throughout thickness.
   1. Minimum Requirements: Comply with ASTM F1066, of Class corresponding to type specified.
   2. Size: 12 by 12 inch.
   3. Thickness: 0.125 inch.
   4. Manufacturer: Armstrong World Industries: www.armstrong.com.
      a. VCT-1: Armstrong Standard Excelon, or approved.
      b. Substitutions: See Section 01 60 00 - Product Requirements.
   5. Color: As selected from manufacturer's standard.

2.2 RESILIENT BASE

A. Resilient Base: Cove, Type TV Vinyl.
   1. Height: 4 inch unless otherwise noted.
   2. Length: Roll.
   3. Color: As selected.
   4. Manufacturers:
      a. Flexco; www.flexcofloors.com
      b. Substitutions: See Section 01 60 00 - Product Requirements.

2.3 FLOOR REDUCER AND TRANSITION ADAPTER STRIPS

A. Suitable for purpose, ADA compliant rolling type as instructed by manufacturer and as accepted by Architect.

2.4 ACCESSORIES

A. Subfloor Filler: White premix latex; type recommended by adhesive material manufacturer.

B. Primers, Adhesives, and Seaming Materials: Waterproof; types recommended by flooring manufacturer.
   1. Provide only products having lower volatile organic compound (VOC) content than required by the more stringent of the South Coast Air Quality Management District Rule No.1168 and the Bay Area Air Quality Management District Regulation 8, Rule 51.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.

B. Verify that floor surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive resilient base.

C. Cementitious Sub-floor Surfaces: Verify that substrates are dry enough and ready for resilient flooring installation by testing for moisture and pH.

   1. Verify that concrete slabs comply with ASTM F710 and substrates are dry and free of curing compounds, sealers, hardeners and other materials that are incompatible with adhesives bond.

D. Verify that required floor-mounted utilities are in correct location.

3.2 PREPARATION

A. Remove sub-floor ridges and bumps. Fill minor low spots, cracks, joints, holes, and other defects with sub-floor filler to achieve smooth, flat, hard surface.

B. Prohibit traffic until filler is cured.

3.3 INSTALLATION

A. Starting installation constitutes acceptance of sub-floor conditions.

B. Install in accordance with manufacturer's instructions.

C. Spread only enough adhesive to permit installation of materials before initial set.

D. Fit joints tightly.

E. Set flooring in place, press with heavy roller to attain full adhesion.

F. Where type of floor finish, pattern, or color are different on opposite sides of door, terminate flooring under centerline of door.

G. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated.

H. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.

3.4 TILE FLOORING

A. Mix tile from container to ensure shade variations are consistent when tile is placed, unless manufacturer's instructions say otherwise.

3.5 RESILIENT BASE

A. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches between joints.

B. Miter internal corners. At external corners, use premolded units. At exposed ends, use premolded units.

C. Install base on solid backing. Bond tightly to wall and floor surfaces.

3.6 CLEANING

A. Remove excess adhesive from floor, base, and wall surfaces without damage.

B. Clean in accordance with manufacturer's instructions.

3.7 PROTECTION

A. Prohibit traffic on resilient flooring for 48 hours after installation.

END OF SECTION 09 65 00

SECTION 09 68 00
CARPETING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Carpet.
   2. Accessories.

B. Related Requirements:
   1. Section 03 54 00 - Cast Underlayment.

1.2 REFERENCE STANDARDS

A. Reference Standards: Current edition at date of Bid.

B. CRI (CIS) - Carpet Installation Standard; Carpet and Rug Institute; 2009.

C. CRI (GLA) - Green Label Testing Program - Approved Adhesive Products; Carpet and Rug Institute; Current Edition.

1.3 SUBMITTALS

A. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns, colors available, and method of installation.

B. Two 12”x12” samples of each material.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing specified carpet with minimum three years documented experience.

B. Installer Qualifications: Company specializing In installing carpet with minimum three years experience.

1.5 FIELD CONDITIONS

A. Store materials in area of installation for minimum period of 24 hours prior to installation.

B. Maintain minimum 70 degrees F ambient temperature 24 hours prior to, during and 24 hours after installation.

1.6 WARRANTY

A. Manufacturer: Standard Warranty against edge ravel, delamination of secondary back adhesion, not less than 11 pound tuft bind, and no more than 10 percent face yarn loss by weight of carpet.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Carpet: Broadloom.
   1. Basis of Design: Tandus Flooring, www.tandus.com.
      a. Product: Antron Legacy Nylon, 18 oz/sy. Face Weight with ER3 Backing.
      b. Format: 24” x 24” Tile.
      c. Style: Runway II.
      d. Color: Blue Velvet.
   2. Substitution: See Section 01 60 00.

2.2 ACCESSORIES

A. Edge Binding: Roppe Carpet Edging. Profile #39. Color as selected from manufacturers standard.

B. Sub-Floor Filler: Type recommended by carpet manufacturer.

C. Tackless Strip: Carpet gripper, of type recommended by carpet manufacturer to suit application, with attachment devices.

D. Carpet Reducer: See Section 09 65 00.

E. Adhesives - General: Compatible with materials being adhered; maximum VOC content of 50 g/L; CRI Green Label certified; in lieu of labeled product, independent test report showing compliance is acceptable.

F. Seam Adhesive: As recommended by manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.

B. Verify that floor surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive carpet.

C. Cementitious Sub-floor Surfaces: Verify that substrates are dry enough and ready for carpet flooring installation by testing for moisture and pH.
   1. Verify that concrete slabs comply with ASTM F710 and the following:
      a. Substrates are dry and free of curing compounds, sealers, hardeners and other materials that are incompatible with adhesives bond,
      b. Adhesion Tests: Perform testing by Owner’s special inspector to verity acceptable substrate conditions, conforming to manufacturer’s Warranty provisions, prior to installing work of this Section.
         1) Alkalinity and Adhesion Testing: Perform tests recommended by floor tile manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9 pH.
         2) Moisture Testing: Proceed with installation only after substrates pass testing according to floor tile manufacturer's written recommendations, but not less stringent than the following:

NEHS

(a) Perform anhydrous calcium chloride test according to ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
(b) Perform relative humidity test using in situ probes according to ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level.

2. Obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.

D. Verify that required floor-mounted utilities are in correct location.

3.2 PREPARATION

A. Remove debris and clean floor in conformance with manufacturer's instructions

B. Repair subfloor ridges and bumps.
1. Fill minor holes and cracks over 1/8 inch thick with polymer-modified cementitious underlayment.
2. Fill depressions and low spots where floor is not level using cementitious underlayment specified Section 03 54 16 or subfloor filler.
3. Grind ridges or rough areas that may telegraph through carpet.

C. Feather substrate with cementitious underlayment or do such work as necessary for carpet to carpet transition alignment at top surface.

D. Clear debris and deposits from surfaces. Remove adhesives and contaminants from existing concrete floors. Vacuum substrate immediately prior to carpet installation.

E. Apply floor adhesive as instructed by manufacturer to seal concrete surface and make suitable for carpet adhesion.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions, CRI 104, and provisions of Contract Documents.

3.4 CARPET LAYOUT AND FITTING

A. Install carpet tile from same dye lot within each continuous carpet floor area. Remove and replace carpet within continuous areas differing in appearance.

B. Lay out and fit to maintain pattern, texture, and direction of pile within each floor area prior to installation.

C. Extend carpet to cover complete flooring area of each room, including alcoves and closets, unless otherwise indicated.
1. Install under open-bottomed obstructions, removable flanges, and furnishings.
2. Center broadloom edges and seams under doors at door jambs.

D. Make cutouts and terminations as needed for complete and finished appearance.

E. Measure area, snap chalk lines, and determine starting point for uniform layout of carpet tile to reduce cutting and eliminate piece less than 1/4 size of full carpet tile width where possible.

F. Cut carpet evenly and accurately to fit neatly at walls, columns, and projections.

G. Cut and join carpet ends in serpentine pattern as necessary to conceal carpet pattern.

H. Do not bridge building expansion joints with continuous carpeting.

3.5 CARPET REDUCER STRIPS

A. Carpet Reducer Strips: Install at carpet edges transitioning to hard flooring surfaces.

3.6 FIELD QUALITY CONTROL

A. Adhesion Tests: Perform testing by Owner's special inspector to verify acceptable substrate conditions, conforming to manufacturer's Warranty provisions, prior to installing work of this Section.
   1. Moisture Emissions of Concrete Substrate: Verify moisture emissions within range as specified in Section 03 30 00 and as acceptable to manufacturer.
   2. Alkalinity of Concrete Substrate: Verify pH factor within range as specified Section 03 30 00 and as acceptable to manufacturer.
   3. Notify Owner and Architect in the event of moisture emissions and alkalinity levels exceed the range acceptable to manufacturer.

3.7 ADJUSTING

A. Remove mismatched, non-uniform, and damaged carpet tile and replace with new matching adjacent carpet tile.

B. Remove spots, soiling, and stains or replace with new carpet tile where carpet cannot be put back into new condition.

C. Remove protruding face yarn using sharp scissors.

3.8 CLEANING

A. Remove and dispose of debris and unusable scraps.

B. Vacuum carpet using HEPA filter vacuum cleaner. Replace and dispose of vacuum bags when bag is half full.

3.9 PROTECTION

A. Take measures to protect carpet from soiling and damage prior to Owner occupation.

B. Replace permanently soiled or damaged carpet.

END OF SECTION 09 68 00

PAINTING AND COATING

SECTION 09 90 00

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Paint and coatings systems.

1.2 REFERENCES

A. SSPC-SP 1 - Solvent Cleaning.

B. SSPC-SP 2 - Hand Tool Cleaning.

C. SSPC-SP 3 - Power Tool Cleaning.

D. EPA-Method 24.

E. GS-11, GC-03.

1.3 SUBMITTALS

A. Submit under provisions of Section 01 33 00, Submittal Procedures.

B. Product Data: Manufacturer's data sheets on each paint and coating product shall include:
1. Product characteristics
2. Surface preparation instructions and recommendations
3. Primer requirements and finish specification
4. Storage and handling requirements and recommendations
5. Application methods

C. Drawdowns: Submit (4) four painted samples of each color and sheen specified on card stock paper 8 x 10 inches for approval. For wood stains, provide samples of wood species specified with various finishes for comparison and selection by Architect.
1. Final coats must match approved samples.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver manufacturer's unopened containers to the work site. Packaging shall . bear manufacturer’s name, label

B. Storage: Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction. Store materials in an area that is within the acceptable temperature range, per manufacturer’s instructions. Protect from freezing.

C. Handling: Maintain clean, dry storage area, to prevent contamination or damage to coatings.

1.5 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not apply coatings under environmental conditions outside manufacturer's absolute limits.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers: - Sherwin-Williams Company or approved.

2.2 PAINT SYSTEMS

A. PS-1: Ferrous Metal

1. Primer Coat: Kem Bond HS Metal Primer
2. 1st Coat: DTM Acrylic, Semi-Gloss
3. 2nd Coat: DTM Acrylic, Semi-Gloss
4. Typical film thickness: 8 mils wet, 3.2 mils dry, per coat
5. Color: As selected.

PS-2: Gypsum Wallboard – Low Odor, Zero VOC, Match Existing Sheen.

1. 1st Coat: S-W Harmony Interior Latex Primer, B11 (4 mils wet, 1.3 mils dry).
2. 2nd Coat: S-W Harmony Interior Latex Egg-Shell, B9 Series(4 mils wet, 1.6 mils dry per coat).
3. 3rd Coat: S-W Harmony Interior Latex Egg-Shell, B9 Series(4 mils wet, 1.6 mils dry per coat).
4. Color: As selected.

PS-3 - Gypsum Wallboard – Epoxy paint system, Semi-gloss finish.

1. Two-part component epoxy - Benjamin Moore Super Spec HP, Polyamide Epoxy P36, or approved. (3.3 mils wet, 2.0 mils dry).
2. Color: As selected.

PS-4: Painted Wood, Wood Trim, and Finish Plywood, Semi-gloss finish.

1. 1ST Coat: Acrylic primer sealer.
2. 2nd & 3rd Coats: Exterior acrylic latex enamel. (4 mils wet, 1.5 mils dry per coat)
   a. Match existing color and sheen, unless otherwise noted.

2.3 ACCESSORIES

A. Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials required, per manufacturer's specifications.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Apply coatings after substrates have been properly prepared.

B. If substrate preparation is responsibility of another installer, notify General Contractor of unsatisfactory preparation before proceeding.

C. Proceed with work only after conditions have been corrected. Commencement of work means acceptance of surface conditions.

3.2 SURFACE PREPARATION

A. Remove oil, dust, grease, dirt, loose rust, peeling paint or other contamination to ensure adequate adhesion.

B. Lightly sand or Scotch Brite existing surfaces.

C. Spot prime with galvanized metal primer.

3.3 INSTALLATION

A. Apply coatings and materials according to manufacturer's specifications. Mix and thin coatings according to manufacturer's recommendations.

B. Do not apply to wet or damp surfaces.

NEHS

C. Apply coatings using methods recommended by manufacturer.

D. Uniformly apply coatings without runs, drips, or sags, without brush marks, and with consistent sheen.

E. Apply coatings at spreading rate required to achieve the manufacturer's recommended dry film thickness.

3.4 PROTECTION

A. Protect finished work from damage until completion of project.

END OF SECTION 09 90 00

TOILET ACCESSORIES

SECTION 10 28 13

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Toilet accessories and their associated fasteners and hardware.

B. Shower Enclosures

1.2 QUALITY ASSURANCE

A. Furnish inserts and anchoring devices which must be set in concrete or built into masonry. Coordinate delivery with other Work to avoid delay.

B. Coordinate accessory locations with other Work to avoid interference and to assure proper operation and servicing of accessory units.

C. Provide all accessories manufactured by the same company.

1.3 SUBMITTALS

A. Submit the following in accordance with Section 01 33 00, Submittal Procedures:
   1. Catalog data.
   2. Manufacturer's installation instructions.

PART 2 – PRODUCTS

2.1 PRODUCT OPTIONS AND SUBSTITUTIONS

A. Alternate products may be accepted; follow Section 01 25 00, Substitution Procedures.

2.2 MATERIALS, GENERAL

A. Use stainless steel complying with ANSI Type 302/304, with polished No. 4 finish, 22 gage (0.34 inch) minimum, unless otherwise indicated.

B. Use leaded and unleaded brass, flat products, complying with FS QQ-B-613; rods, shapes, forgings and flat products with finished edges, FS QQ-B-62.

C. Use commercial quality, cold rolled, sheet steel complying with ASTM A366, 20 gage (0.040 inch) minimum, unless otherwise indicated. Provide surface preparation and metal pretreatment as required for applied finish.

D. Use galvanized steel sheet complying with ASTM A527, G60.

E. Use base metal with nickel and chromium electrodeposited in compliance with ASTM B456, Type SC2.

F. Use galvanized steel mounting devices complying with ASTM A153, hot dip galvanized after fabrication.

G. Use screws, bolts, and other devices of same materials as accessory unit or of galvanized steel where concealed.

F. Shower Enclosure: Fiber reinforced composite, two layers, polyester core.

2.3 MANUFACTURERS

A. Bradley Corporation, Bobrick Washroom Equipment Co., AJ Washroom Accessories. American Specialties Inc. (ASII), Georgia Pacific, Trubro. Products specified are referenced to Bobrick model numbers unless noted otherwise.

b. Trubro Lavatory Guard Insulation Kits

2.4 PRODUCTS

A. Owner-Furnished, Contractor-Installed Items:

1. Soap Dispensers
2. Paper Towel Dispensers
3. Toilet Paper Dispensers
4. Electric Hand Dryers.
5. Slim-Jim Trash Cans (Resin Type).

B. Trubro Lav Guard 2 Insulation Kit for undersink pipes, stops, and traps.

C. Mirrors: Stainless Steel Framed.
1. See Drawings for dimensions.

D. Grab Bars: Stainless steel 1-1/4" diameter peened tubing, type 304 satin finish.
1. Concealed mounting anchors with snap-on concealed mounting flange.
2. Bobrick, or approved.

2.5 FABRICATION

A. Only an unobtrusive stamped logo of the manufacturer is permitted on exposed faces of the units. In an unexposed location, place the manufacturer's name and product model number.

B. Fabricate units with welded and ground joints and edges rolled. Hang doors with continuous stainless steel piano hinges. Provide for concealed anchorage wherever possible.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install accessories in accordance with approved manufacturer's installation instructions. Securely attach each accessory, level and plumb, at locations shown on the Drawings and at heights, spacing, and load resistance required by ADAAG (Americans with Disabilities Act Accessibility Guidelines.

B. Use fasteners that are appropriate for surfaces where accessories are to be mounted.

C. Use concealed fasteners wherever possible.

3.2 CLEANING

A. Clean surfaces in compliance with manufacturer's instructions.

END OF SECTION 10 28 13

SECTION 12 21 13
METAL HORIZONTAL LOUVER BLINDS

PART 1 – GENERAL

1.1 SUMMARY

A. Provide aluminum horizontal louver blinds at interior face of exterior windows.

1.2 SUBMITTALS

A. Product Data: Submit manufacturer's product data and installation instructions for each material and product used.

B. Samples: Submit two representative samples of each material specified indicating visual characteristics and finish. Include samples range if variation of finish is anticipated.

1.3 QUALITY ASSURANCE

A. Comply with governing codes and regulations. Provide products of acceptable manufacturers, which have been in satisfactory use in similar service for three years. Deliver, handle, and store materials in accordance with manufacturer's instructions.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Manufacturers: Bali, Levelor, Graber, Hunter Douglas or approved.

B. Horizontal Blinds:
1. Operation: Tilting and lifting mechanisms. Full height wands
2. Slats: Aluminum.
3. Slat Width: 1 inch
4. Color: From manufacturer's standard, non-premium colors.

C. Controls Side: verify with Architect prior to ordering

PART 3 – EXECUTION

3.1 INSTALLATION

A. Install materials and systems in accordance with manufacturer's instructions and approved submittals. Install materials and systems in proper relation with adjacent construction and with uniform appearance. Coordinate with work of other sections.

B. Restore damaged finishes and test for proper operation. Clean and protect work from damage.

END OF SECTION 12 21 13

SECTION 21 05 00

COMMON WORK RESULTS FOR FIRE SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

A. The intent of Division 21, Fire Suppression Specifications, and the accompanying Drawings is to be a reference for preliminary locations and routing of fire protection system components. Not all components required for a complete system are shown, including but not limited to standpipes, hose connections, sprinkler heads, fire protection zones, air compressors, dry valves, piping, appurtenances, connections, etc.

B. Provide a complete and workable facility with complete systems that comply with the requirements of the state codes, local codes, fire marshal, owner's insurance underwriter, and any other authority having jurisdiction.

C. Division 21, Fire Suppression Specifications and the accompanying Drawings are complimentary and what is called for by one as binding as if called for by both. Items shown on the Drawings are not necessarily included in the Specifications and vice versa.

D. Imperative language is frequently used in Division 21, Fire Suppression Specifications. Except as otherwise specified, requirements expressed imperatively are to be performed by the Contractor.

E. Piping and sprinkler head locations meet the Architectural design intent for the building in addition to applicable code. The right is reserved to make any reasonable changes in sprinkler head location prior to roughing-in, without cost impact. Deviation from the general routing piping mains, standpipes, or other routing shown must be approved by the architect prior to installation. If additional space is required for fire protection system components, Architect to make a formal request.

F. Heat, heat trace, and associated power required for fire protection system components are the responsibility of the design-build contractor. Request approval from the electrical engineer to use spaces in electrical panels provided at no additional cost.

G. Furnish piping, pipe fittings, valves, gauges, and incidental related items as required for complete systems. Identify valves, piping and equipment components to indicate their function and system served.

H. The General and Supplemental Conditions apply to this Division, including but not limited to:
   1. Drawings and specifications.
   2. Public ordinances, permits.
   3. Include payments and fees required by governing authorities for work of this Division.

I. Division 01, General Requirements, applies to this Division.

1.2 RELATED SECTIONS

A. Division 01, General Requirements

B. Division 21, Fire Suppression

C. Section 21 10 00, Water Based Fire Suppression Systems

1.3 QUALITY ASSURANCE

A. Regulatory Requirements:
   1. Products and equipment prohibited from containing pentabrominated, octabrominated and decabrominated diphenyl ethers. Where products or equipment's within this specification contain these banned substances, provide complying products and equipment's from approved manufacturers with equal performance characteristics.
   2. General:
      a. Conform Work and materials to requirements of the local and State codes, fire marshal, the owner's insurance underwriter, and any other authority having jurisdiction; and Federal, State and other applicable laws and regulations.
   3. Contractor responsible for obtaining and payment for permits, licenses, and inspection certificates required in accordance with provisions of Contract Documents.
   4. Fire protection system designs must bear the stamp and seal of the registered Professional Engineer who prepared the documents. The Engineer's stamp certifies that the work was done under the Engineer's supervision and control. Certification from NICET technicians, or other contractors, cannot replace the certification by the Engineer. Verify/coordinate with local building department for their specific requirements.

B. New materials and Equipment:
   1. Good work quality, free of faults and defects and in conformance with the Contract Documents.

C. Apparatus: Build and install to deliver full rated capacity at the efficiency for which it was designed.

D. The entire system and apparatus operate at full capacity without objectionable noise or vibration.

E. For remodel projects, the existing system must remain fully operational, or provisions made to provide coverage while the new system is being installed. New installation switchover requires minimal down time. Provide method to maintain fire protection or fire watch during any system down time. Include any related cost for materials or labor that is needed for providing continuous coverage.

F. Install equipment level and true equipment. Housekeeping pads and curbs account for floor or roof slope.

G. Materials and Equipment:
   1. Each piece of equipment furnished meet detailed requirements of the Drawings and Specifications and suitable for the installation shown. Equipment not meeting requirements will not be acceptable, even though specified by name along with other manufacturers.
   2. Where two or more units of the same class of equipment are furnished, use products of the same manufacturer. Component parts of the entire system need not be products of same manufacturer.
   3. Furnish materials and equipment of size, make, type, and quality herein specified.
   4. Equipment scheduled by performance or model number considered the basis of the design. If other specified manufacturer's equipment is provided in lieu of the basis of design equipment the contractor is responsible for changes and costs which may be necessary to accommodate this equipment, including different sizes and locations for connections, different electrical characteristics, different dimensions, different access requirements, or any other differences which impact the project.

H. Workmanship:
1. General: Install materials in a neat and professional manner.
2. Manufacturer's Instructions:
   a. Follow manufacturer's directions where they cover points not specifically indicated. If they are in conflict with the Drawings and Division 21, Fire Suppression Specifications, obtain clarification before starting work.

I. Cutting and Patching:
1. Cutting, patching, and repairing for the proper installation and completion of the work specified in this Division including plastering, masonry work, concrete work, carpentry work, and painting performed by skilled craftsmen of each respective trade in conformance with the appropriate Division of Work.
2. Make additional openings required in building construction by drilling or cutting. Use of jackhammer is specifically prohibited.
3. Fill holes which are cut oversize so that a tight fit is obtained around the sleeves passing through.
4. Do not pierce beams or columns without permission of Architect and then only as directed.
5. New or existing work cut or damaged restored to its original condition. Where alterations disturb lawns, paving, walks, etc., the surfaces repaired, refinished, and left in condition existing prior to commencement of work.

1.4 SUBMITTALS

A. Certified Shop Drawings:
1. Drawings indicate the general layout of the piping and various items of equipment. Coordination with other trades and with field conditions will be required. For this purpose, prepare fire protection system layout Drawings showing locations and types of head or outlets, alarm valves and devices, pipe sizes and cutting lengths, test tees and valves, drain valves, and other related items. New drawings prepared by Contractor and not reproductions or tracings of Architect's Drawings. Overlay drawings with shop drawings of other trades and check for conflicts. Drawings the same size as Architect's Drawings with title block similar to the Drawings and identifying Architect's Drawing number or any reference drawings. Drawings fully dimensioned including both plan and elevation dimensions. Shop drawings cannot be used to make scope changes.
2. Shop Drawings:
   a. Prepare in two-dimensional format.
   b. Include but are not limited to:
      1) Sprinkler head layout drawings overlaid with ceiling and floor plans.
      2) Sprinkler floor plans, including piping, equipment, and heads to a minimum of 1/4-inch equals 1-foot scale or same as plans, whichever is greater.
3. Submit shop drawings for review prior to beginning fabrication. Additional shop drawings may be requested when it appears that coordination issues are not being resolved in the field or when there is a question as to whether contract documents are being complied with or the design intent is being met.

B. Product Data:
1. Submit product data for review on scheduled pieces of equipment, on equipment requiring electrical connections or connections by other trades, and as required by each specification section or by Drawing notes. Include manufacturer's detailed shop drawings, specifications, and data sheets. Data sheets include capacities, RPM, BHP, pressure drop, design and operating pressures, temperatures, and similar data. Manufacturer's abbreviations or codes are not acceptable
2. Provide sample of each type of sprinkler head.

3. Indicate equipment operating weights including bases and weight distribution at support points.
4. In the case of equipment such as wiring devices, time switches, valves, etc., specified by specific catalog number, a statement of conformance will suffice.

C. Hydraulic Calculations:
1. Submit hydraulic calculations specific to the installation.

D. Test Reports:
1. Submit certificates of completion of tests and inspections.

E. Submission Requirements:
1. Refer to Division 01, General Requirements for additional requirements related to submittals.
2. Shop Drawings:
   a. Provide three sets of Drawings showing sprinkler head locations and layout coordinated with architectural ceiling details to the Architect for review prior to submitting Drawings to insurance underwriter and Fire Marshal.
   b. Provide six sets of Drawings and calculations to the Architect to be sent to the Owner's insurance underwriter for approval.
   c. Then submit six sets of approved Drawings to Architect for final review.
3. Product Data:
   a. Submit electronic copies of shop drawings and product data for Work of Division 21 in PDF format with each item filed under a folder and labeled with its respective specification section number, article, paragraph, and mark, if applicable.
   b. Include a complete index in the original submittal. Indicate both original items submitted and note stragglers that will be submitted at a later date to avoid delay in submitting.
   c. Submit shop product data in a single submittal. Partial submittals will not be accepted. Re-submittals submitted after return of the original binder includes a tab similar to that originally submitted. Upon receipt of the returned re-submittals, insert them in the previously submitted binder.

F. Contractor Responsibilities:
1. See that submittals are submitted at one time and are in proper order.
2. Obtain approvals and permits from the AHJ.
3. Ensure that equipment will fit in the space provided.
4. Assure that deviations from Drawings and Specifications are specifically noted in the submittals. Failure to comply will void review automatically.

1.5 OPERATING AND MAINTENANCE MANUAL, PARTS LISTS, AND OWNERS INSTRUCTIONS

A. Refer to Division 01, General Requirements for additional requirements.

B. Submit three bound copies of manufacturer's operation and maintenance instruction manuals and parts lists for each piece of equipment or item requiring servicing. Literature on 8-1/2-inch by 11-inch sheets or catalogs suitable for side binding. Submit data when the work is substantially complete, packaged separately, and clearly identified in durable 3-ring binder. Include name and contact information for location of source parts and service for each piece of equipment. Clearly mark and label in each submittal, the piece of equipment provided with the proper nameplate and model number identified. Provide wiring diagrams for electrically powered equipment.

C. Instruct Owner thoroughly in proper operation of equipment and systems, in accordance with manufacturer's instruction manuals. Operating instructions cover phases of control.

1.6 AS-BUILT DRAWINGS

A. Provide record drawings in hard copy and PDF format.
   1. Drawings include the following:
      a. Project specific title block.
      b. Notations reflecting the as built conditions of any additions to or variations from the construction documents provided as part of the BIM coordination, RFIs, ASIs, Owner Changes, and Field Coordination.

1.7 PROJECT CONDITIONS

A. Existing Conditions: Prior to bidding, verify and become familiar with existing conditions by visiting the site, and include factors which may affect the execution of this Work. Include related costs in the initial bid proposal.

B. Coordinate exact requirements governed by actual job conditions. Check information and report any discrepancies before fabricating work. Report changes in time to avoid unnecessary work.

C. Coordinate shutdown and start-up of existing, temporary, and new systems and utilities. Notify Owner, City, and Utility Company.

1.8 WARRANTY

A. Provide a written guaranty covering the work of this Division (for a period of one calendar year from the date of acceptance by the Owner) as required by the General Conditions.

B. Provide manufacturer's written warranties for material and equipment furnished under this Division insuring parts and labor for a period of one year from the date of Owner acceptance of Work of this Division.

C. Correct warranty items promptly upon notification.

1.9 TEST REPORTS AND CERTIFICATES

A. Submit one copy of test reports and certificates specified herein to the Architect.

1.10 SUBSTITUTIONS

A. Submit any requests for product substitutions in accordance with the Instructions to Bidders and the General and Supplemental Conditions.

PART 2 PRODUCTS

2.1 ACCESS PANELS

A. Furnish under this Division as specified in another Division of work.

2.2 PIPE SLEEVES

A. Interior Wall and Floor Sleeves:
   1. 18 gauge galvanized steel or another pre-approved water tight system.

B. Interior Wall and Floor Sleeves (fire rated):
   1. Fire rated and water tight system approved by Authority Having Jurisdiction and Owners Insurance underwriter, with rating equal to floor or wall penetration, and designed specifically for the floor or wall construction, piping material, size and service.

C. FLOOR, WALL AND CEILING PLATES

D. Furnish stamped split type plates as follows:
   1. Floor Plates:
      a. Cast brass, chromium plated.
   2. Wall and Ceiling Plates:
      a. Spun aluminum.

PART 3 EXECUTION

3.1 COORDINATION

A. Coordinate fire protection piping and appurtenances with ducts, other piping, electrical conduit, and other equipment.

B. Conceal fire protection piping and equipment be concealed except in area without ceilings and as noted on the Drawings.

C. Locate piping, heads, and equipment where shown on Drawings.

3.2 GENERAL

A. Install fire protection systems to serve the entire building.

B. The drawings indicate approximate locations of piping, sprinkler zones, and types of systems. The drawings do not indicate the locations of sprinkler heads in ceiling areas. Locate sprinklers in the center of ceiling panels and symmetrically within rooms and down corridors, coordinated with and in pattern with lights and grilles. Deviations must be approved.

C. Locations of sprinkler heads, outlets, piping, and appurtenances are not shown in areas and therefore are to be installed in accord with code requirements.

D. Location of heads shown in ceiling areas may be changed if required by code requirements, but only after review by the Architect for new head locations for each specific instance.

3.3 SLEEVES

A. Interior Floor and Wall Sleeves:

1. Provide sleeves large enough to provide clearances around pipe outside diameter as required by NFPA. Penetrations through mechanical room and fan room floors made watertight by packing with safing insulation and sealing with Tremco Dymeric Sealant or approved water tight system.

B. Sleeves through Rated Floors and Walls:
1. Similar to interior sleeves except install fire-rated system approved by Authority Having Jurisdiction and Owner's Insurance Underwriter, with rating equal to floor or wall penetration, and designed specifically for the floor or wall construction, piping material, size and service.

C. Floor sleeves maintain a water barrier by providing a water tight seal or extend 1-inch above finished floor except through mechanical equipment room floors and shafts where sleeves extend 2-inches above finished floor level. Sleeves through roof extend 8-inches above roof. Wall sleeves flush with face of wall unless otherwise indicated. Sleeves through planters extend 8-inches above planter base.

D. Do not support pipes by resting pipe clamps on floor sleeves. Provide supplementary members so pipes are floor supported.

E. Special sleeves detailed on the Drawings take precedence over this section.

3.4 FLOOR, WALL AND CEILING PLATES

A. Install on piping passing through finished walls, floors, ceilings, partitions, and plaster furrings. Plates completely cover opening around pipe and duct.

B. Secure wall and ceiling plates to pipe or structure.

C. Plates not required in mechanical rooms or unfinished spaces.

3.5 CLEANING

A. General:
1. Clean equipment and piping of stampings and markings (except those required by codes), iron cuttings, and other refuse.

B. Painted Surfaces:
1. Clean scratched or marred painted surfaces of rust or other foreign matter and paint with matching color industrial enamel, except as otherwise noted.

C. Additional requirements are specified under specific Sections of this Division.

3.6 EQUIPMENT PROTECTION

A. Keep pipe and conduit openings closed by means of plugs or caps to prevent the entrance of foreign matter. Protect piping, conduit, equipment, and apparatus against dirty water, chemical or mechanical damage both before and after installation. Restore damaged or contaminated equipment, or apparatus to original conditions or replace at no cost to the Owner.

B. Protect bright finished shafts, bearing housings, and similar items until in service. No rust will be permitted.

C. Cover or otherwise suitably protect equipment and materials stored on the job site.

3.7 ACCESSIBILITY

A. General:
   1. Locate valves, indicating equipment or specialties requiring frequent reading, adjustments, inspection, repairs, and removal or replacement conveniently and accessibly with reference to the finished building.

B. Gauges:
   1. Install gauges so as to be easily read from the floors, platforms, and walkways.

3.8 PAINTING

A. General:
   1. Coordinate painting of fire suppression equipment and items with products and methods in conformance with the appropriate Division of Work, Painting.

B. Equipment Rooms and Finished Areas:
   1. Hangers
   2. Miscellaneous Iron Work
   3. Structural Steel Stands
   4. Tanks
   5. Equipment Bases:
      a. Paint one coat of black enamel.
   6. Steel Valve Bodies and Bonnets:
      a. One coat of black enamel.
   7. Equipment:
      a. One coat of red machinery enamel. Do not paint nameplates.
   8. Sprinkler Heads:
      a. Not painted.

C. Concealed Spaces (above ceilings, not visible):
   1. Hangers, Miscellaneous Iron Work, Valve Bodies, and Bonnets: Not painted.

D. Sprinkler Piping:
   1. Concealed from View: Not painted.
   2. Exposed to View: Paint pipe and hangers exposed to view, including in equipment spaces, with one coat approved rust inhibiting primer. Final finish coat as specified in conformance with the appropriate Division of Work, Painting.
   3. Exterior: Wire brush and apply two coats of rust-inhibiting primer and one coat of grey exterior machinery enamel. Final finish coat as specified in conformance with the appropriate Division of Work, Painting.
   4. Alarm Bell: Factory paint with two coats of red enamel.

3.9 ADJUSTING AND CLEANING

A. General:
   1. Before operating any equipment or systems, make thorough check to determine that systems have been flushed and cleaned as required and equipment has been properly installed, lubricated, and

serviced. Check factory instructions to see that installations have been made accordingly and that recommended lubricants have been used.

2. Use particular care in lubricating bearings to avoid damage by over-lubrication and blowing out seals. Check equipment for damage that may have occurred during shipment, after delivery, or during installation. Repair damaged equipment as approved or replace with new equipment.

B. Piping:
   1. Clean interior of piping before installation.
   2. Flush sediment out of piping systems.

3.10 ELECTRICAL EQUIPMENT

A. Do not install fire suppression systems in switchgear rooms, transformer vaults, telephone rooms, or electric closets except as indicated.

B. Fire Suppression systems not to pass over switchboards or electrical panelboards. Where conflicts exist, bring to attention of Architect.

END OF SECTION

SECTION 21 10 00

WATER BASED FIRE SUPRESSION SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes Design-Build work and the following:
   1. Sprinkler Heads
   2. Valves
   3. Black Steel Pipe
   4. Flanged Joints
   5. Mechanical Pipe Couplings and Fittings
   6. Valve Identification
   7. Piping Markers
   8. Equipment Identification

1.2 RELATED SECTIONS
   1. Division 01, General Requirements
   2. Division 21, Fire Suppression

1.3 QUALITY ASSURANCE

A. Provide a complete automatic fire sprinkler/combination standpipe system.
   1. Grooved joint couplings, fittings, valves, and specialties products of a single manufacturer. Grooving tools of the same manufacturer as the grooved components.
   2. Castings used for coupling housings, fittings, valve bodies, etc., date stamped for quality assurance and traceability.

B. Regulatory Requirements:
   1. Sprinkler system to comply with NFPA 13 and local Fire Marshal requirements.
   2. Refer to Section 21 05 00, Common Work Results for Fire Suppression for additional requirements.

C. Hydraulically Calculated Sprinkler System: Sprinkler system to be hydraulically calculated grid system designed to provide:
   1. Light Hazard Occupancies: 0.10 GPM/Ft2 density at most remote 1500 SF for public areas, living spaces, or designated by the local fire marshal with an excess of 10 psi additional pressure requirements incorporated into the design over specified pressure requirements.

D. NFPA 13 (without the use of exceptions found in NFPA 13 systems minimum guideline) used for the location, sizing, and installation of piping and sprinkler systems unless local fire marshal or owner's insurance underwriter requirements are more stringent. Exceptions must be approved by the Engineer prior to usage.

E. Water Service Pressure Basis of Design:
   1. Coordination was done to determine fire service water pressure used to develop the fire sprinkler system design information included herein.
   2. Fire Protection contractor to obtain current flow test information prior to starting their design of the fire sprinkler system.

1.4 SUBMITTALS

A. Provide submittal in accordance with Section 21 05 00, Common Work Results for Fire Suppression.

B. Sprinklers referred to on shop drawings and identified by the listed manufacturer's style or series designation. Trade names and abbreviations are not permitted.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Sprinkler Heads:
1. Viking
2. Victaulic
3. Reliable Automatic Sprinkler
4. Tyco Fire Products

B. Valves:
1. Where only one manufacturer's model is listed, equivalent products by those specified below, or equal, are acceptable.
2. Use only one manufacturer.
3. Gate, Swing Check:
   a. Jenkins
   b. Victaulic
   c. Crane
   d. Hammond
   e. NIBCO
   f. Kennedy
4. Silent Check:
   a. Jenkins
   b. Victaulic
   c. Mueller
   d. Metraflex
   e. Gustin-Bacon
5. Butterfly:
   a. Jenkins
   b. NIBCO
   c. Keystone
   d. Victaulic
   e. Gustin-Bacon
6. Specialty:
   a. NIBCO
   b. Conbraco
   c. Victaulic

C. Mechanical Pipe Couplings and Fittings:
1. Victaulic
2. Gruvlok

D. Piping Markers:
   1. W.H. Brady
   2. Seton
   3. Marking Systems, Inc. (MSI).

2.2 SPRINKLER HEADS

A. General:
   1. One manufacturer throughout building. Mixing of sprinkler brands is not permitted.
   2. Brass frame construction with a coated metal-to-metal seating mechanism. Sprinklers utilizing non-metal parts in the sealing portion of the sprinkler are strictly prohibited.
   3. Quick response frangible bulb type fusible element with a temperature rating of 155 degrees or 200 degrees F or a fast response metal type fusible element with a temperature rating of 165 degrees or 212 degrees F.
   4. 1/2-inch NPT, a standard orifice, and a 5.6 nominal K Factor.
   5. UL listed and FM Approved for working water pressures up to 175 psi. Sprinkler heads in dry and pre-action type systems installed per NFPA 13.
   6. Heads, UL approved for application and installation.

B. Provide high temperature, 212 degrees F heads for mechanical rooms, areas below skylights, dishwashing and other areas which have high heat producing equipment to prevent accidental trip page.

C. Sprinklers Installed in Finished Ceilings:

D. Sprinklers Installed in Finished Ceilings:
   1. Quick response, concealed pendant with white drop-off cover plate, rough bronze finish, 155 degrees F unless required otherwise.

E. Sprinklers Installed in Unfinished Ceiling Areas (or Above Finished Ceilings Where Required):
   1. Pendant or up-right fusible solder type, rough bronze finish, and adequate temperature for the hazard.

F. Flexible Stainless Steel Hose:
   1. UL rated, FM approved stainless steel hose assembly for individual sprinkler connections, Victaulic Vic-Flex.
   2. Drop includes a UL approved braided hose with a bend radius to 2-inch to allow for proper installation in confined spaces.
   3. Provide union joints for ease of installation.
   4. Attach flexible drop to the ceiling grid using a one-piece open gate bracket. The bracket allows installation before the ceiling tile is in place.
   5. The braided drop system is UL listed and FM Approved for sprinkler services to 175 psi (1206 kPa).

2.3 VALVES

A. Gate, butterfly, and check valves meet current MSS standards.

B. Bronze gate and check valves made with dezincification-resistant materials. Bronze valves made with copper alloy (brass) containing more than 15 percent zinc are not permitted.

C. Full lug and grooved butterfly valves suitable for bi-directional dead end service at full rated pressure without use or need of a downstream flange.

D. Valves in Insulated Piping: Valves have 2-inch stem extensions and the following features:

E. Gate Valves: Rising stem type.

F. Butterfly Valves: Extended necks.

G. Valve ends may be threaded, flanged, soldered, or grooved as applicable to piping system.

H. Provide ball drip drains, test orifices, and other related items as required to provide a complete fire protection system.

I. Gate Valves:
   1. Bronze Gate: Bronze body, bronze screwed bonnet, bronze solid wedge, OS&Y pattern, rising stem, pre-grooved stem for supervisory switch mounting, 175 psi CWP, UL listed, FM approved; NIBCO T-104.
   2. Iron Gate: Iron body, bronze trim, OS&Y pattern, solid wedge, pre-grooved stem for supervisory switch mounting, 175 psi CWP, UL listed, FM approved; NIBCO F-607-OTS.
   3. Iron Gate, High Pressure: Iron body, bronze trim, flanged OS&Y pattern, solid wedge, FM approved for 300 psi, UL listed 350 psi; NIBCO F-697-0.

J. Check Valves:
   1. Horizontal Bronze Swing Check:
      a. Bronze body, bronze-mounted, TFE disc, 150 psi SWP, 300 psi CWP; NIBCO T-443-Y, NIBCO S-433-Y.
      b. Check valves in main riser path FM approved.
   2. Horizontal Bronze Swing Check, High Pressure:
      a. Bronze body, bronze-mounted, regrinding bronze disc, 300 psi SWP, 1000 psi CWP; NIBCO T473-B.
      b. Check valves in main riser path FM approved.
   3. Horizontal Iron Swing Check:
      a. Iron body, bronze-mounted, regrinding bronze disc and seat ring, 200 psi CWP; NIBCO F-918-B.
      b. Check valves in main riser path FM approved.
   4. Vertical and Silent Check Valves:
      a. Iron body, stainless steel spring, wafer type, globe style, 200 psi CWP; NIBCO 910-B.
      b. Check valves in main riser path, FM approved.
   5. Vertical and Silent Check Valves, High Pressure:
      a. Iron body, stainless steel spring, wafer type, globe style, 400 psi CWP; NIBCO W-960-B, NIBCO F-960-B.
      b. Check valves in main riser path, FM approved.

K. Butterfly Valves:
   1. Iron Butterfly:
      a. Ductile iron body, aluminum-bronze disc and one-piece stainless steel shaft, copper bushing, fasteners and pins not used to attach stem to disc, gear operator, stem neck length to accommodate insulation where applicable, EPDM liner or disc, 200 psi CWP; NIBCO LD 2000 (lug style), NIBCO GD-4765 (grooved ends).
      b. Butterfly valves in main riser path, FM approved.

2. Iron Butterfly, High Pressure: Ductile iron body, ductile iron disc and one-piece stainless steel shaft, copper bushings, fasteners and pins not used to attach stem to disc, with lever handle and locking feature on valves 6-inches and smaller, gear operator, EPDM liner or disc, 300 psi CWP, integral supervisory switch, UL listed, FM approved; NIBCO GD-4765.

L. Specialty Valves:
1. Drain Valves: Bronze ball valve, garden hose end, cap and chain 3/4-inch size, bronze cast body, chrome-plated full port ball, with handle, Teflon seat, threaded body packnut design (no threaded stem designs allowed) with adjustable stem packing, 600 psi CWP; NIBCO T-585-70-HC.
2. Gauge Cocks: Brass, tee handle, male to female, 200 psi working pressure, 1/4-inch; Conbraco 41 series, or equal.

2.4 BLACK STEEL PIPE

A. General:
1. UL listed and FM approved for fire protection use.
2. Fittings and joints must be UL listed with pipe chosen for use.
3. Listing restrictions and installation procedures per NFPA 13 and state and local authorities for fire protection use.
4. Pipe/fittings must be hot-dipped galvanized in accordance with ASTM A53 for dry pipe sprinkler systems.

B. Pipe: ASTM A135 or A53.
1. Fire Protection:
a. Schedule 10 or Schedule 40 in sizes up to 5 inches.
b. 0.134-inch wall thickness for 6-inch.
c. 0.188-inch wall thickness for 8-inch and 10-inch.
d. 0.330-inch wall thickness for 12-inch.

C. Fittings: Roll grooved ends with mechanical couplings as specified.

D. Service Above Grade: Fire protection system only for sizes listed, as approved by NFPA 13.

2.5 FLANGED JOINTS

A. Flanged Joints:
1. Cast iron or steel for screwed piping and forged steel welding neck for welded line sizes.
2. Pressure rating and drilling matches the apparatus, valve, or fitting to which they are attached.
3. Flanges in accordance with ANSI B16.1; 150 lb. for system pressures to 150 psig; 300 pounds for system pressures 150 psig to 400 psig.
4. Gaskets 1/16-inch thick, Cranite, or equal, ring type, coated with graphite and oil to facilitate making a tight joint.
5. Make joint using American Standard hexagon head bolts, lock washers, and nuts (per ASTM A307 GR.B) for service pressures to 150 psig; alloy steel stud bolts, lock washer, and American Standard hexagon head nuts (per ASTM A307 GR.B) for service pressures 150 psig to 400 psig. Use length of bolt required for full nut engagement.
6. Provide electro-cad plated bolts and nuts.

2.6 MECHANICAL PIPE COUPLINGS AND FITTINGS

A. Couplings and Fittings:
1. Coupling housing to be zero flex rigid type coupling with angled bolt pad design. Couplings fully installed at visual pad-to-pad offset contact. Couplings that require gapping of bolt pads or specific torque ratings for proper installation are not permitted. Installation-Ready, for direct stab installation without field disassembly. Similar to Victaulic Type 009N.
2. Flexible couplings to be used only when expansion contraction, deflection or noise and vibration is to be dampened. Flexible Coupling to be similar to Victaulic Installation-Ready Type 005.Coupling gasket similar to Victaulic's Grade E molded synthetic rubber per ASTM D-2000.
3. Coupling bolts oval neck track head type with hexagonal heavy nuts per ASTM A-449 and A-183.

2.7 VALVE IDENTIFICATION

A. Valve Tags:
1. General:
a. Identify valves with metal tags or plastic signs, legends to be stamped or embossed.
b. Indicate the function of the valve and its normal operating position, and area served; i.e.

3RD FL	(Area Served)
ISOLATION	(Valve Function)
NO	(Normal Operation Position)

2. Size: Valve tags 2-inch diameter with 1/4-inch high letters.
3. Material: Use 0.050 or 0.064-inch brass tags.
4. Control Valves:
a. Use 1/16-inch thick laminated 3-ply plastic, center ply white, outer ply red, lamicoid, or equal.
b. Form letters by exposing center ply.

B. Valve Tag Directory: Include the following:
1. Tag Number
2. Location
3. Exposed or Concealed
4. Area Served
5. Valve Size
6. Valve Manufacturer
7. Valve Model Number
8. Normal Operating Position of Valve

2.8 PIPING MARKERS

A. Label pipes with all-vinyl, self-sticking labels or letters.

B. Pipe covering sizes up to and including 3/4-inch outside diameter, select labels with 1/2-inch letters. For sizes from 3/4 to 2-inch outside diameter, 3/4-inch letters; above 2-inches outside diameter, 2-inch letters.

C. Identify and color code as follows with white directional arrows.

SERVICE	PIPE MARKER	BACKGROUND COLOR
SPRINKLER WATER	FIRE PROTECTION WATER	RED
AIR, COMPRESSED	*COMPRESSED AIR*	GREEN

2.9 EQUIPMENT IDENTIFICATION

A. Nameplates:
1. Tag pumps, and miscellaneous equipment with engraved nameplates.
2. 1/16-inch thick, 3-inch by 5-inch laminated 3-ply plastic, center ply white, outer ply black.
3. Form letters by exposing center ply.
4. Identify unit with code number as shown on Drawings and area served.

B. Equipment Nameplate Directory:
1. List pumps, compressors and other equipment nameplates.
2. Include Owner and Contractor furnished equipment.
3. List nameplate designation, manufacturer's model number, location of equipment, area served or function, disconnect location, and normal position of HOA switch.

PART 3 EXECUTION

3.1 INSTALLATION

A. General:
1. Provide seismic hangers as required by code.
2. Provide tamper switches on sprinkler system isolation valves. Provide flow switches for sprinkler zones.
3. A corrosion-resistant metal placard provided on riser indicating location number of sprinklers, design criteria, water demand, and date of installation.
4. Provide fire sprinkler guards on exposed sprinklers in areas subject to damage.
5. Quick response sprinklers listed for installation in an Ordinary Hazard occupancy when installed in an Ordinary Hazard occupancy.

B. Flexible Sprinkler Wet and Dry Head Drop:
1. Install per manufacturer's installation requirements.
2. Coordinate head location with other trades to assure space is available to maintain proper radius requirements.
3. Provide flexible sprinkler drops of appropriate length as conditions require.
4. Provide flexible sprinkler drops at sprinkler heads located in suspended, dropped, or acoustical ceilings. In hard lid ceiling areas, provide flexible heads at Contractor's option.

C. Sprinklers above finished ceilings: Include heads above finished ceilings if structure is combustible, or if steel beams are not provided with spray-on fire proofing.

D. Electrical: Electrical work to comply with Division 26, Electrical.

E. Hangers and Supports:
1. Install sprinkler system and service main piping, hangers, and supports in accordance with NFPA 13.
2. Install standpipe piping, hangers, and supports in accordance with NFPA 14.
3. Connections to structural framing not to introduce twisting, torsion, or lateral bending in the framing members. Provide supplementary steel as required.

F. Valves:
1. Provide valves at connections to equipment where shown or required for equipment isolation.
2. Install valves accessible and same size as connected piping.

3. Provide separate support for valves where necessary.
4. Provide drain valves in low points in the piping system, and at equipment, as required by code, and as indicated.
5. Fire Suppression Service:
    a. In piping 2-inches and smaller; bronze gate valve, bronze swing check valve, vertical check valve.
    b. In piping 2-1/2-inches and larger; iron gate valve, iron swing check valve, vertical check valve.
    c. UL approved butterfly valves.
    d. Silent check valves on pump discharge.
6. Provide gauge cocks for pressure gauges.

G. Piping Preparation:
1. Measurements, Lines and Levels:
    a. Check dimension at the building site and establish lines and levels for work specified in this Section.
    b. Establish inverts, slopes, and elevations by instrument, working from an established datum point. Provide elevation markers for use in determining slopes and elevations in accordance with Drawings and Specifications.
    c. Use established grid and area lines for locating trenches in relation to building and boundaries.

H. Piping:
1. Hold piping as tight to structure as possible. In general, run piping in areas without ceilings parallel to building elements in a neat, professional manner.
2. Pipe inspector test connections to exterior and discharge as approved by local applicable governing authorities.
3. Provide test tees as required.
4. Install unions in non-flanged piping connections to apparatus and adjacent to screwed control valves, and appurtenances requiring removal for servicing so located that piping may be disconnected without disturbing the general system.
5. Mechanical Couplings:
    a. On systems using galvanized pipe and fittings, galvanize fittings at factory.
    b. Before assembly of couplings, lightly coat pipe ends and outside of gaskets with approved lubricant.
    c. Pipe grooving in accordance with manufacturer's specifications contained in latest published literature.
6. Install piping as to drain per NFPA 13.
7. Support piping independently at apparatus so that its weight not carried by the equipment.

I. Drain Piping:
1. Pitch drain piping 1/2-inch per 10-feet minimum; no traps allowed.
2. Discharge drain piping to outside with suitable splash plate to a location as approved by the architect.

J. Piping Joints:
1. Join pipe and fittings using methods and materials recommended by manufacturer in conformance with standard practice and applicable codes. Cleaning, cutting, reaming, grooving, etc. done with proper tools and equipment. Hacksaw pipe cutting prohibited. Peening of welds to stop leaks not permitted.
2. Grooved Joints:
    a. Install in accordance with the manufacturer's latest published installation instructions.
    b. Clean pipe ends free from indentations, projections and roll marks in the area from pipe end to (and including) groove.

c. Gasket manufactured by the coupling manufacturer and verified as suitable for the intended service.
d. Factory trained representative (direct employee) of the coupling manufacturer to provide on-site training for contractor's field personnel in the use of grooving tools, application of groove, and product installation.
e. Periodically visit the job site and review installation to ensure best practices in grooved joint installation are being followed.
f. Remove and replace any improperly installed products.

3. No couplings installed in floor or wall sleeves.
4. Steel Piping:
   a. Screwed Joints:
      1) Pipes cut evenly with pipe cutter reamed to full inside diameter with burrs and cuttings removed.
      2) Joints made up with suitable lubricant or Teflon tape applied to male threads only, leaving two threads bare.
      3) Joints tightened so that not more than two threads are left showing.
      4) Junctions between galvanized steel waste pipe and bell of cast iron pipe made with tapped spigot or half coupling on steel pipe to form spigot end and caulked.
   b. Flanged Joints:
      1) Pressure rating of flanges match valve or fitting joined.
      2) Coat joint gaskets with graphite and oil.
5. Welded Joints:
   a. Preparation for Welding: Bevel piping on both ends before welding:
      1) Use following weld spacing on buttwelds:

NOMINAL PIPE WALL THICKNESS	SPACING	BEVEL
1/4-inch or less	1/8-inch	37-1/2
Over 1/4-inch, less than 3/4-inch	3/16-inch	27-1/2

      2) Before welding, remove corrosion products and foreign material from surfaces.
   b. Welded Joints:
      1) Use arc-welding process using certified welders. Port openings of fittings must match the inside diameter of the pipe to which they are welded. Use full radius welding elbows for turns, use welding tees for tees. Use reducing fittings for size reduction. Weldolets may be used for branches up through one-half the pipe size of the main to which they are attached. Nipples are not allowed.
   c. Welding Operation:
      1) After deposition, clean each layer of weld metal to remove slag and scale by wire brushing or grinding. Chip where necessary to prepare for proper deposition of next layer.
      2) Weld reinforcement no less than 1/16-inch not more than 1/8-inch above normal surface of jointed sections. Reinforcement crowned at center and taper on each side to surfaces being joined. Exposed surface of weld present professional appearance and be free of depressions below surface of jointed members.
      3) Do not weld when temperature of base metal is lower than 0 degrees F. Material to be welded during freezing temperatures made warm and dry before welding is started. Metal warm to the hand or approximately 60 degrees F.

K. Pipe Wrap:
   1. Apply per manufacturer's written instructions.
   2. Apply wrapping to fittings in field after installation.

NEHS

3.2 IDENTIFICATION

A. Valve Identification:
   1. Valve Tags:
      a. Attach to valve with a brass chain.
      b. Valve tag numbers continuous throughout the building for each system. Obtain a list for each system involved from the Owner.
   2. Valve Tag Directory:
      a. Post final copy in Operation and Maintenance Manual.

B. Piping Markers:
   1. Unless recommendations of ANSI A13.1 are more stringent, apply labels or letters after completion of pipe cleaning, painting, or other similar work, as follows:
      a. Every 20-feet along continuous exposed lines.
      b. Every 10-feet along continuous concealed lines.
      c. Adjacent to each valve and stub out for future.
      d. Where pipe passes through a wall, into and out of concealed spaces.
      e. On each riser.
      f. On each leg of a T.
      g. Locate conspicuously where visible.
   2. Apply labels or letters to lower quarters of the pipe on horizontal runs where view is not obstructed or on the upper quarters when pipe is normally viewed from above. Apply arrow labels indicating direction of flow. Arrows to be the same color and sizes as identification labels.

C. Equipment Identification:
   1. Nameplates:
      a. Attach to prominent area of equipment, either with sheet metal screws, brass chain, or contact cement as applicable.
   2. Nameplate Directory:
      a. Post final copy in Operation and Maintenance Manual.

3.3 EXTRA STOCK

A. Provide additional number of heads of each type and temperature rating installed as required to meet NFPA 13 requirements.

B. Provide storage cabinet or cabinets as required to receive reserve sprinkler heads and special installation tools required.

C. Provide index label for each head indicating manufacturer, model, orifice size of K-factor, and temperature rating.

D. Provide, inside cabinet a list of heads stored within and brief description of where installed.

E. Locate cabinet near sprinkler control station as approved.

3.4 FIELD QUALITY CONTROL

A. Tests and Inspections:
   1. Perform tests and arrange for required inspections of installed system as required.

2. Notify the Architect 48 hours prior to any test or inspection.
3. Provide final test and certification in the presence of an Owner representative. Coordinate hereunder.

B. Inspection Service:
1. At start of warranty year, execute inspection agreement.
2. Without additional charge to Owner, make quarterly inspection of system during year.
   a. Check and operate control valves.
   b. Lubricate valve parts.

C. Report each inspection to Owner.

END OF SECTION

SECTION 22 05 00

COMMON WORK RESULTS FOR PLUMBING

PART 1 GENERAL

1.1 SUMMARY

A. The intent of Division 22, Plumbing and the accompanying Drawings is to provide a complete and workable facility with complete systems as shown, specified and required by applicable codes. Include all work specified in Division 22, Plumbing and shown on the accompanying Drawings, including appurtenances, connections, etc., in the finished job.

B. Division 22, Plumbing and the accompanying Drawings are complementary and as binding as if called for by both. Items shown on the Drawings are not necessarily included in the Specifications and vice versa. Specifications supersede drawings in case of conflict.

C. The Drawings that accompany the Division 22, Plumbing, are diagrammatic. They do not show every offset, bend, tee, or elbow which may be required to install work in the space provided and avoid conflicts. Offsets and transitions assumed at a minimum at each duct crossing, structural penetrations through shear walls or beams, structural grids where ceiling heights are restricted, and at piping mains. Follow the Drawing as closely as is practical to do so and install additional bends, offsets and elbows where required by local conditions from measurements taken at the Building, subject to approval, and without additional cost to the Owner. The right is reserved to make any reasonable changes in fixture location prior to roughing-in, without cost impact.

D. The General and Supplemental Conditions apply to this Division, including but not limited to:
   1. Drawings and specifications.
   2. Public ordinances, permits.
   3. Include payments and fees required by governing authorities for work of this Division.

1.2 RELATED SECTION

A. Division 01, General Requirements

B. Division 22, Plumbing

1.3 QUALITY ASSURANCE

A. Regulatory Requirements:
   1. Products and equipment prohibited from containing pentabrominated, octabrominated and decabrominated diphenyl ethers. Where products or equipment within this specification contain these banned substances, provide complying products and equipment from approved manufacturers with equal performance characteristics.
   2. General:
      a. Conform work and materials to local and State codes, and Federal, State and other applicable laws and regulations.
   3. Responsible for obtaining and payment for permits, licenses, and inspection certificates required in accordance with provisions of Contract Documents.

B. New materials and equipment. Work of good quality, free of faults and defects and in conformance with the Contract Documents.

C. Build and install apparatus to deliver its full rated capacity at the efficiency for which it was designed.

D. Operate the entire plumbing system and apparatus at full capacity without objectionable noise or vibration.

E. Install equipment level and true. Use housekeeping pads and curbs to account for floor or roof slope.

F. Materials and Equipment:
1. Meet detailed requirements of the Drawings and Specifications and suitable for the installation shown. Equipment not meeting requirements will not be acceptable, even though specified by name along with other manufacturers.
2. Where two or more units of the same class of equipment are furnished, use products of the same manufacturer. Component parts of the entire system need not be products of same manufacturer.
3. Furnish materials and equipment of size, make, type, and quality herein specified.
4. Equipment scheduled by performance or model number considered the basis of the design. If other specified manufacturer's equipment is provided in lieu of the basis of design equipment the contractor is responsible for changes and costs which may be necessary to accommodate this equipment, including different sizes and locations for connections, different electrical characteristics, different dimensions, different access requirements or any other differences which impact the project.

G. Workmanship:
1. General:
   a. Install materials in a neat and professional manner.
2. Manufacturer’s Instructions:
   a. Follow manufacturer’s directions where they cover points not specifically indicated.
   b. If in conflict with the Drawings and Division 22, Plumbing, obtain clarification before starting work.

H. Cutting and Patching:
1. Cutting, patching, and repairing for the proper installation and completion of the work specified in this Division including plastering, masonry work, concrete work, carpentry work, and painting performed by skilled craftsmen of each respective trade in conformance with the appropriate Division of Work.
2. Additional openings required in building construction made by drilling or cutting. Use of jackhammer is specifically prohibited.
3. Fill holes which are cut oversize so that a tight fit is obtained around the sleeves passing through.
4. Do not pierce beams or columns without permission of Architect and then only as directed.
5. Restore new or existing work cut or damaged to its original condition. Where there are alterations disturb lawns, paving, walks, etc., repair, refinish, and leave in condition existing prior to commencement of work.

1.4 SUBMITTALS

A. Shop Drawings:
1. Contract Drawings indicate the general layout of the piping, and various items of equipment.
2. Coordinate with other trades and field conditions.
3. Prepare Shop Drawings of piping, and equipment installations.

4. Prepare new Shop Drawings by Contractor and not reproductions or tracings of Architect's Drawings.
5. Overlay drawings with shop drawings of other trades and check for conflicts.
6. Drawings same size as Architect's Drawings with title block similar to Contract Drawings and identifying Architect's Drawing number or any reference drawings.
7. Fully dimensioned including both plan and elevation dimensions.
8. Shop drawings cannot be used to make scope changes.
9. Prepare in two-dimensional format.
10. Shop drawings include but are not limited to:
    a. Plumbing site plan drawn to same scale as site plan.
    b. Complete floor plans with plumbing to a minimum of 1/4-inch equals 1-foot scale.
    c. Sections of congested areas to a minimum of 1/2-inch equals 1-foot scale.
    d. Fabricated Equipment: Scale and drawing sizes to suit contractor except equipment not less than 1/2-inch equals 1-foot scale.
    e. Beam penetration drawings indicating beam penetrations meeting the requirements indicated on the floor plans and on the structural drawings to a minimum of 1/4-inch equals 1-foot scale.
    f. Slab penetration drawings of HVAC, plumbing, sprinklers, lighting and electrical to a minimum of 1/4-inch equals 1-foot scale.
11. Submit shop drawings for review prior to beginning fabrication. Additional shop drawings may be requested when it appears that coordination issues are not being resolved in the field or when there is a question as to whether contract documents are being complied with or the design intent is being met.

B. Product Data:
1. Submit product data for review on scheduled pieces of equipment, on equipment requiring electrical connections or connections by other trades, and as required by each specification section or by Drawing notes. Include manufacturer's detailed shop drawings, specifications and data sheets. Data includes the following:
    a. Capacities
    b. RPM
    c. BHP
    d. Pressure Drop
    e. Design and Operating Pressures
    f. Temperatures
2. Manufacturer's abbreviations or codes are not acceptable.
3. List the name of the motor manufacturer and service factor for each piece of equipment.
4. Indicate equipment operating weights including bases and weight distribution at support points.
5. In the case of equipment such as wiring devices, time switches, valves, etc., specified by specific catalog number, a statement of conformance will suffice.

C. Submission Requirements:
1. Shop Drawings and Product Data:
    a. Refer to Division 01, General Requirements for additional requirements related to submittals.
    b. Submit electronic copies of shop drawings and product data for Work of Division 22, Plumbing in PDF format with each item filed under a folder and labeled with its respective specification section number, article, and paragraph and mark, if applicable.
    c. Include a complete index in the original submittal. Indicate both original items submitted and note stragglers that will be submitted at a later date to avoid delay in submitting.
    d. The bulk of the shop drawings and product data, excepting Controls and Instrumentation, included with the original submittal. Controls and Instrumentation submittals may lag but still complete when submitted. Partial submittals will not be accepted. Other stragglers submitted

after return of the original binder includes a tab similar to that originally submitted. Upon receipt of the returned late submittal, insert them in the previously submitted binder.

D. Contractor Responsibilities:
   1. Submit submittals at one time and are in proper order.
   2. Ensure equipment will fit in the space provided.
   3. Assure that deviations from Drawings and Specifications are specifically noted in the submittals. Failure to comply will void review automatically.

1.5 AS-BUILT DRAWINGS

A. Provide record drawings in hard copy and pdf format. Drawings include the following:
   1. Project specific titleblock.
   2. Notations reflecting the as built conditions of any additions to or variations from the construction documents provided as part of the BIM coordination, RFIs, ASIs, Owner Changes, and Field Coordination.

1.6 OPERATING AND MAINTENANCE MANUAL, PARTS LISTS, AND OWNER'S INSTRUCTIONS

A. Refer to Division 01, General Requirements for additional requirements.

B. Submit three bound copies of manufacturer's operation and maintenance instruction manuals and parts lists for each piece of equipment or item requiring servicing. Show literature on 8-1/2-inches by 11-inches sheets or catalogs suitable for side binding.

C. Submit data when the work is substantially complete, packaged separately, and clearly identified in durable 3-ring binder. Include name and contact information for location of source parts and service for each piece of equipment.

D. Clearly mark and label in each submittal, the piece of equipment provided with the proper nameplate and model number identified. Provide wiring diagrams for electrically powered equipment.

E. Instruct Owner thoroughly in proper operation of equipment and systems, in accordance with manufacturer's instruction manuals. Operating instructions cover all phases of control.

1.7 PROJECT CONDITIONS

A. Existing Conditions:
   1. Prior to bidding, verify and become familiar with existing conditions by visiting the site, and include factors which may affect the execution of this Work.
   2. Include related costs in the initial bid proposal.

B. Coordinate exact requirements governed by actual job conditions. Check information and report any discrepancies before fabricating work. Report changes in time to avoid unnecessary work.

C. Coordinate shutdown and start-up of existing, temporary, and new systems and utilities. Notify Owner, City, and Utility Company.

1.8 WARRANTY

A. Provide a written guaranty covering the work of this Division (for a period of one calendar year from the date of acceptance by the Owner) as required by the General Conditions.

B. Provide manufacturer's written warranties for material and equipment furnished under this Division insuring parts and labor for a period of one year from the date of Owner acceptance of Work of this Division.

C. Correct warranty items promptly upon notification.

1.9 TEST REPORTS AND CERTIFICATES

A. Submit one copy of test reports and certificates specified herein to the Architect.

1.10 SUBSTITUTIONS

A. Submit requests for product substitutions in accordance with the Instructions to Bidders and the General and Supplemental Conditions.

PART 2 PRODUCTS

2.1 ACCESS PANELS

A. Furnish under this Division as specified in another Division of work.

2.2 PIPE SLEEVES

A. Interior Wall and Floor Sleeves: 18 gauge galvanized steel, or another pre-approved system.

B. Interior Wall and Floor Sleeves, Fire Rated: Fire rated and water tight system approved by Authority Having Jurisdiction and Owners Insurance underwriter, with rating equal to floor or wall penetration, and designed specifically for the floor or wall construction, piping material, size and service.

C. Exterior Wall Sleeves: Cast iron.

D. On Grade Floor Sleeves: Same as exterior wall sleeves.

E. Water Tight Sleeves: Combination steel pipe sleeves with water stop and anchor plate; Link Seal Model WS, mated with synthetic rubber links interlocked with bolts and nuts; Link Seal Model LS.

2.3 FLOOR, WALL AND CEILING PLATES

A. Furnish stamped split type plates as follows:
   1. Floor Plates: Cast brass, chromium plated
   2. Wall and Ceiling Plates: Spun aluminum

2.4 ELECTRICAL EQUIPMENT

A. General:
   1. Equipment and installed work as specified under Division 26, Electrical.

B. Coordinate with the electrical Drawings and electrical contractor for minimum electrical equipment bracing requirements based on the available interrupting current (AIC) rating at the bus of the panelboard or switchboard serving the piece of equipment. Provide equipment that meets the bracing requirement.

C. Codes: Electrical equipment and products bear the Underwriters label as required by governing codes and ordinances.

PART 3 EXECUTION

3.1 ACCESS PANELS

A. Install in accord with manufacturer's recommendations, coordinated with architectural features.

B. Provide 2-hour fire rated doors where required bearing the UL label.

C. Furnish 18-inch by 18-inch panels for ceilings and for access to equipment in soffits and shafts, and 12-inch by 12-inch for walls unless indicated otherwise.

D. Furnish where indicated and where required to access valves, trap primers, shock arresters, and other appurtenances requiring operation, service, or maintenance. Submit proposed locations for review prior to installation.

3.2 SLEEVES

A. Interior Floor and Wall Sleeves:
   1. Provide sleeves large enough to provide 3/4-inch clearances around pipe.
   2. Where pipe is insulated, provide sleeves large enough to provide 3/4-inch clearance around insulation. Maintain continuous insulation as it passes through sleeve.
   3. Penetrations through mechanical room and fan room floors made watertight by packing with safing insulation and sealing with Tremco Dymeric Sealant or approved system.

B. Sleeves Through Rated Floors and Walls:
   1. Similar to interior sleeves except install fire rated system approved by Authority Having Jurisdiction and Owners insurance underwriter
   2. Rating equal to floor or wall penetration, and designed specifically for the floor or wall construction, piping material, size and service.

C. Exterior Wall Sleeves Below Grade:
   1. Provide water tight sleeves. Install at pipes entering building below grade and where shown. Adjust to provide positive hydrostatic seal.
   2. Responsible for following manufacturer's procedure for installing and tightening seal. Secure sleeves against displacement.

D. On Grade Floor Sleeves: Same as below grade exterior wall sleeves, caulked from inside.

E. Exterior Wall Sleeves Above Grade: Similar to interior wall sleeves except caulk outside with Tremco Dymeric Sealant.

F. Layout work prior to concrete forming. Do cutting and patching required. Reinforce sleeves to prevent collapse during forming and pouring.

G. Floor sleeves maintain a water barrier by providing a water tight seal or they extend 1-inch above finished floor except through mechanical equipment room floors and shafts where sleeves extend 2-inches above finished floor level. Sleeves through roof extend 8-inches above roof. Wall sleeves flush with face of wall unless otherwise indicated. Waste stacks using carriers have sleeves flush with floor and sealed. Sleeves through planters extend 8-inches above planter base.

H. Do not support pipes by resting pipe clamps on floor sleeves. Provide supplementary members so pipes are floor supported.

I. Special sleeves detailed on drawings take precedence over this Section.

3.3 CLEANING

A. General: Clean plumbing equipment, fixtures and piping of stampings and markings (except those required by codes), iron cuttings, and other refuse.

B. Painted Surfaces: Clean scratched or marred painted surfaces of rust or other foreign matter and paint with matching color industrial enamel, except as otherwise noted.

C. Additional requirements are specified under specific Sections of this Division.

3.4 EQUIPMENT PROTECTION

A. Keep pipe and conduit openings closed by means of plugs or caps to prevent the entrance of foreign matter. Protect piping, conduit, fixtures, equipment, and apparatus against dirty water, chemical or mechanical damage both before and after installation. Restore damaged or contaminated fixtures, equipment, or apparatus to original conditions or replace at no cost to the Owner.

B. Protect bright finished shafts, bearing housings, and similar items until in service. No rust will be permitted.

C. Cover or otherwise suitably protect equipment and materials stored on the job site.

3.5 ACCESSIBILITY

A. General: Locate valves, thermometers, cleanout fittings and other indicating equipment or specialties requiring frequent reading, adjustments, inspection, repairs, and removal or replacement conveniently and accessibly with reference to the finished building.

B. Thermometers and Gauges: Install thermometers and gauges so as to be easily read from the floors, platforms, and walkways.

3.6 FLOOR, WALL AND CEILING PLATES

A. Install on piping passing through finished walls, floors, ceilings, partitions, and plaster furrings. Plates completely cover opening around pipe.

B. Secure wall and ceiling plates to pipe, insulation, or structure.

C. Plates not to penetrate insulation vapor barriers.

D. Plates not required in mechanical rooms or unfinished spaces.

3.7 PAINTING

A. General:
1. Coordinate painting of mechanical equipment and items with products and methods in conformance with the appropriate Division of Work, Painting.
2. Exposed work under this division receives either a factory painted finish or a field prime coat finish, except:
3. Exposed copper piping.
4. Aluminum jacketed outdoor insulated piping.

B. Equipment Rooms and Finished Areas:
1. Insulation: Not painted.
2. Hangers, Uninsulated Piping, Miscellaneous Iron Work, Structural Steel Stands, Uninsulated Tanks, and Equipment Bases: Paint one coat of black enamel.
3. Steel Valve Bodies and Bonnets: One coat of black enamel.
4. Brass Valve Bodies: Not painted.
5. Equipment:
   a. One coat of grey machinery enamel.
   b. Do not paint nameplates.

C. Concealed Spaces (above ceilings, not visible):
1. Insulation: Not painted.
2. Hangers, Uninsulated Piping, Miscellaneous Iron Work, Valve Bodies and Bonnets: Not painted.

D. Exterior Steel: Wire brush and apply two coats of rust-inhibiting primer and one coat of grey exterior machinery enamel.

E. Exterior Black Steel Pipe: Wire brush and apply two coats of rust-inhibiting primer and one coat of exterior enamel. Painting schemes comply with ANSI A13.1.

3.8 ADJUSTING AND CLEANING

A. Before operating any equipment or systems, make thorough check to determine that systems have been flushed and cleaned as required and equipment has been properly installed, lubricated, and serviced. Check factory instructions to see that installations made accordingly and that recommended lubricants have been used.

B. Use particular care in lubricating bearings to avoid damage by overlubrication and blowing out seals. Check equipment for damage that may have occurred during shipment, after delivery, or during installation. Repair damaged equipment as approved or replace with new equipment.

3.9 ELECTRICAL EQUIPMENT

A. Do not install piping for plumbing systems not serving electrical space in switchgear room, transformer vault, telephone room, or electric closet except as indicated.

B. Piping for plumbing systems not to pass over switchboards or electrical panelboards. Where conflicts exist, bring to attention of Architect.

3.10 EQUIPMENT CONNECTIONS

A. Make final connections to equipment specified in sections other than Division 22, Plumbing of the specifications and Owner furnished equipment in accordance with manufacturer's instructions and shop drawings furnished and as indicated.

B. Piping:
1. Connections include hot and cold water, deionized water, distilled water, natural gas, medical gases, medical air, and vacuum, dental air and vacuum, lab air and vacuum, sanitary waste and vent, lab waste and vent and fuel oil.
2. Provide valves and specialties as specified and as detailed on the Drawings. Provide increasers, reducers, and any other fittings required for complete installation.
3. Independently support piping connections to prevent undue strain on equipment.

END OF SECTION

SECTION 22 05 23

GENERAL DUTY VALVES AND SPECIALTIES FOR PLUMBING

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes:
   1. Ball Valves
   2. System Specialties

1.2 RELATED SECTIONS

A. Division 01, General Requirements

B. Division 22, Plumbing

1.3 SUBMITTALS

A. Submit product data.

1.4 DEFINITIONS

A. CWP Cold working pressure

B. EPDM Ethylene propylene copolymer rubber

C. NBR Acrylonitrile-butadiene, Buna-N, or nitrile rubber

D. NRS Nonrising stem

E. OS&Y Outside screw and yoke

F. RS Rising stem

G. PTFE Polytetrafluoroethylene plastic

H. SWP Steam working pressure

I. Lead Free Section 1417 of the Safe Drinking Water Act (SDWA) establishes the definition for lead free as a weighted average of 0.25 percent lead calculated across the wetted surfaces of a pipe, pipe fitting, plumbing fitting, and fixture and 0.2 percent lead for solder and flux. The Act provides a methodology for calculating the weighted average of wetted surfaces.

1.5 QUALITY ASSURANCE

A. ASME Compliance:
   1. ASME B16.10 for ferrous valve dimensions.

2. ASME B31.9 for building services piping valves.

B. NSF Compliance: NSF/ANSI 61 and/or NSF/ANSI 372 for valve materials for potable-water service. ANSI/NSF-359

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. General: Where only NIBCO figure numbers are listed, equivalent products by those specified below are acceptable.
   1. Valves:
      a. Ball:
         1) Gruvlok
         2) Apollo
         3) Crane
         4) Hammond
         5) Milwaukee
         6) Victaulic

B. Other Manufacturers: Submit substitution request.

C. Use only one manufacturer.

D. Valve ends may be threaded, flanged, soldered, or grooved, as applicable to piping system. Refer to Section 22 21 13, Pipe and Pipe Fittings Plumbing for allowable fittings.

2.2 BALL VALVES

A. Lead Free Bronze Ball: Two piece, full port, lead free silicon bronze body, Stainless steel or silicon bronze trim, Reinforced PTFE or TFE seats, 600 psi CWP NIBCO T/S-585-80-LF or T/S-585-66-LF.

PART 3 EXECUTION

3.1 INSTALLATION

A. Provide valves at connections to equipment where shown or required for equipment isolation.

B. Provide separate support for valves where necessary.

C. Provide drain valves in low points in the piping system, at coils and equipment, and as indicated.

D. Install in accordance with manufacturer’s recommendations.

3.2 APPLIED LOCATIONS PLUMBING VALVES

A. In piping 2-inches and smaller:

System	Valve Types				
	Gate	Globe	Swing Check	Ball	Butterfly
Domestic Hot	Lead Free Bronze	Lead Free Bronze	Lead Free Bronze	Lead Free Bronze	Not Allowed
Domestic Cold	Lead Free Bronze	Lead Free Bronze	Lead Free Bronze	Lead Free Bronze	Not Allowed

3.3 VALVE IDENTIFICATION

A. General: Identify valves to indicate their function and system served.

B. Refer to Section 22 05 53, Identification for Plumbing Piping and Equipment.

3.4 INSTALLATION

A. Manual Air Vents:
   1. Install at high points where automatic air vents are not used, where noted, and where required for proper venting of system.
   2. Install in accordance with manufacturer's recommendations.

B. Test Plugs: Install where indicated and in accordance with the manufacturer's recommendations.

END OF SECTION

SECTION 22 05 29

HANGERS SUPPORTS AND ANCHORS FOR PLUMBING

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes:
   1. Supports, Anchorage and Restraint
   2. Pipe Attachments
   3. Pipe Rollers, Insulation Protection Shields and Insulation Protection Saddles
   4. Building Attachments

1.2 RELATED SECTIONS

A. Division 01, General Requirements

B. Division 22, Plumbing

C. Section 22 07 00, Insulation for Plumbing

D. Section 22 21 13, Pipe and Pipe Fittings Plumbing

1.3 SUBMITTALS

A. Submit the following:
   1. Shop Drawings of contractor fabricated piping support structures.
   2. No other submittals required under this section.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Supports, Anchorage and Restraint:
   1. Unistrut
   2. Superstrut
   3. Powerstrut and Kinline
   4. B-Line Systems
   5. AnvilStrut

B. Pipe Attachments:
   1. Anvil
   2. Superstrut
   3. B-Line Systems
   4. Tolco
   5. ERICO

C. Pipe Rollers, Insulation Protection Shields and Insulation Protection Saddles:
   1. Anvil or equivalent
   2. Super Strut
   3. B-Line Systems
   4. Tolco
   5. ERICO

D. Building Attachments:
   1. Anvil as listed or equivalent products
   2. Elcen
   3. Superstrut
   4. B-Line Systems
   5. Tolco
   6. ERICO

2.2 SUPPORTS, ANCHORAGE AND RESTRAINT

A. General:
   1. Provide pipe and equipment hangers and supports in accordance with the following:
      a. Equipment, supports, and seismic restraints for conduit, piping, and ductwork are not shown on the Drawings, the contractor responsible for their design.
      b. Resist seismic forces as specified in the latest edition of the International Building Code for the seismic zone in which the project is constructed.
      c. Seismic restraint not to introduce excessive stresses in the piping caused by thermal expansion or contraction.
      d. Connections to structural framing not to introduce twisting, torsion, or lateral bending in the framing members. Provide supplementary steel as required.
      e. In accordance with the latest edition of the SMACNA Seismic Restraint Manual - Guidelines for Mechanical Systems for the Seismic Hazard Level corresponding to the seismic zone in which the project is constructed.
      f. In accordance with the applicable code.
      g. Follow provisions described in Section 22 05 48, Vibration and Seismic Controls for Plumbing Piping and Equipment.

B. Engineered Support Systems: Design, detail, and bear the seal of a professional engineer registered in the State having jurisdiction.
   1. Supports and seismic restraints for suspended piping and equipment.
   2. Support frames such as pipe racks or stanchions for piping and equipment which provide support from below.
   3. Equipment and piping support frame anchorage to supporting slab or structure.

C. Fabricate support members from welded standard structural shapes, pipe, and plate to carry the necessary rollers, hangers, and accessories as required.

D. Support piping less than 4-inch pipe size from or by prefabricated roll-formed channels with necessary accessories to adequately support piping system.

E. Supports and Accessories: Preformed roll-formed channels and accessories with matching compatible accessories as shown, as specified, and as required.

F. Dissimilar Metal Protection: Hydra-Zorb cushions or Cush-a-strip.

G. Clamps: Super Strut Series 700 through 702 or AnvilStrut Series 1000 through 1200.

2.3 PIPE ATTACHMENTS

A. Uninsulated Horizontal Copper Piping:
   1. 2-inch and Smaller: Anvil CT-65, CT-69, CT-99C.
   2. Larger than 2-inch:
      a. Anvil 260 field or factory copper plated, plastic coated or other recognized industry methods.
      b. Electricians' tape is unacceptable.

B. Insulated Horizontal Copper Pipe with Hangers Inside of Insulation: Same as Uninsulated Horizontal Copper Pipe.

C. Insulated Horizontal Copper Pipe with Hangers Outside of Insulation:
   1. 2-inch and Smaller: Anvil 65, 70, 104 or 260.
   2. Larger than 2-inch: Anvil 260.

D. Other Uninsulated Horizontal Pipe:
   1. 2-inch and Smaller: Anvil 65, 70, 104 or 260.
   2. Larger than 2-inch: Anvil 260.

E. Other Insulated Horizontal Pipe With Hangers Inside of Insulation:
   1. 2-inch and Smaller: Anvil 65, 70, 104, 260 or 300.
   2. Larger than 2-inch: Anvil 260.

F. Other Insulated Horizontal Pipe with Hangers Outside of Insulation:
   1. 2-inch and Smaller: Anvil 65, 70, 104 or 260.
   2. Larger than 2-inch: Anvil 260.

G. Riser Clamps Copper Pipe:
   1. 4-inch and Smaller: Anvil CT-121, CT-121C or 261C.
   2. Larger than 4-inch: Anvil 261C.

H. Riser Clamps Other Piping: Anvil 261.

2.4 BUILDING ATTACHMENTS

A. Beam Hangers:
   1. On piping 6-inch and smaller: Anvil 86 with retaining clip Figure 89.
   2. On piping larger than 6-inch: Anvil 228, or 292.

B. Inserts:
   1. Anvil 152 malleable iron or 281 steel inserts.
   2. Inserts sized for required rod to support load being carried.

C. Expansion Plugs: Similar and equal to Phillips red-head self-drilling flush shell selected for safety factor of 4.

D. Powder actuated fasteners with silencers as approved by Architect.

PART 3 EXECUTION

3.1 HANGERS AND SUPPORTS

A. General:
1. Install support systems as detailed and in accordance with manufacturer's recommendations. Provide pipe racks, pipe stands, trapeze hangers, etc., as required, and as detailed on the Drawings.
2. Provide adjustable hangers for pipes complete with inserts, adjusters, bolts, nuts, swivels, all-thread rods, etc., except where specified otherwise.
3. Arrange for grouping of parallel runs of horizontal piping to be supported together on trapeze type hangers where possible. Where piping of various sizes is to be supported together by trapeze hangers, space hangers for smallest pipe size or install intermediate supports for smaller diameter pipe. Do not use wire or perforated metal to support piping and do not support piping from other piping.
4. Except as otherwise indicated for exposed continuous pipe runs, install hangers, and supports of same type and style as installed for adjacent similar piping.
5. Install cast iron piping in accordance with Cast Iron Soil Pipe Industry (CISPI) Standards.
6. Support piping within 2-feet of each change of direction on both sides of fitting.

B. Insulated Piping Systems:
1. Refer to Section 22 07 00, Insulation for Plumbing for insulation requirements.
2. Insulated Piping Systems with Vapor Barrier Insulation:
   a. Install hangers outside of insulation.
   b. On piping 1-1/2-inch and larger, provide insulation protection shields at each support location.
3. Insulated Piping Systems with Non-Vapor Barrier Insulation:
   a. At the contractor's option, hangers may be installed inside or outside of insulation for piping 2-inch and smaller.
   b. If hangers are installed outside of insulation, provide insulation protection shields at support locations on piping 1-1/2-inch and larger.
   c. On piping larger than 2-inch, provide insulation saddles at each support location.
4. Insulation Protection:
   a. Band insulation protection shields firmly to insulation to prevent slippage.
   b. Tack weld insulation protection saddles to steel pipe. Braze saddles to copper pipe.

C. Vertical Piping:
1. Support with U-clamps fastened to wall to hold piping away from wall unless otherwise approved.
2. Riser clamps on steel pipe to be directly welded to pipe. Riser clamps on copper pipe to be installed directly under fitting.
3. Risers that are not subject to thermal change to be supported at each floor of penetration.
4. Risers that are subject to thermal change require engineered supports. Size supports to carry forces exerted by piping system when in operation. Riser supports follow provisions described in Section 22 05 48, Vibration and Seismic Controls for Plumbing Piping and Equipment.
5. Horizontal Piping:
6. Trapeze Hangers:
   a. Multiple pipe runs where indicated supported on channels with rust resistant finish.
   b. Provide necessary rods and supporting steel.

7. Support Spacing:
   a. Provide support at minimum spacing per MSS SP-69-1996 Pipe Hangers and Supports - Selection and Application:
      1) Support piping within 2-feet of each change in direction.
      2) Steel Pipe, Copper Tubing:

Minimum Pipe Size	Maximum Span Steel	Maximum Span Copper	Maximum Span Pex A pipe with Pex a Pipe Channel	Rod Size
1-inch and smaller	7-feet	5-feet	6-feet	1/4-inch
1-1/4-inch to 2-inch	8-feet	8-feet	8-feet	3/8-inch
2-1/2-inch to 3-inch	11-feet	9-feet	8-feet	1/2-inch
4-inch to 5-inch	14-feet	12-feet	-	1/2-inch

      3) Building Attachments:
8. Fastening or attaching to steel deck (without concrete fill) is prohibited. It will be necessary to support piping from structural members, beams, joists, or provide intermediate angle iron supporting members between joists. Supports may be attached to concrete filled steel deck with load limitations shown on the structural drawings or otherwise obtained from the structural engineer.
9. Provide horizontal bracing on horizontal runs 1-1/2 inch and larger and exceeding 50-feet in length at 75-foot intervals and as required to provide stabilized piping systems.
10. Provide additional structural steel angles, channels, or other members required to support piping where structures do not occur as required for proper support.
11. Arrange supports to prevent eccentric loading of joists and joist girders. Locate supports at joist panel points.

END OF SECTION

SECTION 22 05 53

IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes:
   1. Valve Identification
   2. Piping Markers
   3. Equipment Identification

1.2 RELATED SECTIONS

A. Division 01, General Requirements

B. Division 22, Plumbing

1.3 SUBMITTALS

A. Submit the following:
   1. Valve Tag Directory: Submit for approval prior to fabrication of valve tags.
   2. Equipment Nameplate Directory: Submit for approval prior to fabrication.
   3. Operating and Maintenance Data: Include a copy of valve tag and equipment nameplate directories in each set of Operating and Maintenance manuals.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Piping Markers:
   1. W.H. Brady
   2. Seton
   3. Marking Systems, Inc. (MSI)
   4. Other Manufacturers: Submit substitution request.

2.2 VALVE IDENTIFICATION

A. Valve Tags:
   1. General: Identify valves with metal tags, legends to be stamped or embossed. Indicate function of the valve and its normal operating position.

56 HW	(NUMBER AND CONTENT OF PIPE)
ISOLATION	(VALVE FUNCTION)
NO	(NORMAL OPERATION POSITION)

   2. Size: Valve tags 2-inch diameter with 1/4-inch high letters.
   3. Material: Use 0.04-inch brass tags.
   4. Automatic Valves and Regulating Valves: Use 1/16-inch thick laminated 3-ply plastic, center ply white, outer ply red, lamicoid, or equal. Form letters by exposing center ply.

5. Buildings Systems: Contact the Owner for coordination with existing building tagging system and supplementary information required for specific systems before valve tagging begins.

B. Valve Tag Directory: Include tag number, location, exposed or concealed, service, valve size, valve manufacturer, valve model number, and normal operating position of valve.

2.3 PIPING MARKERS

A. Label pipes with all-vinyl, semi-rigid plastic or strap-on labels.

B. For pipes O.D. smaller than 3/4-inch and for valve and fitting identification, use valve tag.

C. For sizes from 3/4 to 1-1/4-inch outside diameter, 1/2-inch letters, 8-inch marker width.

D. For sizes from 1-1/2 to 2-inch outside diameter, 3/4-inch letters, 8-inch marker width.

E. For sizes from 2-1/2 to 6-inch outside diameter, 1-1/4-inch letters, 12-inch marker width.

F. Identify and color-code pipe markers as follows with directional arrows.

PLUMBING SERVICE	PIPE MARKER*	BACKGROUND/TEXT COLOR
COLD WATER	DOMESTIC COLD WATER	GREEN/WHITE
HOT WATER	DOMESTIC HOT WATER SUPPLY	GREEN/WHITE
	DOM. HOT WATER RECIRC	GREEN/WHITE
SANITARY WASTE	SANITARY WASTE	GREEN/WHITE
VENT	VENT	GREEN/WHITE
* Directional arrow applied adjacent to pipe marker indicating direction of flow.		
** Provide custom marker labels for piping for which no standard manufactured marker is available. Submit sample for approval.		

2.4 EQUIPMENT IDENTIFICATION

A. Nameplates:
1. 1/16-inch thick, 3-inch by 5-inch laminated 3-ply plastic, center ply white, outer ply black. Form letters by exposing center ply.
2. Identify unit with code number as shown on Drawings and area served.

B. Equipment Nameplate Directory:
1. List pumps and other equipment nameplates.
2. Include Owner and Contractor furnished equipment.
3. List nameplate designation, manufacturer's model number, location of equipment, area served or function, disconnect location, and normal position of HOA switch.

PART 3 EXECUTION

3.1 VALVE IDENTIFICATION

A. Valve Tags:
1. Attach to valve with a brass chain.

2. Continuous valve tag numbers throughout the building for each system. Obtain a list for each system involved from the Owner.

B. Valve Tag Directory: Post final copy in Operation and Maintenance Manual.

3.2 PIPING MARKERS

A. Unless recommendations of ANSI A13.1 are more stringent, apply labels or letters after completion of pipe cleaning, insulation, painting, or other similar work, as follows:
1. Every 20-feet along continuous exposed lines.
2. Every 10-feet along continuous concealed lines.
3. Adjacent to each valve, flange, and stub-out for future.
4. On pipe before and after wall, floor, and ceiling penetrations.
5. On pipe into and out of concealed spaces.
6. Adjacent to changes in pipe direction.
7. On each riser.
8. Adjacent to each leg of a T.
9. Locate conspicuously where visible. Position pipe labels on pipe to achieve the best visibility.
10. Provide pipe identification (over insulation) for reclaimed water systems in accordance with current local codes and rulings.
11. Apply labels or letters to lower quarters of the pipe on horizontal runs where view is not obstructed or on the upper quarters when pipe is normally viewed from above.

B. Apply arrow labels indicating direction of flow.

3.3 EQUIPMENT IDENTIFICATION

A. Nameplates: Attach to prominent area of equipment, either with sheet metal screws, brass chain, or contact cement as applicable.

B. Nameplate Directory: Post final copy in Operation and Maintenance Manual.

END OF SECTION

SECTION 22 07 00

INSULATION FOR PLUMBING

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes:
   1. Pipe Insulation
   2. Pipe Acoustical Wrap
   3. Accessories Piping

1.2 RELATED SECTIONS

A. Division 01, General Requirements

B. Division 22, Plumbing

C. Section 22 05 29, Hangers, Supports and Anchors for Plumbing

1.3 QUALITY ASSURANCE

A. Regulatory Requirements:
   1. Insulating products prohibited from containing pentabrominated, octabrominated and decabrominated diphenyl ethers. Where products within this specification contain these banned substances, provide complying products from approved manufacturers with equal performance characteristics.
   2. Flame and Smoke Ratings: Installed composite flame spread not to exceed 25 and smoke developed not to exceed 50 as tested by UL 723 or ASTM E84.
   3. Energy Codes: Local Building and Energy Codes govern where insulation performance requirements for thickness exceeds thickness specified.

B. Protection: Protect against dirt, water, chemical, or mechanical damage before, during, and after installation. Repair or replace damaged insulation at no additional cost.

C. Source Quality Control:
   1. Service: Use insulation specifically manufactured for service specified.
   2. Labeling: Insulation labeled or stamped with brand name and number.
   3. Insulation and accessories not to provide nutritional or bodily use to fungi, bacteria, insects, rats, mice, or other vermin. Asbestos free and no interaction with corrosively with equipment, piping, or ductwork.

1.4 SUBMITTALS

A. Submit the following.
   1. Product Data: For each type including density, conductivity, thickness, jacket, vapor barrier, and flame spread and smoke developed indices.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. General:
1. Johns Manville
2. Knauf
3. Owens Corning
4. CertainTeed
5. Such insulation by one manufacturer.
6. Other Manufacturers: Submit substitution request.

B. Pipe Insulation:
1. Fiberglass:
a. Johns Manville Microlok HP

2.2 PIPE INSULATION

A. Fiberglass: Split sectional or Snap-On type with 0.23 per inch maximum thermal conductivity (K-factor) at 75 degrees F mean temperature, 850 degrees F maximum service rating and white, vapor barrier jacket with pressure sensitive closure system.

2.3 ACCESSORIES PIPING

A. Adhesives:
1. General: Maximum Flame Spread/Smoke Developed Rating of 25/50, SCAQMD Rule 1168 compliant.
2. Fiberglass: Integral closure system.
3. Cements:
4. Insulating: Ryder.
5. Heat Transfer: Chemax Tracit-300.

B. Wire Mesh: 1-inch mesh with 20 gauge annealed steel wire.

C. Pipe Fitting Covers:
1. One piece PVC insulated pipe fitting covers.
2. Zeston, Ceel-Co.

D. Metal Pipe Jacket: 0.016-inch thick aluminum jacket with formed fitting covers, aluminum snap straps and sealant.

E. Cloth Facing: Presized fiberglass cloth.

F. Tapes:
1. Pressure sensitive, weather resistant, and for temperatures up to 150 degrees F.
2. Zeston Z-tape.

G. Paint: Ultraviolet resistant latex paint with special adherence capabilities to the PVC fitting covers, elastomeric, aluminum facing, Kraft paper, tapes, and adhesives.

PART 3 EXECUTION

3.1 GENERAL

A. Workmanship:
   1. Installation: Insulation installed in first class, neat professional manner.
   2. Applicators: Employed by firm that specializes in insulation work.

B. Preparation: Surfaces of piping and equipment clean, free of oil or dirt, and dry before insulation is applied.

C. Stamps: ASME stamps, UL labels, and similar stamps and labels are not covered.

3.2 PLUMBING PIPE AND EQUIPMENT INSULATION APPLIED LOCATIONS

A. Insulation Applied Locations – Plumbing Piping:

System	Pipe Size	Insulation Type	Insulation Thickness
Domestic Cold Water, Above Grade	1-1/4-inch and smaller	Fiberglass, all-purpose jacket	1-inch
Domestic Cold Water, Above Grade	Above 1-1/4-inch	Fiberglass, all-purpose jacket	1 1/2-inch
Domestic Hot Water Supply/Return, Above Grade	1-1/2-inch and smaller	Fiberglass, all-purpose jacket	1 1/2-inch
Domestic Hot Water Supply/Return, Above Grade	Above 1-1/2-inch	Fiberglass, all-purpose jacket	2-inch

B. The following piping is not insulated:
   1. Waste and vent.
   2. Domestic cold water runouts to single fixture less than 12-inch long and exposed supplies.
   3. Priming lines except where heat traced.

C. Insulation include the following:
   1. Fittings
   2. Valve Bodies
   3. Insulate valves and irregular fittings with section of pipe insulation and insulating cement, securely fastened, and finished with 6 oz. canvas and Foster 30-36 lagging adhesive.

D. Flanges, valves, strainers, not requiring a vapor barrier to insulate with removable replaceable pads fabricated of 1-inch layer of Pittsburgh Corning Temp Mat sandwiched between inner and outer layer of 8 oz. glass cloth held together with stainless staples with sufficient stainless lacing hooks to hold pad firmly to flange or valve with minimum 3-inch overlap onto adjacent pipe insulation using 18 gauge SS lacing wire.

3.3 PIPING INSTALLATION

A. General:
   1. Joints: Coat both sides of complete joining area with applicable adhesive.
      a. Longitudinal Joints: Make joints on top or back of pipe to minimize visibility. Except foam plastic, seal with closure system or 3-inch wide tape.

b. Butt Joints: Butt lightly together and, except for foam plastic, seal with 3-inch wide tape or butt straps.
c. Multiple Layered Insulation: Joints staggered.

2. Access: Strainer and other items requiring service or maintenance with easily removable and replaceable section of insulation to provide access.
3. Voids:
   a. Fill voids, chipped corners and other openings with insulating cement or material compatible with insulating material.
   b. In insulation with heat tracing where piping is shown or specified to be heat traced, bed heat tape into heat transfer cement with insulation over heat tape and cement.
4. Seal joints, seams, and fittings of metal watertight jackets at exterior locations.

B. Fiberglass Insulation: Exterior insulation encased in metal jacket.

C. Fittings: Insulation specified with continuous vapor barrier, the vapor barrier must not be violated.
1. On Elastomeric Insulation: Fittings covered with covers made up of mitered sections of insulation or with formed pipe fitting covers.
2. In Other Insulation: Fittings covered with insulation to the same level of the adjoining insulation or fill with insulating cement. Finish with pipe fitting covers or cloth facing and tape.

D. Unions, Mechanical Joints, Valves, Etc.:
1. General:
   a. As specified for fittings.
   b. Minimum thickness same as specified for piping.
2. Unions: Build up insulation at least 1/2-inch beyond adjoining insulation.
3. Flanges: With square corners. Where flanges are not insulated, terminate adjacent insulation so flange bolts can be removed.
4. Flanged Valves: Insulation with square corners.

E. Vapor Barrier Insulation:
1. Refer to Section 22 05 29, Hangers, Supports, and Anchors for Plumbing for support requirements.
2. Piping which requires vapor barrier protection of continuous vapor barrier, which may not be pierced or broken. The following piping systems require vapor barrier protection:
   a. Domestic cold water.
   b. Other piping systems with a nominal operating temperature below 65 degrees F.
3. Vapor Barrier Insulation:
   a. Insulation for pipe requiring vapor barrier protection 1-1/4-inch or smaller, insulation continuous through pipe hangers and rollers.
   b. For pipe 1-1/2-inch and larger, 18-inch section of calcium silicate, same thickness as pipe insulation with continuous vapor barrier jacket at each hanger or roller. Provide pipe shield specified in Section 22 05 29, Hangers, Supports, and Anchors for Plumbing.

F. Non-Vapor Barrier Insulation:
1. Refer to Section 22 05 29, Hangers, Supports, and Anchors for Plumbing for support requirements.
2. At contractor's option, insulation may be interrupted at supports. Butt insulation tight to support.
3. If contractor elects to continue insulation at supports, installation as specified for piping systems with vapor barrier installation.
4. Void between saddle and pipe filled with insulation.

G. Acoustical Wrap:
   1. Install in accordance with the manufacturer's instructions.
   2. Applied locations for piping systems where specified or indicated on drawings.

3.4 EQUIPMENT INSTALLATION

A. General: Install true and smooth. Insulation over curved surfaces conform to curves of surface.
   1. Access:
      a. Insulated removable heads, water boxes, pump casings, access, etc., that require service, inspection or maintenance provided with covers or section that are easily removable and replaceable.
      b. Reinforce openings in adjacent insulation with metal beading. In vapor barriered insulation, coat joints with vapor barrier mastic.
   2. Voids, Depressions and Cavities: Fill voids, chipped corners, and other openings with insulating cement or material compatible with insulating material.
   3. Vapor Barrier Insulation: Barrier not to be pierced or broken.
      a. Coat defects with vapor barrier mastic and patched with insulation facing or tape.
      b. Staples brush coated with vapor barrier coating.
      c. Cover raw edges coated with vapor barrier mastic sealed to equipment surface.
   4. Non-Vapor Barriered Insulation:
      a. Patch tears with insulation facing or tape.
      b. Cover and neatly bevel raw edges to equipment surface.
   5. Multilayered Insulation: With staggered joints.

3.5 FIELD QUALITY CONTROL

A. Field Test: Test and approve systems prior to installation of insulation.

B. Existing Insulation:
   1. Repair existing insulation damaged during construction.
   2. Make neat connections where new and existing insulation meet.
   3. Where existing piping, or equipment is removed, cover existing surfaces neatly to match existing.

END OF SECTION

SECTION 22 21 13

PIPE AND PIPE FITTINGS PLUMBING

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes:
   1. Cast Iron Soil Pipe, Service Weight (No-Hub)
   2. Black Steel Pipe, Schedule 40
   3. Copper Pipe
   4. Flanged Joints
   5. Unions
   6. Solder and Brazing

1.2 RELATED SECTIONS

A. Division 01, General Requirements

B. Division 22, Plumbing

C. Section 22 05 29, Hangers, Supports, and Anchors for Plumbing

D. Section 22 05 23, General Duty Valves for Plumbing

1.3 QUALITY ASSURANCE

A. Regulatory Requirements:
   1. Piping material and installation to meet requirements of the local plumbing, fire, and building codes and serving utility requirements.
   2. Provide chlorination of domestic cold and hot water piping in accordance with County and State health requirements.

B. Grooved Joint Couplings and Fittings:
   1. Products of a single manufacturer.
   2. Grooving tools of the same manufacturer as the grooved components.
   3. Castings used for coupling housings, fittings, valve bodies, etc., date stamped for quality assurance and traceability.

C. Pipe Cleaning: If pipe gets plugged or should foaming of water systems occur, disconnect piping, reclean, and reconnect without additional expense to the Owner.

D. Correct damages to the building or systems resulting from failure to properly clean the system without additional expense to the Owner.

E. Products with a wetted surface installed in potable water systems UL classified in accordance with ANSI / NSF-61 for Drinking Water System components, ANSI/NSF-14 for Plastic Piping System Components and certified to the low lead requirements of NSF-372.

1.4 SUBMITTALS

A. Submit the following:
   1. List of piping materials indicating the service it is being used for. (Do not submit piping product data).
   2. Product data on mechanical couplings and related components, double wall fuel oil pipe and fittings, and polypropylene waste and vent pipe.

B. Test Reports and Certificates: Submit certificates of inspections and pipe tests to Owner.

C. Other: Make certified welders' certificates available.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. As indicated.

2.2 CAST IRON SOIL PIPE, SERVICE WEIGHT (NO-HUB)

A. General: A code approved hubless system conforming to Cast Iron Soil Pipe Institute Standard 301.

B. Pipe and Fittings:
   1. Service weight hubless cast iron conforming to ASTM A 888, marked with the collective trademark of the Cast Iron Soil Pipe Institute (CISPI) and listed by NSF International.
   2. Manufacturers:
      a. Tyler
      b. AB&I
      c. Charlotte

C. Gaskets: Compression type conforming to ASTM C 564.

D. Above Grade Couplings: Band type coupling in conformance with Cast Iron Soil Pipe Institute (CISPI) 310-90, consisting of stainless steel clamp, and corrugated shield assemblies with a neoprene sealing sleeve ANSI A21.6, ANSI A21.10 Fittings.
   1. Service:
      a. Sanitary, storm, and overflow drain.
      b. Vent piping 2 inches and above.

2.3 BLACK STEEL PIPE, SCHEDULE 40

A. General:
   1. Fittings and joints must be UL listed for use with pipe chosen for use.
   2. Listing restrictions and installation procedures per state and local authorities must be followed.

B. Pipe: Schedule 40 conforming to ASTM A 135 or A 53.

C. Fittings:
   1. 150 pound screwed malleable iron on 2 inches and below, Schedule 40 welding fittings conforming to ASTM A 234 for 2-1/2 inches and above or mechanical couplings on select piping as herein specified.

2. Welded below grade fittings.
3. Long radius type elbows on pumped systems.
4. Short radius elbows not acceptable for use except as approved on a case by case basis.

D. Service:
1. Natural gas piping and vent lines.

2.4 COPPER PIPE

A. Pipe: Hard drawn copper tubing, Class L or K, ASTM B 88.

B. Fittings:
1. Wrought copper, 150 psi; ANSI B16.22 for soldered joints, ANSI B16.50 for brazed joints; Chase, Revere, Mueller or approved equal.
2. System using mechanically extracted collars in main with branch line inserted to not obstruct flow may be used on domestic water piping above ground, similar to T-drill.

C. Service:
1. Domestic hot and cold water piping above ground (Type L, hard drawn) on piping 4 inches and smaller.

2.5 FLANGED JOINTS

A. Cast iron or steel for screwed piping and forged steel welding neck for welded line sizes.

B. Pressure rating and drilling to match apparatus, valve, or fitting to which they are attached.

C. ANSI B16.1; 150 pounds for system pressures to 150 psig; 300 pounds for system pressures 150 psig to 400 psig.

D. Gaskets
1. Flanged services, except steam and pumped condensate, Garlock 3700 or equal, 1/8-inch thick, non-metallic type.
2. Steam and pumped condensate Flexitaulic Style CG or equal, 1/8-inch thick, semi-metallic type.

E. Make joint using American Standard hexagon head bolts, lock washers, and nuts (per ASTM A307 GR.B) for service pressures to 150 psig; alloy steel stud bolts, lock washer, and American Standard hexagon head nuts (per ASTM A307 GR.B) for service pressures 150 psig to 400 psig.

F. Use length of bolt required for full nut engagement.

G. Provide electro-cad plated bolts and nuts on cold and chilled water lines.

2.6 UNIONS

A. 150 psi malleable iron, brass to iron seat, ground joint, black or galvanized to match pipe. 200 psi WOG bronze, ground joint, solder type for copper tubing.
1. Unions or flanges for servicing or disconnect are not required in installations using grooved mechanical joint couplings. Couplings serve as disconnect points.

B. Dielectric fittings nationally listed, have a dielectric thermoplastic interior lining, and meet requirements of ASTM F1545. Fittings suitable for the pressure and temperature to be encountered.

2.7 SOLDER AND BRAZING

A. Brazed Joints:
   1. Wrought Copper Piping Fittings: Westinghouse Phos-Copper or Dyna-Flow by J.W. Harris Co., Inc.
   2. Applied locations:
      a. Below grade piping.
      b. Above grade piping larger than 2-inches for the following services: Industrial cold water, domestic hot and cold water, and pumped waste.
      c. Oxygen, nitrous oxide, carbon dioxide, medical vacuum, lab vacuum and lab air. Braze in accordance with Copper Development Association Copper Tube Handbook using BCUP series filler material.
      d. Joints in Domestic Hot and Cold Water Piping: Use mechanically extracted collars. Braze in accordance with Copper Development Association Copper Tube Handbook using BCUP series filler material.
      e. Solar hot water.

B. Soldered Joints:
   1. Wrought Copper Pipe Fittings: All-State 430 with Duzall Flux, Engelhard Silvabrite with Engelhard General Purpose Flux or J.W. Harris Co.
   2. Valves, Cast Fittings or Bronze Fittings: Harris Stay-Silv-15 or Handy & Harmon Sil-Fos.
   3. Applied locations: Above grade piping 2-inch and smaller for the following services: Industrial cold water, domestic hot and cold water, pumped waste, trap priming lines.

PART 3 EXECUTION

3.1 PREPARATION

A. Measurements, Lines and Levels:
   1. Check dimension at the building site and establish lines and levels for work specified in this Section.
   2. Establish inverts, slopes, and manhole elevations by instrument, working from an established datum point. Provide elevation markers for use in determining slopes and elevations in accordance with Drawings and Specifications.
   3. Use established grid and area lines for locating trenches in relation to building and boundaries.

3.2 PIPING INSTALLATION

A. Install unions in non-flanged piping connections to apparatus and adjacent to screwed control valves, traps, and appurtenances requiring removal for servicing so located that piping may be disconnected without disturbing the general system.

B. Install piping as to vent and drain. Install according to manufacturer's recommendations.

C. Support piping independently at apparatus so that its weight not carried by the equipment.

D. Dielectric Fittings:
   1. Provide dielectric couplings, unions, or flanges between dissimilar metals.
   2. Provide dielectric couplings as required to isolate cathodically protected piping and equipment.

E. No-Hub Couplings: Install per manufacturer's instructions.

3.3 PIPING JOINTS

A. Pipe and fittings joined using methods and materials recommended by manufacturer in conformance with standard practice and applicable codes. Cleaning, cutting, reaming, grooving, etc. done with proper tools and equipment. Hacksaw pipe cutting prohibited. Peening of welds to stop leaks not permitted.

B. Copper Piping:
   1. Pipe cut evenly with cutter, ream to full inside diameter; end of pipe and inside of fitting thoroughly cleaned and polished.
   2. Joints uniformly heated, and capillary space completely filled with solder or braze material, leaving full bead around entire circumference.

C. No couplings installed in floor or wall sleeves.

D. Steel Piping:
   1. Screwed Joints:
      a. Pipes cut evenly with pipe cutter reamed to full inside diameter with burrs and cuttings removed.
      b. Joints made up with Teflon liquid dope or Teflon tape applied to male threads only, leaving two threads bare.
      c. Joints tightened so that not more than two threads are left showing.
      d. Junctions between galvanized steel waste pipe and bell of cast iron pipe made with tapped spigot or half coupling on steel pipe to form spigot end and caulked.
   2. Flanged Joints:
      a. Pressure rating of flanges match valve or fitting joined.
      b. Joint gaskets coated with graphite and oil.

E. Above Grade No-Hub Couplings: Install in accordance with manufacturer recommendations.

3.4 ADJUSTING AND CLEANING

A. General:
   1. Clean interior of piping before installation.
   2. Flush sediment out of piping systems after installation before connecting plumbing fixtures to the piping.
   3. Clean strainers prior to placing in service.

3.5 INSTALLATION, NATURAL GAS PIPING

A. Install piping where shown on Drawings.

B. Black Steel Pipe:
   1. Arc-weld joints by certified welders as outlined above.
   2. On piping below grade install protective pipe wrap after testing and prior to backfilling in accordance with the manufacturer's recommendations. Overlap one-half spiral lap for double thickness.
   3. Piping installed under building floor slabs in vented sleeve per code.

END OF SECTION

SECTION 22 40 00

PLUMBING FIXTURES

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes:
   1. Fixture Trim
   2. Plumbing Fixtures
   3. Drainage Products
   4. related sections

B. Division 01, General Requirements

C. Division 22, Plumbing

1.2 QUALITY ASSURANCE

A. Water Closets: Maximum Performance (MaP) score of no less than 800

B. Faucets: Certify to NSF/ANSI 61 and California AB1953

C. Electric Water Coolers and Drinking Fountains: Certified to NSF/ANSI 61 and California AB1953

D. SUBMITTALS

E. Submit the following:
   1. Product data for each item specified.
   2. Operating and Maintenance Data:
      a. Mounting heights for fixtures.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers are stated for each fixture specified. The following manufacturers are also acceptable, except when indicated only.

B. Fixture Trim:
   1. Supply Stops:
      a. Chicago
      b. NPT McGuire (LK series)
      c. Brasscraft (SCR series)
   2. Traps:
      a. McGuire
      b. Kenney
      c. Brasscraft

3. Support Rims:
    a. Hudee
4. Vacuum Breakers:
    a. Chicago Faucet
    b. A.W. Cash
    c. Febco, chrome plated

C. Fixtures:
1. Bradley
2. American Standard
3. Kohler
4. Sloan
5. Toto

D. Mixing Valves:
1. Powers
2. Leonard
3. Symmons
4. Chicago

E. Faucets:
1. Chicago
2. Delta Commercial
3. Kohler
4. Symmons
5. Moen Commercial

F. Shock Arrestors:
1. PPP
2. J.R. Smith

G. Trap Primer Stations:
1. PPP

H. Exposed Waste and Supply Piping Insulation Kits:
1. Truebro
2. McGuire

I. Other Manufacturers: Submit substitution request.

2.2 FIXTURE TRIM

A. Supply Stops: Chicago cast brass rigid riser supplies with loose key angle stops, wall flanges, NPT female inlet, chrome plate finish; equivalent NPT McGuire (LK series), Brasscraft (SCR series), or NPT stops by fixture supplier.

B. Traps:
1. For floor drains, provide coated cast iron P-trap; recessed, screw jointed or bell and spigot.

2. For other fixtures, provide 17 gauge, chrome plated cast brass P-Traps with solder bushings, and clean-out.

C. Support Rims: Hudee stainless steel rims, if sink not furnished with integral rim.

D. Vacuum Breakers:
1. Chicago Faucet
2. A.W. Cash
3. Febco, chrome plated

2.3 PLUMBING FIXTURES

A. WS-1 Wash Station (ADA):
1. Bradley, Model MG series, 2 station, wall-hung, equipped with Chicago 802-V665ABCP faucets with polished chrome plated solid brass body construction, 4-inch spout, vandal proof metering push handles, 2.2 gpm pressure compensating aerator, adjustable cycle time closure cartridge, vandal resistant complete.
2. Mixing Valve (Point-of-Use):
3. Leonard 270 series thermostatic point-of-use mixing valve.
4. ASSE 1070 certified.
5. Bronze body.
6. Locked temperature adjustment cap (vandal resistant).
7. Integral check valves on hot and cold inlets.
8. Minimum flow 0.5 GPM.
9. Maximum flow 3.5 GPM at 5 PSI loss.

B. Exposed Waste and Supply Piping Insulation Kits: McGuire Prowrap insulation kit for exposed supplies and waste piping below ADA lavatories and ADA sinks.

PART 3 EXECUTION

3.1 FIXTURE TRIM

A. Provide plumbing fixture trim where applicable on fixtures, including but not limited to supply stops, traps, support rims, flush valve, and vacuum breakers.

B. Provide rough-in and final piping connection to fixtures. Carefully review all construction documents to assure that all fixtures are provided with necessary services for a complete operating system.

C. Rigidly secure rough-in piping, carriers and supports, and other service piping to structure.

3.2 PLUMBING FIXTURES

A. Americans with Disabilities Act:
1. Those fixtures indicated by ADA complies with and be installed in accordance with Americans with Disabilities Act Guidelines (ADAAG). Where applicable building code requirements are more stringent than ADAAG guidelines, building code requirements followed.
2. Lavatories:
   a. Mounting height of ADA lavatories at a maximum height of 34 inches from floor to rim.
   b. Provide insulation kits on exposed hot water and waste piping beneath ADA lavatories.

B. Fixture Mounting Heights: Fixtures standard rough-in catalogued heights unless shown otherwise on the Architectural Drawings.

C. Water Supplies: When both hot and cold water to a fixture is required, connect the hot on the left and the cold on the right.

D. Floor Mounted Supports and Chair Carriers:
   1. Secure floor mounted supports and chair carriers to slab with a minimum of 1/2-inch bolts.
   2. Install supports and carriers per manufacturer's installation instructions.

E. Mixing Valves: Provide piping connections per manufacturer's installation instructions.

END OF SECTION

SECTION 23 05 00

COMMON WORK RESULTS FOR HVAC

PART 1 GENERAL

1.1 SUMMARY

A. The intent of Division 23, HVAC Specifications and the accompanying Drawings is to provide a complete and workable facility with complete systems as shown, specified and required by applicable codes. Include work specified in Division 23, HVAC and shown on the accompanying Drawings, including appurtenances, connections, etc., in the finished job.

B. The Drawings that accompany the Division 23, HVAC Specifications are diagrammatic. They do not show every offset, bend, tee, or elbow which may be required to install work in the space provided and avoid conflicts. Offsets and transitions assumed at a minimum at each duct crossing, structural penetrations through shear walls or beams, structural grids where ceiling heights are restricted, and at piping mains. Follow the Drawing as closely as is practical to do so and install additional bends, offsets and elbows where required by local conditions from measurements taken at the Building, subject to approval, and without additional cost to the Owner. The right is reserved to make any reasonable changes in outlet location prior to roughing-in, without cost impact.

C. The General and Supplemental Conditions apply to this Division, including but not limited to:
   1. Drawings and specifications.
   2. Public ordinances, permits.
   3. Include payments and fees required by governing authorities for work of this Division.

D. Division 01, General Requirements, General Requirements, applies to this Division.

1.2 RELATED SECTIONS

A. Division 01, General Requirements

B. Division 23, Heating, Ventilating, and Air Conditioning (HVAC)

1.3 QUALITY ASSURANCE

A. Regulatory Requirements:
   1. Products and equipment prohibited from containing pentabrominated, octabrominated, and decabrominated diphenyl ethers. Where products or equipment within this specification contain these banned substances, provide complying products and equipment from approved manufacturers with equal performance characteristics.
   2. General: Work and materials conforms to the local and State codes, and Federal, State and other applicable laws and regulations.
   3. Contractor responsible for obtaining and payment for permits, licenses, and inspection certificates required in accordance with provisions of Contract Documents.

B. New materials and equipment. Work of good quality, free of faults and defects and in conformance with the Contract Documents.

C. Apparatus built and installed to deliver its full rated capacity at the efficiency for which it was designed.

D. The entire mechanical system and apparatus operates at full capacity without objectionable noise or vibration.

E. Install equipment level and true. Housekeeping pads and curbs account for floor or roof slope.

F. Materials and Equipment:
1. Each piece of equipment furnished meet detailed requirements of the Drawings and Specifications and suitable for the installation shown. Equipment not meeting requirements will not be acceptable, even though specified by name along with other manufacturers.
2. Where two or more units of the same class of equipment are furnished, use products of the same manufacturer. Component parts of the entire system need not be products of same manufacturer.
3. Furnish materials and equipment of size, make, type, and quality herein specified.
4. Equipment scheduled by performance or model number considered the basis of the design. If other specified manufacturer's equipment is provided in lieu of the basis of design equipment the contractor is responsible for changes and costs which may be necessary to accommodate this equipment, including different sizes and locations for connections, different electrical characteristics, different dimensions, different access requirements, or any other differences which impact the project.

G. Workmanship:
1. General: Install materials in a neat and professional manner.
2. Manufacturer's Instructions:
   a. Follow manufacturer's directions where they cover points not specifically indicated.
   b. If conflict with the Drawings and Division 23, HVAC Specifications, obtain clarification before starting work.

H. Cutting and Patching:
1. Cutting, patching, and repairing for the proper installation and completion of the work specified in this Division including plastering, masonry work, concrete work, carpentry work, and painting performed by skilled craftsmen of each respective trade in conformance with the appropriate Division of Work.
2. Additional openings required in building construction made by drilling or cutting. Use of jackhammer is specifically prohibited.
3. Fill holes which are cut oversize so that a tight fit is obtained around the sleeves passing through.
4. Do no pierce beams or columns without permission of Architect and then only as directed.
5. Restore new or existing work cut or damaged to its original condition. Where alterations disturb lawns, paving, walks, etc., surfaces repaired, refinished, and left in condition existing prior to commencement of work.

1.4 SUBMITTALS

A. Shop Drawings:
1. The Contract Drawings indicate the general layout of the piping, ductwork, and various items of equipment. Coordination with other trades and with field conditions will be required. For this purpose, prepare Shop Drawings of piping, ductwork, and equipment installations. Shop Drawings new drawings prepared by Contractor and not reproductions or tracings of Architect's Drawings. Overlay drawings with shop drawings of other trades and check for conflicts. Drawings the same size as Architect's Drawings with title block similar to Contract Drawings and identifying Architect's

Drawing number or any reference drawings. Drawings fully dimensioned including both plan and elevation dimensions. Shop drawings cannot be used to make scope changes.

2. Prepare in two-dimensional format.
3. Include but are not limited to:
    a. Complete floor plans with sheet metal and HVAC piping to a minimum of 1/4-inch equals 1-foot scale.
    b. Sheet metal and HVAC piping of mechanical and fan rooms to a minimum of 1/2-inch equals 1-foot scale.
    c. Sections of congested areas to a minimum of 1/2-inch equals 1-foot scale.
    d. Controls and Instrumentation: Scale and drawing sizes to suit controls supplier.
    e. Fabricated Equipment: Scale and drawing sizes to suit contractor except equipment not less than 1/4-inch equals 1-foot scale.
    f. Beam penetration drawings indicating beam penetrations meeting the requirements indicated on the floor plans and on the structural drawings to a minimum of 1/4-inch equals 1-foot scale.
    g. Slab penetration drawings of HVAC, plumbing, sprinklers, lighting and electrical to a minimum of 1/4-inch equals 1-foot scale.
    h. Submit shop drawings for review prior to beginning fabrication. Additional shop drawings may be requested when it appears that coordination issues are not being resolved in the field or when there is a question as to whether contract documents are being complied with or the design intent is being met.

B. Product Data:
1. In general, submit product data for review on scheduled pieces of equipment, on equipment requiring electrical connections or connections by other trades, and as required by each specification section or by Drawing notes. Include manufacturer's detailed shop drawings, specifications, and data sheets. Data sheets include capacities, RPM, BHP, pressure drop, design and operating pressures, temperatures, and similar data. Manufacturer's abbreviations or codes are not acceptable.
2. List the name of the motor manufacturer and service factor for each piece of equipment.
3. Indicate equipment operating weights including bases and weight distribution at support points.
4. In the case of equipment such as wiring devices, time switches, valves, etc., specified by specific catalog number, a statement of conformance will suffice.

C. Submission Requirements:
1. Shop Drawings and Product Data:
    a. Refer to Division 01, General Requirements for additional requirements related to submittals.
    b. Submit electronic copies of shop drawings and product data for Work of Division 23, HVAC in PDF format with each item filed under a folder and labeled with its respective specification section number, Article and paragraph and mark if applicable.
    c. Include a complete index in the original submittal. Indicate both original items submitted and note stragglers that will be submitted at a later date to avoid delay in submitting.
    d. The bulk of the shop drawings and product data, excepting Controls and Instrumentation, included with the original submittal. Controls and Instrumentation submittals may lag but complete when submitted. Partial submittals will not be accepted. Other stragglers submitted after return of the original binder includes a tab similar to that originally submitted. Upon receipt of the returned late submittal, insert them in the previously submitted binder.

D. Contractor Responsibilities:
1. Submit submittals one time and are in proper order.
2. Ensure that equipment will fit in the space provided.
3. Assure that deviations from Drawings and Specifications are specifically noted in the submittals. Failure to comply will void review automatically.

1.5 AS-BUILT DRAWINGS

A. Record Drawings: Provide hard copies and pdf format.
   1. Drawings include the following:
      a. Project Specific Titleblock.
      b. Notations reflecting the as built conditions of any additions to or variations from the construction documents provided as part of the BIM coordination, RFIs, ASIs, Owner Changes, and Field Coordination.

1.6 OPERATING AND MAINTENANCE MANUAL, PARTS LISTS, AND OWNER'S INSTRUCTIONS

A. Refer to Division 01, General Requirements for additional requirements.

B. Submit three bound copies of manufacturer's operation and maintenance instruction manuals and parts lists for each piece of equipment or item requiring servicing. Literature on 8-1/2-inch by 11-inch sheets or catalogs suitable for side binding. Submit data when the work is substantially complete, packaged separately, and clearly identified in durable 3-ring binder. Include name and contact information for location of source parts and service for each piece of equipment. Clearly mark and label in each submittal, the piece of equipment provided with the proper nameplate and model number identified. Provide wiring diagrams for electrically powered equipment.

C. Instruct Owner thoroughly in proper operation of equipment and systems, in accordance with manufacturer's instruction manuals. Operating instructions cover phases of control.

1.7 PROJECT CONDITIONS

A. Existing Conditions:
   1. Prior to bidding, verify and become familiar with existing conditions by visiting the site, and include factors which may affect the execution of this Work.
   2. Include related costs in the initial bid proposal.

B. Coordinate exact requirements governed by actual job conditions. Check information and report discrepancies before fabricating work. Report changes in time to avoid unnecessary work.

C. Coordinate shutdown and start-up of existing, temporary, and new systems and utilities. Notify Owner, the City, and Utility Company.

1.8 WARRANTY

A. Provide a written guaranty covering the work of this Division (for a period of one calendar year from the date of acceptance by the Owner) as required by the General Conditions.

B. Provide manufacturer's written warranties for material and equipment furnished under this Division insuring parts and labor for a period of one year from the date of Owner acceptance of Work of this Division.

C. Correct warranty items promptly upon notification.

1.9 TEST REPORTS AND CERTIFICATES

A. Submit one copy of test reports and certificates specified herein to the Architect.

1.10 SUBSTITUTIONS

A. Submit requests for product substitutions in accordance with the Instructions to Bidders and the General and Supplemental Conditions.

PART 2 PRODUCTS

2.1 ACCESS PANELS

A. Furnish under this Division as specified in another Division of work.

2.2 PIPE AND DUCT SLEEVES

A. Interior Wall and Floor Sleeves: 18 gauge galvanized steel, or another pre-approved system.

B. FLOOR, WALL AND CEILING PLATES

C. Furnish stamped split type plates as follows:
   1. Floor Plates: Cast brass, chromium plated.
   2. Wall and Ceiling Plates: Spun aluminum.

2.3 MACHINERY GUARDS

A. Furnish guards for protection on rotating and moving parts of equipment. Provide guards for metal fan drives and motor pulleys, regardless of being enclosed in a metal cabinet.

B. Design guards so as not to restrict air flow at fan inlets resulting in reduced capacity.

C. Provide shaft holes in guards for easy use of tachometers at pulley centers. Guards easily removable for pulley adjustment or removal and changing of belts.

D. Guards meet OSHA requirements including back plates.

E. Provide inlet and outlet screens on fans in plenums or where exposed to personnel.

2.4 ELECTRICAL EQUIPMENT

A. General: Equipment and installed work as specified under Division 26, Electrical.

B. Coordinate with the electrical Drawings and electrical contractor for minimum electrical equipment bracing requirements based on the available fault current rating at the bus of the panelboard or switchboard serving the piece of equipment. Provide equipment with a Short Circuit Current Rating (SCCR) that meets the bracing requirement.

C. Motors – AC Induction:
1. Furnish as integral part of driven equipment.
2. Drip proof induction type with ball bearings unless noted otherwise.
3. Motors 1 hp and above premium energy efficient type, except for emergency equipment motors.
4. Built to NEMA Standards for the service intended.
5. Rated for voltage specified, suitable for operation within the range of 10 percent above to 10 percent below the specified voltage.
6. Energy Efficient Motors:
   a. Baldor
   b. Westinghouse
   c. General Electric
   d. Or approved equal.
7. Motors meet the efficiency standards identified in the table below as determined using the IEEE Method B test at full load.

MINIMUM MOTOR EFFICIENCIES					
		RPM IEEE 112B Efficiency			
HP	KW	900	1200	1800	3600
1	0.75	--	82.5	85.5	80.0
1.5	1.15	--	86.5	86.5	85.5
2	1.53	--	87.5	86.5	86.5
3	2.3	84.0	89.5	89.5	88.5
5	3.8	85.5	89.5	89.5	89.5

8. Refer to Equipment Schedules on the Drawings for motor horsepower, voltage, and phase.
9. Refer to individual product sections for additional motor requirements.
10. Furnish motors on belt drive equipment of nominal nameplate horsepower not less than 120 percent of equipment brake horsepower required for performance specified.
11. Built-in thermal overload protection, or be protected externally with separate thermal overload devices with low voltage release or lockout. Hermetically sealed motors have quick trip devices.
12. Motors controlled by variable frequency drives inverter duty rated and have Class F insulation or better. Withstand repeated voltage peaks of 1600V with rise times of 0.1 microseconds and greater in accordance with NEMA Standard MG1 Part 31.
13. Motors served from variable frequency drives equipped with shaft grounding system which provide a path for current to flow between the shaft and motor frame. SGS or equal.
14. Motors located in environment air plenums not tied to air handling functions totally enclosed type motors.
15. Motors – Electronic Commutation (EC):
16. Furnished as integral part of driven equipment.
17. Permanently lubricated with ball bearings unless noted otherwise.
18. Internal motor circuitry converts AC power supplied to the motor to DC power to operate the motor.
19. Speed controllable down to 20 percent of full speed.
20. Motor efficiency at a minimum of 85 percent at all speeds.
21. Refer to Equipment Schedules on the Drawings for motor horsepower, voltage, and phase.
22. Refer to individual product sections for additional motor requirements.
23. Built-in thermal overload protection, or be protected externally with separate thermal overload devices with low voltage release or lockout. Quick trip devices hermetically sealed motors.
24. Starters: Provided under Division 26, Electrical, suitable for performing the control functions required, with the exception of self-contained equipment and where the starters are furnished as part of the control package.

D. Equipment Wiring:
   1. Interconnecting wiring within or on a piece of mechanical equipment provided with the equipment unless shown otherwise.
   2. This does not include the wiring of motors, starters and controllers provided under Division 26, Electrical.

E. Control Wiring: Control wiring for mechanical equipment provided under Section 23 09 00, Instrumentation and Controls for HVAC.

F. Codes: Electrical equipment and products bear the UL label as required by governing codes and ordinances.

PART 3 EXECUTION

3.1 ACCESS PANELS

A. Install in accord with manufacturer's recommendations, coordinated with architectural features.

B. Provide 2-hour fire rated doors where required bearing the UL label.

C. Furnish 18-inch by 18-inch panels for ceilings and for access to equipment in soffits and shafts, and 12-inch by 12-inch for walls unless indicated otherwise.

D. Furnish where indicated and where required to access valves, fire/smoke dampers, trap primers, shock arresters, and other appurtenances requiring operation, service or maintenance. Submit proposed locations for review prior to installation.

3.2 SLEEVES

A. Interior Floor and Wall Sleeves:
   1. Provide sleeves large enough to provide 3/4-inch clearances around pipe or ductwork.
   2. Where pipe or ductwork is insulated, provide sleeve large enough to provide 3/4-inch clearance around insulation. Maintain continuous insulation as it passes through sleeve.
   3. Penetrations through mechanical room and fan room floors watertight by packing with safing insulation and sealing with Tremco Dymeric Sealant or approved system.

B. Exterior Wall Sleeves Above Grade: Similar to interior wall sleeves except caulk outside with Tremco Dymeric Sealant.

C. Layout work prior to concrete forming. Do cutting and patching required. Reinforce sleeves to prevent collapse during forming and pouring.

D. Floor sleeves maintain a water barrier by providing a water tight seal or they extend 1-inch above finished floor except through mechanical equipment room floors and shafts where sleeves extend 2-inches above finished floor level. Sleeves through roof extend 8-inches above roof. Wall sleeves flush with face of wall unless otherwise indicated.

E. Do not support pipes by resting pipe clamps on floor sleeves. Supplementary members provided so pipes are floor supported.

F. Special sleeves detailed on drawings take precedence over this section.

3.3 CLEANING

A. General: Clean mechanical equipment, piping and ductwork of stampings and markings (except those required by codes), iron cuttings, and other refuse.

B. Painted Surfaces: Clean scratched or marred painted surfaces of rust or other foreign matter and paint with matching color industrial enamel, except as otherwise noted.

C. Additional requirements are specified under specific Sections of this Division.

3.4 EQUIPMENT PROTECTION

A. Keep pipe, ductwork, and conduit openings closed by means of plugs or caps to prevent the entrance of foreign matter. Protect piping, conduit, ductwork, equipment, and apparatus against dirty water, chemical or mechanical damage both before and after installation. Restore damaged or contaminated fixtures, equipment, or apparatus to original conditions or replace at no cost to the Owner.

B. Protect bright finished shafts, bearing housings, and similar items until in service. No rust will be permitted.

C. Cover or otherwise suitably protect equipment and materials stored on the job site.

3.5 ACCESSIBILITY

A. General: Locate valves, thermometers, cleanout fittings and other indicating equipment or specialties requiring frequent reading, adjustments, inspection, repairs, and removal or replacement conveniently and accessibly with reference to the finished building.

B. Thermometers and Gauges: Install thermometers and gauges so as to be easily read from the floors, platforms, and walkways.

3.6 FLOOR, WALL, AND CEILING PLATES

A. Install on piping and ductwork passing through finished walls, floors, ceilings, partitions, and plaster furrings. Plates completely cover opening around pipe and duct.

B. Secure wall and ceiling plates to pipe, insulation, or structure.

C. Plates not penetrate insulation vapor barriers.

D. Plates not required in mechanical rooms or unfinished spaces.

3.7 PAINTING

A. General:
   1. Coordinate painting of mechanical equipment and items with products and methods in conformance with the appropriate Division of Work, Painting.

2. Exposed work under this Division receives either a factory painted finish or a field prime coat finish, except:
   a. Exposed copper piping.
   b. Aluminum jacketed outdoor insulated piping.

B. Equipment Rooms and Finished Areas:
1. Insulation: Not painted.
2. Hangers, Uninsulated Piping, Miscellaneous Iron Work, Structural Steel Stands, Uninsulated Tanks, and Equipment Bases: Paint one coat of black enamel.
3. Steel Valve Bodies and Bonnets: One coat of black enamel.
4. Brass Valve Bodies: Not painted.
5. Equipment:
   a. One coat of grey machinery enamel.
   b. Do not paint nameplates.
6. Grilles, Diffusers, Registers: Paint sheet metal and visible ductwork behind grilles, diffusers, and registers flat black.

C. Concealed Spaces (above ceilings, not visible):
1. Insulation: Not painted.
2. Do not paint the following:
   a. Hangers
   b. Uninsulated Piping
   c. Miscellaneous Iron Work
   d. Valve Bodies and Bonnets

D. Exterior Steel: Wire brush and apply two coats of rust-inhibiting primer and one coat of grey exterior machinery enamel.

E. Roof Mounted Equipment:
1. Paint two coats of exterior machinery enamel.
2. Color as selected by Architect.
3. Where factory standard finish is indicated in the equipment specification, it is assumed that the standard finish is painted.

3.8 ADJUSTING AND CLEANING

A. Before operating any equipment or systems, make thorough check to determine that systems have been flushed and cleaned as required and equipment has been properly installed, lubricated, and serviced. Check factory instructions to see that installations have been made accordingly and that recommended lubricants have been used.

B. Use particular care in lubricating bearings to avoid damage by over-lubrication and blowing out seals. Check equipment for damage that may have occurred during shipment, after delivery, or during installation. Repair damaged equipment as approved or replace with new equipment.

3.9 ELECTRICAL EQUIPMENT

A. Ductwork or piping for mechanical systems not serving electrical space not installed in any switchgear room, transformer vault, telephone room, or electric closet except as indicated.

B. Ductwork or piping for mechanical systems not to pass over switchboards or electrical panelboards. Where conflicts exist, bring to attention of Architect.

3.10 EQUIPMENT CONNECTIONS

A. Make final connections to equipment specified in sections other than Division 23, HVAC of the specifications and Owner furnished equipment in accordance with manufacturer's instructions and shop drawings furnished and as indicated.

B. Piping:
1. Connections include steam supply, steam vent, and condensate.
2. Provide valves and specialties as specified and as detailed on the Drawings. Provide increasers, reducers, and any other fittings required for complete installation.
3. Independently support piping connections supported to prevent undue strain on equipment.

C. Ductwork: Make exhaust connections to fume hoods, emergency generator radiators, and any other processing, laboratory, or kitchen equipment in strict accordance with manufacturer's instructions.

D. Engine Exhaust: Make connections as necessary for complete working installation to the emergency generators as indicated and specified.

END OF SECTION

SECTION 23 05 48

VIBRATION AND SEISMIC CONTROLS FOR HVAC

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

B. The provisions of Division 23, Heating, Ventilation and Air Conditioning (HVAC) Section 23 05 00, Common Work Results for HVAC, apply to work specified in this Section.

1.2 SUMMARY

A. This Section includes:
   1. Neoprene Waffle Pad
   2. Restrained Neoprene Mount
   3. Spring Isolators
   4. Springs with Restraints
   5. Base with Springs
   6. Inertia Base
   7. Isolating Spring Hangers
   8. Isolating Neoprene Hangers
   9. Rooftop Air Handling Unit Isolation Curb
   10. Isolating Sleeves
   11. Seismic Restraints
   12. Flexible Sphere Connector
   13. Flexible Hose Connector

B. Isolation of mechanical equipment as indicated on the Drawings and specified herein.

C. Seismic restraint of equipment, piping, and ductwork.

1.3 RELATED SECTIONS:

A. Division 01, General Requirements

B. Division 23, Heating, Ventilating, and Air Conditioning (HVAC)

C. Section 23 05 29, Hangers, Supports and Anchors for HVAC

D. Section 23 31 01, HVAC Ducts and Casing-Low Pressure

E. Section 23 31 02, HVAC Ducts and Casing-Medium Pressure

1.4 QUALITY ASSURANCE

A. Single manufacturer select and furnish isolation required, except packaged equipment with integral isolators meeting all the isolation and seismic requirements of this Specification.

B. System of vibration isolators and seismic controls designed, detailed, and bear the seal of a professional engineer registered in the State having jurisdiction.

C. Isolation performance requirements are indicated in the specifications. Deflections indicated are nominal static deflections for specific equipment supported.

D. Seismic snubbers, restrained isolator housings, and cable system components have anchorage preapproval OPM number from OSHPD in the State of California verifying the maximum certified load ratings.

E. Isolator Stability and Rated Capacity:
1. Spring diameters not less than 0.8 of the compressed height of the spring at rated load.
2. Springs have a minimum additional travel to solid equal to 50 percent of the rated deflection.

F. Seismic Restraints:
1. Restraint of equipment, piping, and ductwork to be in accordance with the current state and local Building Code.
2. Calculations in accordance with current state and local Building Code.

1.5 SUBMITTALS

A. Submit the following:
1. Submit Shop Drawings showing complete details of construction for steel and concrete bases including:
   a. Equipment mounting holes.
   b. Dimensions
   c. Isolation selected for each support point.
   d. Details of mounting brackets for isolator.
   e. Weight distribution for each isolator.
   f. Code number assigned to each isolator.
2. Submit product data and calculation sheets for isolators, showing:
   a. Size, type, load rating, and rated deflection of each required isolator.
   b. Percent of vibration transmitted based on the lowest disturbing frequency of the equipment.
3. Structural Details and Calculations substantiating that building structure, anchorages, and fabricated steel braces can safely withstand maximum calculated loads stamped and signed by a registered structural engineer.
4. Installation report as specified in PART 3 of this Section.
5. Operation and maintenance data.

1.6 EQUIPMENT VIBRATION ISOLATION

A. Provide a balanced set of vibration isolators for each piece of equipment listed in the Equipment Schedules.

B. Isolation work to include, but not necessarily be limited to, the following:
1. Isolation support of motor-driven equipment.
2. Inertia base frames in conjunction with isolation.

3. Isolation support of air-handling housings.
4. Isolation support of piping, piping risers, and ductwork.
5. Penetration isolation of pipework, ductwork, and conduits through walls, floors, or ceilings.
6. Flexible connections of ductwork and piping to equipment.

C. Each piece of rotating equipment must meet a reasonable criterion for maximum vibration levels at each bearing, while in operation. The criteria for varying operating speeds are given as follows:
   1. Rotating equipment operating at peak vibration velocities must not exceed 0.08-inch/second.
   2. If it is discovered that the operating vibration velocities exceed this criteria, the equipment repaired or replaced at no expense to the owner until approval of the equipment is given by the Engineer.

D. Provide components or materials not specially mentioned herein, but necessary to the proper vibration isolation of the equipment.

1.7 CONTRACTOR RESPONSIBILITY

A. Vibration isolation devices, including auxiliary steel bases and pouring forms, design and furnish by a single manufacturer or supplier.

B. Adequately restrain all equipment, piping, and ductwork to resist seismic forces. Design and select restraint devices to meet seismic requirements as defined in the latest issue of the International Building Code under Earthquake Loads and applicable state and local codes.

C. Have the following responsibilities:
   1. Selection, installation, adjustment, and performance of vibration isolators which will meet the requirements given on the plans or in the Specifications.
   2. Provide Engineering drawings, details, supervision, and instruction to assure proper installation and performance.
   3. Provide whatever assistance necessary to ensure correct installation and adjustment of the isolators.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Type 7 – Isolating Spring Hangers:
   1. Mason 30N, similar Amber-Booth
   2. Kinetics Noise Control
   3. Vibrex

2.2 TYPE 7 - ISOLATING SPRING HANGERS

A. Combination rubber-in shear and steel spring isolators installed on the hanger rods.

B. Isolators shall have the proper deflection to allow the piping to deflect as a unit with the equipment isolators.

C. Neoprene element and the cup shall have neoprene bushing bushings projecting through the steel box.

D. Hangers designed for 30 degree angular movement.

E. Minimum Deflection: 1-inch

2.3 SEISMIC RESTRAINTS

A. General Requirements:
1. Provided for equipment, piping and ductwork, both supported and suspended.
2. Bracing of piping shall be in accordance with state and local code requirements and ASCE 7 Seismic Design Requirements for Nonstructural Components, whichever is most stringent.
3. Bracing of ductwork shall be in accordance with the state and local code requirements, ASCE 7 Seismic Design Requirements for Nonstructural Components, and with the provisions set forth in the SMACNA seismic restraint manual.
4. The structural requirements for the restraints, including their attachment to the building structure, shall be reviewed and approved by the Structural Engineer.
5. Attachments to supported or suspended equipment must be coordinated with the equipment manufacturer.

B. Supported Equipment:
1. All-directional Seismic Rubbers: Interlocking steel members restrained by a one-piece molded neoprene bushing of bridge bearing neoprene.
2. Replaceable bushing and minimum of 1/4-inch thick. Rated loadings not to exceed 1000 psi.
3. An air gap of 1/4-inch shall be incorporated in the snubber design in all directions before contact is made between the rigid and resilient surfaces.
4. Snubber End Caps:
   a. Removable to allow inspection of internal clearances.
   b. Rotated neoprene bushings be rotated to ensure no short circuits exist before systems are activated.
5. Snubber: Mason Industries, Inc. Type Z-1225

C. Bracing of Pipes:
1. Provide seismic bracing of piping as detailed below to meet the building code requirements:
   a. Exception: Piping suspended by individual hangers need not be braced where the following criteria are met.
      1) Distance between the top of the pipe to the bottom of the support structure is 12-inches or less.
      2) Seismic braces are not required on high deformability piping when the Ip=1.0 and provisions are made to avoid impact with larger pipe or mechanical components or to protect the pipe in the event of such impact and the nominal pipe size is 3-inch diameter or less.
      3) Seismic braces are not required on high deformability piping when the Ip=1.5 and provisions are made to avoid impact with larger pipe or mechanical components or to protect the pipe in the event of such impact and the nominal pipe size is 1-inch diameter or less.
2. Seismic braces for pipes on trapeze hangers may be used.
3. Provide flexibility in joints where pipes pass through building seismic joints or expansion joints, or where pipes connect to equipment.
4. Cast iron pipe of all types, glass pipe, and any other pipe joined 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 on unsupported sections of piping shall be braced or stabilized between floors.
5. Vertical risers shall be laterally supported with a riser clamp at each floor. For buildings greater than six stories high or for piping subject to thermal change 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.
   2. 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.
   3. 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.
   4. 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.
   5. Install duct flex connections at equipment connections to accept expected differential displacement and protect the equipment connection from damage.

E. Suspended Equipment and Piping and Ductwork:
   1. Seismic cable restraints shall consist of galvanized steel aircraft cables sized to resist seismic loads with a minimum safety factor of two and arranged to provide all-directional restraint.
   2. Cable must be pre-stretched to achieve a certified minimum modulus of elasticity. Cable end connections shall be steel assemblies that swivel to final installation angle and utilize two clamping bolts to provide proper cable engagement.
   3. Cable assemblies shall be type SCB at the ceiling and at the clevis bolt, SCBH between the hanger rod and the clevis or SCBV if clamped to a beam, all as manufactured by Mason Industries, Inc.
   4. Steel angles or strut, sized to prevent buckling, shall be clamped to pipe or equipment rods utilizing a minimum of three ductile iron clamps at each restraint location when required. Welding of a minimum of three ductile iron clamps at each restraint location when required. Welding of support rods is not acceptable. Rod clamp assemblies shall be type SRC or UCC as manufactured by Mason Industries, Inc.
   5. Pipe clevis cross-bolt braces are required in all restraint locations. They shall be special purpose preformed channels deep enough to be held in place by bolts passing over the cross bolt. Clevis cross brace shall be type CCB as manufactured by Mason Industries, Inc.

PART 3 EXECUTION

3.1 GENERAL

A. Do not install any equipment or pipe which makes rigid contact with the building.

B. The installation or use of vibration isolators must not cause any change of position of equipment or piping which would result in stresses in piping connections or misalignment of shafts or bearings. In order to meet this objective, equipment and piping shall be maintained in a rigid position during installation. The load shall not be transferred to the isolator until the installation is complete and under full operational load.

C. Correct, at no additional cost, all installations which are defective in workmanship or materials.

3.2 PREPARATION

A. Treat all isolators, including springs, hardware, and housing, with a corrosion protective coating of epoxy powder or electro galvanizing.

B. Coat steel frames exposed to weather with a rustproof metal primer.

C. Provide hot dipped galvanizing on steel frames as indicated on the plans for corrosion protection in severe conditions.

3.3 INSTALLATION

A. General:
1. Install isolation where indicated on the Drawings by type and location and where indicated below.
2. The assigned code number shall be marked on the isolators and bases to assure placement in the proper location.
3. Anchor isolator seismic housing baseplate to floor.
4. Rubber grommets and washers shall be provided to isolate the bolt from the building structure. Under no circumstances shall the isolation efficiency be destroyed when bolting the isolators to the building structure.

B. Type 7 – Isolating Spring Hangers:
1. Service:
   a. Fan Coil Units

3.4 SEISMIC RESTRAINTS

A. General:
1. Install and adjust seismic restraints so that the equipment, piping, and ductwork support is 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 the 1/4-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 Seismic Restraint Manual 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 to resist both the seismic load and the additional force induced by expansion and contraction.

4. Fuel oil, gas, cast iron pipe of all types, glass pipe and any other pipes joined with four band shield and clamp assembly shall be braced at 1/2 the spacings shown above.
5. 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.
6. 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.
7. Branch lines may not be used to restrain main lines.
8. Where thermal expansion is a consideration, guides and anchors may be used as transverse and longitudinal restraints provided they have a capacity equal to or greater than the restraint loads in addition to the loads induced by expansion or contraction.
9. Subject to confirmation by field inspection, seismic bracing is not required on piping when the piping is supported by rod hangers and the hangers in the entire run are 12-inches or less in length from the top of the pipe to the supporting structure, hangers are detailed to avoid bending of the hangers and their attachments and provisions are made for piping to accommodate expected deflections.

D. Bracing of Ductwork:
1. Transverse restraints shall occur at 30-foot intervals or at both ends of the duct run if less than the specified interval. Transverse restraints shall be installed at each duct turn and at each end of a duct run.
2. Longitudinal restraints shall occur at 60-foot intervals with at least one restraint per duct run. Transverse restraints for one duct section may also act as a longitudinal restraint for a duct section connected perpendicular to it if the restraints are installed within 4-feet of the intersection of the ducts and if the restraints are sized for the larger duct. Duct joints shall conform to SMACNA duct construction standards.
3. Hanger straps must be positively attached to the duct within 2-inches of the top of the duct with a minimum of two number 10 sheet metal screws.
4. A group of ducts may be combined in a 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.
5. 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.
6. 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. The cables shall be adjusted to a degree of slackness approved by the Structural Engineer.
2. The uplift and downward restraint nuts and Mason type RW neoprene covered steel rebound washers for the Type 6 hangers adjusted so there is a maximum 1/4-inch clearance.
3. C-clamps for attachment to the bottom of I-beams must incorporate a restraining strap.

3.5 FIELD QUALITY CONTROL

A. Installation Report: Isolation manufacturer's representative shall confirm that all isolation is installed correctly and submit report stating that isolators are installed as shown on Shop Drawings, isolators are free to work properly, and that installed deflections are as scheduled and as specified.

END OF SECTION

SECTION 23 05 53

IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes:
   1. Equipment Identification

1.2 RELATED SECTIONS

A. Division 01, General Requirements

B. Division 23, Heating, Ventilating, and Air Conditioning (HVAC)

1.3 SUBMITTALS

A. Submit the following:
   1. Equipment Nameplate Directory: Submit for approval prior to fabrication.
   2. Operating and Maintenance Data: Include a copy of valve tag and equipment nameplate directories in each set of Operating and Maintenance manuals.

PART 2 PRODUCTS

2.1 EQUIPMENT IDENTIFICATION

A. Nameplates:
   1. Tag air handling supply units, fans, terminal units, and miscellaneous mechanical equipment items with engraved nameplates.
   2. 1/16-inch thick, 3-inch by 5-inch laminated 3-ply plastic, center ply white, outer ply black. Form letters by exposing center ply.
   3. Identify unit with equipment tag as shown on Drawings and area served.
   4. Label constructed from same material as equipment nameplates.

B. Equipment Nameplate Directory:
   1. Include Owner and Contractor furnished equipment.
      a. Air Handlers
      b. Terminal Units
      c. Other Equipment Nameplates
   2. List the following on the Nameplate Directory for each piece of equipment:
      a. Designation
      b. Model Number
      c. Location of Equipment
      d. Area Served or Function
      e. Disconnect Location
      f. Normal Position of HOA Switch

PART 3 EXECUTION

3.1 EQUIPMENT IDENTIFICATION

A. Nameplates: Attach to prominent area of equipment, either with sheet metal screws, brass chain, or contact cement as applicable.

B. Nameplate Directory: Post final copy in Operation and Maintenance Manual.

END OF SECTION

SECTION 23 05 93

TESTING ADJUSTING AND BALANCING FOR HVAC

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes:
   1. Testing and Balancing of Air Systems
   2. Testing and Balancing of Miscellaneous Mechanical Equipment

1.2 RELATED SECTIONS

A. Division 01, General Requirements

B. Division 23, Heating, Ventilating, and Air Conditioning (HVAC)

C. Section 23 09 00, Instrumentation and Controls for HVAC

1.3 QUALITY ASSURANCE

A. Acceptable Testing and Balancing Firms:
   1. A.I.R., Inc.
   2. Air Balance Specialty, Inc.
   3. Neudorfer Engineers, Inc.
   4. Northwest Engineering Services
   5. Pacific Coast Air Balance
   6. Accurate Balancing Agency, Inc.
   7. Precision Test and Balance, Inc.

B. Other Firms: Submit substitution requests prior to bid date.

C. Industrial Standards: Testing and Balancing shall conform to NEBB, American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE), and American National Standards Institute (ANSI) as follows:
   1. NEBB: Comply with Procedural Standards for Testing, Adjusting Balancing of Environmental Systems.
   2. ASHRAE: Comply with recommendations pertaining to measurements, instruments, and testing, adjusting and balancing.
   3. ANSI:
      a. S1.4 Specifications for sound level meters.
      b. S1.11 Specifications for Octave-Band and Fractional-Octave-Band analog and digital filters.

D. Instrument Certification: Instruments used shall be accurately calibrated and certified within six months of balancing and maintained in good working order.

E. Test Observation: If requested, the tests shall be conducted in the presence of the Architect or the Architect's representative.

F. Pre-Balancing Conference:
   1. Prior to starting balancing, general techniques shall be reviewed with the Engineer. This conference must occur prior to measuring existing conditions.
   2. Measuring of existing conditions must occur prior to any demolition or new work.
   3. The conference will review existing conditions and systems to be affected by the project

1.4 SUBMITTALS

A. Submit the following:
   1. Balancing Log – Existing Systems: Submit preliminary report indicating existing conditions prior to making any modifications to existing systems.
      a. Include all air and water outlets, actual field measured air and water volume, and percentage of design volumes.
      b. Provide drawings identifying location of all outlets.
   2. Equipment Data Sheets – Existing Systems: Indicate actual equipment performance, model numbers, bearing and belt data, motor nameplate data, and final balanced motor data.
   3. Balancing Log:
      a. Include all air and water outlets, actual field measured air and water volume, and percentage of design volumes.
      b. Provide drawings identifying location of all outlets.
   4. Equipment Data Sheets: Indicate actual equipment performance, model numbers, bearing and belt data, motor nameplate data, and final balanced motor data.
   5. Additional Data: Submit additional data as provided by Associated Air Balance Council (AABC) Standard forms.
   6. Number of Copies: Submit six copies of the above completed information to the Engineer for review and insertion into the Operating and Maintenance Data.
   7. Instrument Certification: When requested, submit certificate of calibration for equipment to be used.

B. Record data on NEBB forms or forms approved by the Architect.

1.5 PROJECT CONDITIONS

A. Where existing systems are to be adjusted, establish flow rates in all branches prior to making any modifications to system. Adjust central equipment as required and restore all unmodified branches and outlets to original condition. Obtain existing system drawings from Owner and become familiar with extent and nature of existing systems.

B. Do not perform final testing, adjusting, and balancing work until heating, ventilating, and air conditioning equipment has been completely installed and operating continuously as required.

C. Conduct air testing and balancing with clean filters in place. Clean strainers, etc., prior to performing hydronic testing and balancing.

1.6 WARRANTIES

A. In addition to the Requirements of the Contract, include an extended warranty of six months after completion of test and balance work during which time the Architect at his discretion may request a recheck or resetting of any equipment or device listed in the test reports.

PART 2 PRODUCTS – NOT APPLICABLE

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

A. Balance to maximum measured flow. Deviation from specified values of ±10 percent at terminal device and ±5 percent at equipment, or mean sound level deviation of 15 decibels. Advise Engineer if deficiencies are generally noted to enable proper corrective actions.

3.2 AIR SYSTEMS

A. General: Make measurements in accord with Industrial Standards specified above. Record on appropriate forms.

B. Preliminary:
1. Identify and list size, type, and manufacture of all equipment to be tested including air outlets and inlets.
2. Use manufacturer's ratings for equipment to make required calculations except where field test shows ratings to be impractical.

C. Central System:
1. Set speed to provide air volume at farthest run without excess static pressure. Provide additional sheaves and belts as required to accomplish speed adjustment.
2. Read and adjust air supply, return, and exhaust fan units to deliver design conditions at minimum OSA and at 100 percent OSA.
3. Adjust automatic dampers, outside air, return air, and exhaust dampers for design conditions.
4. Read static air pressure conditions on all air handling equipment including filter and coil pressure drops and total pressure across the fan. A Dwyer Series 400 air velocity meter only shall be used for final static pressures at equipment and where critical readings are required.
5. Measure temperature conditions across all outside air, return air, and exhaust dampers to check leakage.
6. Read and record motor data and amperage draw.
7. For variable volume systems, establish minimum static pressure required at sensing point to permit operation over entire VAV range. Adjust supply and return fan speed so that at maximum demand the associated VFD is controlling the motor of motor nameplate RPM to 100 percent. Adjust return fan speed so that return air volumes track with supply air volume minus exhaust air volume.
8. Assist controls contractor in establishing minimum outside air damper positions.

D. Distribution:
1. Evaluate all building and room pressure conditions to determine adequate supply and return air conditions. Balance the building to be slightly positive to outdoors.
2. Evaluate all building and room pressure conditions to determine adequate performance of the system to maintain temperatures without draft.
3. Perform multipoint pitot traverses to confirm instrumentation, shaft tightness, fan operation, etc. Pitot traverses shall be performed using a Dwyer Series 400 air velocity meter only with applicable duct probe.
4. Mark balancing dampers.

3.3 ELECTRIC HEATING EQUIPMENT

A. Test and record voltage and amperage readings at each electric heating device while fully energized and at part load conditions (each step) to verify proper operation.

B. Record data on appropriate forms.

3.4 AUTOMATIC CONTROL SYSTEM

A. In cooperation with control manufacturer's representative, set and adjust automatically operated devices to achieve required sequence of operations.

B. Testing organization shall verify all controls for proper calibration and list controls requiring adjustment by control system installer.

3.5 COORDINATION

A. Coordinate work with other trades to ensure rapid completion of the project.

B. Deficiencies noted during the course of air balancing in the mechanical installation shall be promptly reported to the Architect to allow corrective action to proceed.

C. Periodic review of progress shall be provided as requested.

END OF SECTION

SECTION 23 07 00

INSULATION FOR HVAC

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes:
   1. Ductwork Blanket Insulation
   2. Duct Insulation, Internal
   3. Duct, Pipe and Terminal Unit Acoustical Wrap
   4. Accessories Ductwork

1.2 RELATED SECTIONS

A. Division 01, General Requirements

B. Division 23, Heating, Ventilating, and Air Conditioning (HVAC)

C. Section 23 05 29, Hangers, Supports and Anchors for HVAC

D. Section 23 31 01, HVAC Ducts and Casing – Low Pressure

1.3 QUALITY ASSURANCE

A. Regulatory Requirements:
   1. Prohibit insulating products from containing pentabrominated, octabrominated, and decabrominated diphenyl ethers. Where products within this specification contain these banned substances, provide complying products from approved manufacturers with equal performance characteristics.
   2. Flame and Smoke Ratings: Installed composite flame spread not to exceed 25 and smoke developed not to exceed 50 as tested by UL 723 or ASTM E84.
   3. Energy Codes: Local Building and Energy Codes govern where insulation performance requirements for thickness exceeds thickness specified.

B. Protection:
   1. Protect against dirt, water, chemical, or mechanical damage before, during, and after installation.
   2. Repair or replace damaged insulation at no additional cost.

C. Source Quality Control:
   1. Service: Use insulation specifically manufactured for service specified.
   2. Labeling: Insulation labeled or stamped with brand name and number.
   3. Insulation and accessories not to provide nutritional or bodily use to fungi, bacteria, insects, rats, mice, or other vermin, not to react corrosively with equipment, piping, or ductwork, and asbestos free.

1.4 SUBMITTALS

A. Submit the following.

1. Product Data: For each type including density, conductivity, thickness, jacket, vapor barrier, and flame spread and smoke developed indices.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. DUCTWORK BLANKET INSULATION

B. Fiberglass: 1.0 pcf nominal density, 0.25 per-inch maximum K-factor at 75 degrees F mean temperature, 250 degrees F minimum operating temperature limit.
   1. Exposed: FSK facing (foil scrim Kraft) or vinyl - white appearance.
   2. Concealed with Vapor Barrier: FSK reinforced foil and paper.
   3. Concealed without Vapor Barrier: Facing not required.

C. Semi-Rigid Fiberglass: 2.5 pcf nominal density, 0.24 per-inch maximum K-factor, at 75 degrees F mean temperature, 250 degrees F minimum operating temperature limit.
   1. Exposed: FSK facing (foil scrim Kraft) or vinyl-white appearance.
   2. Concealed with Vapor Barrier: FSK reinforced foil and paper.
   3. Concealed without Vapor Barrier: Facing not required.

D. Elastomeric: Expanded closed cell sheets, 0.27 per-inch maximum K-factor at 75 degrees F mean temperature and 220 degrees F minimum operating temperature limit.

2.2 DUCT INSULATION, INTERNAL

A. Fiberglass Duct Liner.
   1. Thermal Conductance: k-0.23 in accordance with ASTM C518 and ASTM C177 at 75 degrees F mean temperature.
   2. Maximum Operating Temperature: 250 degrees F as determined by ASTM C 411.
   3. Maximum Air Velocity: 6,000 fpm as determined by ASTM C 1071.
   4. Fungi Resistance:
      a. Does not breed or promote as determined by ASTM C1338.
      b. No growth as determined by ASTM G21.
   5. Bacteria Resistance: No growth as determined by ASTM G22.
   6. Flame-spread index of 25 or less as determined by ASTM E 84 or UL 723.
   7. Smoke development index of 50 or less as determined by ASTM E 84 or UL 723.
   8. Acoustical Absorption Coefficients:
      a. NRC value as tested in accordance with ASTM C423, type A mounting:
         1) 1-inch thickness: Minimum NRC 0.70
         2) 2-inch thickness: Minimum NRC 0.90

2.3 ACCESSORIES DUCTWORK

A. Adhesives:
   1. General: Maximum Flame Spread/Smoke Developed Rating of 25/50, SCAQMD Rule 1168 compliant.
   2. Fiberglass: Benjamin Foster 85-62, Design Polymerics 2501/2502
   3. Elastomeric: Armacell 520 BLV
   4. Duct Insulation, Internal: Foster 85-62, Design Polymerics 2501/2502

B. Weld Pins: Duro-Dyne with NC-1 nylon stop clips

C. Cements:
   1. Insulating: Ryder.
   2. Heat Transfer: Chemax Tracit-300

D. Wire Mesh: 1-inch mesh with 20 gauge annealed steel wire.

E. Mastic: Chicago Mastic:
   1. Vapor Barrier: 17-475
   2. Outdoor Mastic: 16-110 white

F. Cloth Facing: Presized fiberglass cloth

G. Tapes: Pressure sensitive, weather resistant, and for temperatures up to 150 degrees F. Zeston Z-tape.

H. Paint: Ultraviolet resistant latex paint with special adherence capabilities to the PVC fitting covers, elastomeric, aluminum facing, Kraft paper, tapes, and adhesives.

PART 3 EXECUTION

3.1 GENERAL

A. Workmanship:
   1. Installation: Insulation installed in first class, neat professional manner.
   2. Applicators: Employ by firm that specializes in insulation work.

B. Preparation: Surfaces of piping, ductwork, and equipment clean, free of oil or dirt, and dry before insulation is applied.

C. Stamps: ASME stamps, UL labels, and similar stamps and labels not covered.

D. EQUIPMENT INSTALLATION

E. General: Install true and smooth. Insulation over curved surfaces conform to curves of surface.
   1. Access:
      a. Insulated removable heads, water boxes, pump casings, access, etc., that require service, inspection or maintenance provided with covers or section that are easily removable and replaceable.
      b. Reinforce openings in adjacent insulation with metal beading.
      c. In vapor barriered insulation, coat joints with vapor barrier mastic.
   2. Voids, Depressions and Cavities: Voids, chipped corners and other openings filled with insulating cement or material compatible with insulating material.
   3. Vapor Barriered Insulation:
      a. Where insulation is specified to have a vapor barrier.
      b. No broken or pierced barrier.
         1) Coated with vapor barrier mastic and patched with insulation facing or tape.
         2) Staples brush coated with vapor barrier coating.

3) Raw edges coated with vapor barrier mastic covered and cover sealed to equipment surface.

4. Non-Vapor Barriered Insulation:
   a. Patch with insulation facing or tape.
   b. Cover raw edges and neatly bevel to the equipment surface.
5. Multilayered Insulation: With staggered joints.

F. DUCT INSULATION APPLIED LOCATIONS

G. General:
1. Provide external insulation with continuous vapor barriers unless specifically noted otherwise.
2. Internally line ductwork completely to grille or diffuser or to indicated terminal points. Dimension shown are net inside of liner.
3. Internally lined ductwork need not be externally insulated.
4. In addition to locations described in specification, internally line medium, low, return and exhaust air ductwork where shown on drawings.
5. Internal lining is not allowed downstream of final filters in systems serving inpatient healthcare facilities.

H. Insulation Applied Location – HVAC Ductwork:

System	Location	Duct Type	Insulation Type	Thickness	Notes
Medium Pressure Supply*	Exposed or Visible (Including above a cloud ceiling)	Rectangular	Internally Lined	1-1/2-inch	
		Round/Oval	Internally Lined	1-1/2-inch	
	Concealed or in mechanical rooms	All	Fiberglass Blanket	1-1/2-inch	
	15-feet upstream and downstream of fans	All	Internally Lined	1-1/2-inch unless otherwise indicated	
Low Pressure Supply*	Exposed or Visible (Including above a cloud ceiling)	Rectangular	Internally Lined	1-1/2-inch	
		Round	Internally Lined	1-1/2-inch	
	Concealed or in mechanical rooms	All	Fiberglass Blanket	1-1/2-inch	
	Downstream of Air Terminal Units	All	Internally Lined	1-1/2-inch	
	15-feet upstream and downstream of fans	All	Internally Lined	1-1/2-inch unless otherwise indicated	
Return Air* (not insulated except)	Concealed Outside Building Envelope	All	Externally insulated without vapor barrier	2-inch	

NEHS

System	Location	Duct Type	Insulation Type	Thickness	Notes
	Exposed Outside Building Envelope	All	Internally Lined	2-inch	
	15-feet upstream and downstream of fans	All	Internally Lined	1-inch unless otherwise indicated	
Exhaust Air* (not insulated except)	15-feet upstream and downstream of fans	All	Internally Lined	1-inch unless otherwise indicated	
	In Toilet Rooms, 10-feet downstream of exhaust grilles	All	Internally Lined	1-inch	
Outside Air (untempered)	Exposed or Visible (Including above a cloud ceiling)	Rectangular	Internally Lined	2-inch	
		Round	Internally Lined	2-inch	
	Concealed or in mechanical rooms	All	Fiberglass Blanket	2-inch	
Supply and Return Plenums	All	All	Internally Lined	2-inch	
Transfer Air	All	All	Internally Lined	1-inch	

3.2 DUCTWORK INSTALLATION

A. General:
1. Install in accordance with manufacturer's instruction.
2. Continuous vapor barrier. Coat with vapor barrier mastic and patch with facing or tape. Joints between insulation and access with vapor barrier mastic.
3. Insulation at access panels to be removable or attached to panel with edges of panel and opening reinforced with metal beading.

B. External Blanket Insulation:
1. Insulation secured to ductwork with 20-gauge snap wires 24-inches on center and at all joints.
2. Joints and seams lapped a minimum of 3-inches and sealed with jacket tape.

C. Internal Duct Liner:
1. Air stream coated surface.
2. Weld pins spaced maximum of 15-inch on center in both directions and within 2-inches of corners and joints. Weld pins flush with liner surface.
3. Complete duct surface coated with adhesive and insulation pressed tightly thereto.
4. Provide edges at terminal points with metal beading and heavily coated with adhesive.
5. Heavily coat joints and corners with adhesive.
6. Damaged areas replaced or heavily coated with adhesive.

D. Volume Dampers: Where volume dampers do not allow for continuous insulation, terminate insulation clear of handle sweep, and finish edges to maintain vapor barrier and to prevent damage to the insulation.

3.3 FIELD QUALITY CONTROL

A. Field Test: Test and approve systems prior to installation of insulation.

B. Existing Insulation:
1. Repair existing insulation damaged during construction.
2. Make neat connections where new and existing insulation meet.
3. Where existing piping, ductwork or equipment is removed, cover existing surfaces neatly to match existing.
4. Where existing insulation is damaged or missing, notify the architect prior to performing to work.

END OF SECTION

SECTION 23 31 01

HVAC DUCTS AND CASING – LOW PRESSURE

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes:
   1. Supports, Anchorage And Restraints
   2. Sheet Metal Ductwork
   3. Flexible Ducts
   4. Exposed or Visible Ductwork In Finished Spaces
   5. Related Sections

B. Division 01, General Requirements

C. Division 23, Heating, Ventilating, and Air Conditioning (HVAC)

D. Section 22 30 00, Plumbing Equipment

E. Section 23 05 48, Vibration and Seismic Controls for HVAC Piping Equipment

F. Section 23 07 00, Insulation for HVAC

G. Section 23 33 00, Air Duct Accessories

1.2 QUALITY ASSURANCE

A. Installer Qualifications: Work performed by qualified, experienced mechanics, in accordance with the manual of Duct and Sheet Metal Construction of the Sheet Metal and Air Conditioning Contractors National Association and these Specifications.

B. Regulatory Requirements:
   1. Entire ductwork system, including materials and installation, installed in accordance with NFPA 90A.
   2. Ductwork and components UL 181 listed, Class I air duct, flame rating not to exceed 25 and smoke rating not to exceed 50.

1.3 SUBMITTALS

A. Submit the following:
   1. Provide catalog data on each product specified hereunder.
   2. Schedule of duct construction standards.
   3. Provide shop drawings showing materials and construction details for single wall housing plenum.
   4. Provide shop drawings showing construction details, support, and seismic restraint of ductwork distribution systems.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Flexible Ducts:
1. Thermaflex M-KE
2. Gen Flex IMP-25S
3. Other Manufacturers: Submit substitution request.

B. SUPPORTS, ANCHORAGE AND RESTRAINTS

C. General:
1. Provide design for supports, anchorages, and seismic restraints for equipment when not shown on the Drawings.
2. Supports, anchorage and restraints provided are required to resist seismic forces as specified in the latest edition of the International Building Code for the seismic zone in which the project is constructed.
3. Follow provisions in Section 23 05 48, Vibration and Seismic Control for HVAC Piping and Equipment for seismic restraints.
4. Seismic restraints are not to introduce stresses in the ductwork caused by thermal expansion or contraction.
5. Connections to structural framing are not to introduce twisting, torsion, or lateral bending in the framing members. Provide supplementary steel as required.

D. Suspended Ductwork: Provide seismic restraints in accordance with the latest edition of the SMACNA, Seismic Restraint Manual - Guidelines for Mechanical Systems for the seismic hazard level corresponding to the seismic zone in which the project is constructed.

E. Engineered Support Systems: Provide designs and details for the following support systems with the seal of a professional engineer registered in the State having jurisdiction:
1. Supports and seismic restraints for suspended ductwork and equipment.
2. Support frames for ductwork and equipment which provide support from below.
3. Equipment and ductwork support frame anchorage to supporting slab or structure.

2.2 SHEETMETAL DUCTWORK

A. Fabricate from galvanized steel, unless noted otherwise.

B. Minimum gauge, duct construction, joint reinforcing, fittings, hangers, and supports in accordance with SMACNA HVAC Duct Construction Standards – Metal and Flexible, Latest Edition.

C. Duct Classification: Ducts considered low pressure when design velocities are 2000 fpm or less and maximum static pressure is 2-inches wg positive or negative.
1. The following ductwork constructed in accordance with minimum reinforcement requirements for static pressure class of 1/2-inch wg positive or negative.
   a. Supply ductwork downstream from terminal units.
   b. Supply, return or exhaust ductwork serving fans scheduled to operate at less than 1/2-inch wg
   c. Supply, return, or exhaust branch ductwork which serves one or two inlets/outlets.

2. The following ductwork constructed in accordance with minimum reinforcement requirements for static pressure class of 1-inch wg positive or negative.
    a. Supply, return, or exhaust ductwork serving fans scheduled to operate at less than 1-inch wg On supply fans pressure drops for louvers, coils, clean filters, and sound traps may be deleted from scheduled fan static.
    b. Supply, return, or exhaust ductwork serving multiple duct branches where contractor can demonstrate that pressures will not exceed 1-inch wg positive or negative.
    c. Boiler direct vent combustion air intake ductwork.
    d. Water heater direct vent combustion air intake ductwork.
3. The following ductwork constructed in accordance with minimum reinforcement requirements for static pressure class of 2-inches wg, positive or negative.
    a. Supply, return, or exhaust ductwork serving fans scheduled to operate at pressures greater than 1-inch wg positive or negative.

D. Longitudinal seams on rectangular duct, Pittsburgh or Button punch snap lock. Snap lock seams for round duct may be used only on ducts classified for 1/2-inch wg. Longitudinal seams for round ducts using lap and rivet, spot weld, or fillet weld may be used only on ducts classified for statics 1-inch wg or less.

E. Joining and reinforcing systems manufactured by Ductmate, Roloc, or TDC are acceptable. Ductmate 35 is equivalent to SMACNA J, and Ductmate 25 is equivalent to SMACNA F.

F. Use of adjustable round elbows not permitted.

2.3 FLEXIBLE DUCTS

A. Flexible air duct with CPE or metal film liner permanently bonded to coated spring steel wire helix with 1-inch thick fiberglass insulation blanket covered with fiberglass reinforced metal film vapor barrier jacket.

B. Duct rated for 6-inch wg positive and 1-inch wg negative.

2.4 EXPOSED OR VISIBLE DUCTWORK IN FINISHED SPACES

A. Round:
    1. Material:
        a. Round or flat oval, machine formed, spiral lock-seam galvanized sheet metal ductwork of thicknesses as listed for sheet metal duct.
        b. Paintable surface.
    2. Fittings: Machine formed, shop fabricated, with welded seams, designed for easiest air flow, similar to United Sheet Metal numbers listed.
        a. Mitered Elbow with Turning Vanes: Type EV-90-2.
        b. Radius Elbows: Type E090-5. Similar for less than 90 degree elbows.
        c. Tees: Type Con-T-1.
        d. Reducing Fittings: May be used unless noted otherwise.

B. Rectangular:
    1. Same as for sheet metal ductwork but paintable surface.
    2. Inside reinforcing.
    3. Use special care to prevent imperfections in the metal surface.

PART 3 EXECUTION

3.1 APPLIED LOCATIONS

A. Supply ductwork on downstream side of terminal box. Galvanized sheet metal ductwork, lined where indicated on the Drawings or as specified in Section 23 07 00, Insulation for HVAC.

B. Supply Ductwork from Spin-In Fittings to Supply Outlet Collar Connection: Flexible duct, maximum 4-foot length.

C. Return Air Trunk Ductwork from End Run to Unit Connection: Galvanized sheet metal ductwork, lined where indicated on the Drawings or as specified in Section 23 07 00, Insulation for HVAC.

D. Exhaust Ductwork: Galvanized sheet metal ductwork, lined where indicated on the Drawings or as specified in Section 23 07 00, Insulation for HVAC.

E. Ductwork between Transfer Grilles: Galvanized sheet metal ductwork, lined where indicated on the Drawings or as specified in Section 23 07 00, Insulation for HVAC.

F. Exposed or Visible Ductwork in Finished Spaces: Sheet metal as specified for application, lined where indicated on the Drawings or as specified in Section 23 07 00, Insulation for HVAC.

3.2 INSTALLATION

A. Ductwork:
   1. Seal traverse joints with an approved mastic during joining procedure or tape after joining to provide airtight duct system.
   2. Low pressure ductwork hanger and support systems in accordance with SMACNA HVAC Duct Construction Standards – Metal and Flexible. Wire supports are not allowed.
   3. Provide supplementary steel for support of ductwork in shafts and between building structural members.
   4. Fabricate changes in direction to permit easy air flow, using full 1.5D radius bends or fixed turning vanes in square elbows. Radius elbows less than 1.5D radius, splitter vanes.
   5. Change in duct size or shape necessitated by interference made using rectangular equivalents of equal velocity.
   6. Where pipe, structural member, or other obstruction passes through a duct, provide streamlined sheet metal collar around member and increase duct size to maintain net free area. Fit collar and caulk to make air tight.

B. Sound Attenuation (Internal Insulation):
   1. Provide sound attenuation duct where shown and as specified under Section 23 07 00, Insulation for HVAC.
   2. Duct dimensions shown are net inside attenuating material.

C. Dampers: Install where shown and where necessary to complete final balancing of system. Install regulators as specified in Section 23 33 00, Air Duct Accessories for each specific project condition. Leave dampers locked wide open in preparation for balancing.

D. Extractors: Install behind supply grilles and registers where shown.

E. Flexible Connectors: Make connections to fans and other rotating equipment with flexible connectors with 2-inch minimum clearance between casing and ductwork. Not required on internally spring isolated units.

F. Spin-in Fittings:
1. Install at branch takeoffs to outlets using round or flex duct.
2. Connect to flexible duct with draw band strap and minimum of two wraps of duct tape.
3. Leave dampers locked wide open.

G. Flexible Ducts:
1. Make connections at ends using draw band strap and a minimum of 2 wraps of duct tape.
2. Suspend center spans from structure above using wire as required by code. Connect to manufacturer's eyelet on jacket or use 1-inch wide galvanized steel strap with single loop at top and smooth edges.
3. Suspending duct by laying it on the ceiling is prohibited.
4. Avoid crimping flex duct. Changes in direction made using 2D radius. Duct connections to grilles, registers, and diffusers using less than 2D radius bends are not acceptable. Where space is constricted, use sheet metal elbows or Thermaflex Flex Boots (or equal).

H. Ductwork, Exposed or Visible in Finished Areas:
1. Use extreme care in handling and installing.
2. Replace dented or damaged sections.
3. Install ductwork straight and true, parallel to building lines.
4. Make connections with pop rivets using couplings where applicable. Grind raw edges smooth and apply paintable sealant to cover imperfections.
5. Remove excess sealant to provide a finished joint.
6. Provide floor, wall, and ceiling plates as specified in Section 23 05 00, Common Work Results for HVAC.
7. Finish, clean and prime ductwork, and hangers for painting.

3.3 FIELD QUALITY CONTROL

A. Coordination with Balance Agency:
1. Provide services of a sheet metal person familiar with the system ductwork to provide assistance to the balancing agency during the initial phases of air balancing in locating sheet metal dampers.
2. Install missing dampers required to complete final balancing.

END OF SECTION

SECTION 23 33 00

AIR DUCT ACCESSORIES

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes:
   1. Medium Pressure Duct Accessories
   2. Low Pressure Duct Accessories

1.2 RELATED SECTIONS

A. Division 01, General Requirements

B. Division 23, Heating, Ventilating, and Air Conditioning (HVAC)

C. Section 23 31 01, HVAC Ducts and Casing-Low Pressure

D. Section 23 31 02, HVAC Ducts and Casing-Medium Pressure

E. Section 23 09 00, Instrumentation and Controls for HVAC

1.3 QUALITY ASSURANCE

A. Work performed by qualified, experienced mechanics in accordance with the manual of Duct and Sheet Metal Construction of the National Association of Sheet Metal and Air Conditioning Contractors and these Specifications.

B. Install entire ductwork system, including materials and installation, in accordance with NFPA 90A.

C. Flexible connectors, flexible equipment connections, tapes, and sealants listed as UL 181, Class I air duct. Flame spread rating not to exceed 25 and smoke developed rating not to exceed 50.

1.4 SUBMITTALS

A. Submit the following: Product data for Duct Accessories.
   1. Medium Pressure Duct Accessories:
      a. Acoustical Turning Vanes
      b. Access Doors
      c. Bell Mouth Fittings
      d. Duct Sealer
   2. Low Pressure Duct Accessories:
      a. Access Doors
      b. Backdraft Dampers
      c. Water Eliminators
      d. Automatic Dampers
      e. Duct Sealer

B. Operation and Maintenance Data: Automatic dampers, fire dampers, smoke dampers. Combination smoke and fire dampers, air flow station.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Medium Pressure Duct Accessories:
   1. Duct Sealer:
      a. McGill Airseal Zero
      b. Design Polymerics DP 1090
      c. Or approved equal.
   2. Flexible Equipment Connector:
      a. Duro Dyne Corporation
      b. Ventfabrics
   3. Acoustical Turning Vanes:
      a. AirSan Acoustiturn
      b. Or approved equal.
   4. Access Doors:
      a. United Sheetmetal APR or ASR
      b. Metco
      c. Semco
      d. Cesco
      e. Ruskin
      f. Nailor-Hart
      g. Or approved equal.

B. Low Pressure Duct Accessories:
   1. Flexible Equipment Connector:
      a. Duro Dyne Corporation
      b. Ventfabrics
   2. Extrators:
      a. Carnes
      b. Anemostat
      c. Barber-Coleman
      d. Nailor-Hart
      e. Or approved equal.
   3. Access Doors:
      a. Air Balance
      b. Ruskin
      c. Metco
      d. Duro Dyne Corporation
      e. Cesco
      f. Nailor-Hart
      g. Or approved equal.
   4. Backdraft Dampers:
      a. Air Balance
      b. Ruskin
      c. Cesco
      d. Advanced Air

e. Nailor-Hart
f. Or approved equal.

2.2 MEDIUM PRESSURE DUCT ACCESSORIES

A. Duct Sealer:
1. Description:
a. Suitable for indoor/outdoor use, including application in moist conditions, rated to 10-inch wg.
b. Maximum Flame Spread/Smoke Developed Rating of 25/50, maximum VOC of 420 g/L less water.
c. SCAQMD Rule 1168 compliant.

B. Flexible Equipment Connector:
1. Description: Woven fiberglass fabric with neoprene coating, air-tight, water-tight, fire retardant.
2. Minimum Density: 30 oz. per sq. yd.
3. Temperature Range: -20 degrees F to 200 degrees F
4. Pressure Range: -10-inch wg to +10-inch wg

C. Turning Vane Assemblies:
1. Sheet Metal Vanes: Multiple radius hollow vane air foil type with 4-1/2-inch inside radius, galvanized steel construction.
2. Runners: Embossed type

D. Acoustical Turning Vanes: Multiple radius air foil type, perforated steel construction with fiberglass fill.

E. Access Doors:
1. Round, oval or rectangular to match duct, single wall to open against positive duct pressure, fastened with spring clips, pressure seal gasket, fastened with chain. Double wall access doors similar except provide insulated frame and insulated door.

F. Bell Mouth Fittings: Round or flat oval, radius of 0.20 D minimum.

2.3 LOW PRESSURE DUCT ACCESSORIES

A. Damper Regulators:
1. Acceptable Manufacturers:
a. Ventlok
b. Young
c. Duro Dyne Corporation
d. Or approved equal.
2. Dial Regulator – Concealed or exposed duct in unfinished spaces:
a. Blade lengths 18-inch and less: 3/8-inch shaft
b. Blade lengths 19-inches and above: 1/2-inch shafts
c. Ventlok 635, or 638 for insulated duct
3. Dial Regulator – Exposed duct in finished space:
a. 3/8-inch shaft
b. Ventlok 640
4. Dial Regulator – Concealed or non-accessible duct:
a. Blade lengths 18-inch and less: 3/8-inch shaft

b. Blade lengths 19-inches and above: 1/2-inch shafts
c. Ventlok 666 regulator with 680 mitered gear assembly where right angled turn is necessary.

5. End Bearings:
   a. Ducts rated to 1-inch WG, open end, Ventlok 607.
   b. Ducts rated above 1-inch WG, closed end, Ventlok 609.
   c. Exposed ductwork, finished spaces, Ventlock 609.
   d. Spring end bearings not allowed.

B. Volume Damper Fabrication:
1. Single blade dampers reinforced or crimped for rigidity, with pivot rod extending through duct. Dampers over 12-inches high use multiple opposed blade damper. Single blade damper no larger than 12-inches by 48-inches. Multiple blade damper factory fabricated, Ruskin MD-35 or equal.
2. Minimum gauge and duct construction in accordance with SMACNA, HVAC Duct Construction Standards, latest edition.
3. Splitter and butterfly dampers fabricated of 18 gauge galvanized steel.
4. Dampers of length suitable to close branch ducts without damper flutter.
5. Damper blade must be aligned with handle and index pointer.

C. Flexible Equipment Connector:
1. Description: Woven fiberglass fabric with neoprene coating, air-tight, water-tight, fire retardant.
2. Minimum Density: 30 oz. per sq. yd.
3. Temperature Range: -20 degrees F to 200 degrees F
4. Pressure Range: -10-inch wg to +10-inch wg

D. Extractors (EX): Gang operated blades, steel construction, blades at 1-inch centers, slide operator set 15 degrees into main trunk duct, Titus AG-45 with No. 1 operator.

E. Spin-in Fittings:
1. Sheet Metal Duct:
   a. Straight pattern sheet metal spin-in fitting with scoops designed for connection to sheet metal ductwork, volume damper, and locking quadrant.
   b. Construction with spot welds or rivets.
   c. Button-punch fabrication prohibited.
2. Fiberglass Duct:
   a. Straight pattern sheet metal spin-in fitting with scoops designed for connection to fiberglass ductwork volume damper, and locking quadrant.
   b. Spot weld or rivet construction.
   c. Button-punch fabrication prohibited.

F. Duct Sealer:
1. Based On:
   a. McGill Airseal Zero
   b. Design Polymerics DP 1090
2. Description:
   a. Suitable for indoor/outdoor use, including application in moist conditions, rated to 10-inch wg.
   b. Maximum Flame Spread/Smoke Developed Rating of 25/50, maximum VOC of 420 g/L less water.
   c. SCAQMD Rule 1168 compliant.

G. Duct Tape for Sheet Metal:
   1. ARNO C520 duct tape similar United
   2. Duro Dyne Corporation
   3. Nashua

H. Tape and Adhesive/Activator System for Sheet Metal: Hardcast, Polymer Adhesives.

I. Turning Vane Assemblies:
   1. Sheet Metal Vanes: Multiple radius hollow vane air foil type 2-inch (small vane) or 4-1/2-inch (large vane) inside radius, galvanized steel construction.
   2. Runners: Push-on type.
   3. Acoustical Vanes: Multiple radius air foil type, perforated steel construction with fiberglass fill. AirSan Acoustiturn or as approved.

J. Access Doors:
   1. Doors complete with steel frame, steel door with backing plate, cam latches (two on units 14-inch by 14-inch and larger), hinge, and gasketing. Insulate doors on insulated or lined ducts.
   2. Grease Duct Access Door: Construct of metal thickness equal to metal duct, doors air, and grease tight with hinge and hand operable latches. Ductmate.
   3. Size:

Duct Width or Duct Diameter	Net Access Door Opening
Up to 8-inch	6-inch by 6-inch
9-inch to 12-inch	8-inch by 8-inch
13-inch to 20-inch	12-inch by 12-inch
21-inch to 30-inch	16-inch by 14-inch
31-inch to 42-inch	18-inch by 14-inch
Over 42-inch	Two 16-inch by 14-inch

K. Backdraft Dampers:
   1. Description: Gravity operated, vinyl edged, metal bladed backdraft dampers.

L. Drip Pans: Provide Type 304 stainless steel drip pans for cooling coils and exhaust heat recovery coils on built-up units as indicated.

M. Louver Blank-off Panels:
   1. At air intake or exhaust louvers which are only partially active area, blank off inactive area with sheet metal closure panels caulked airtight secured to louver frame and insulated with 2-inch rigid fiberglass insulation per Section 23 07 00, Insulation for HVAC.

N. Automatic Dampers:
   1. Description:
      a. Multi-blade air foil type, except where either dimension is less than 10-inches a single blade may be used. Maximum blade length to be 48-inches.
      b. Provide parallel blades for positive or modulating mixing service and opposed blades for throttling service.
      c. Blades to be interlocking, minimum 16 gauge galvanized steel.
   2. Compression type edge seals and side seating stops.
   3. Reinforced blades, have continuous full length axle shafts, axle to axle linkage, and/or operating jackshafts to provide coordinated tracking of blades.

4. Dampers over 25 square-feet in area to be in two or more sections, with interconnected blades. Maximum air leakage of 3 cfm per square foot at 1-inch wg pressure.
5. Provide automatic dampers except those specified to be provided with units. Tested in accordance with AMCA Standard 500. Based on Ruskin CD-60.
6. Damper Operators: Refer to Section 23 09 00, Instrumentation and Controls for HVAC.
7. Manufacturers:
   a. Ruskin
   b. Greenheck
   c. Air Balance
   d. Cesco
   e. Or approved equal.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install devices as shown on the Contract Drawings and per manufacturer's recommendations.

B. Medium Pressure Duct Accessory installation specified under Section 23 31 02, HVAC Ducts and Casing-Medium Pressure.

C. Low Pressure Duct Accessory installation specified under Section 23 31 01, HVAC Ducts and Casing-Low Pressure.

D. Access Doors: Install where indicated and at duct mounted coils, humidifiers, automatic control dampers, smoke dampers, fire dampers, air flow stations, to provide access for cleaning and maintenance.

E. Back Draft Dampers: Install where indicated and at the discharge (or inlet) of exhaust fans where automatic dampers are not indicated.

F. Automatic Dampers:
   1. Install where indicated and are not specified with equipment or in Section 23 09 00, Instrumentation and Controls for HVAC.
   2. Coordinate damper operators with Section 23 09 00, Instrumentation and Controls for HVAC.

G. Drip Pans:
   1. Install under each cooling coil and exhaust heat recovery coil as indicated.
   2. Provide drain connection from each drip pan and pipe to nearest floor drain through trap.
   3. Drip pans over 6-feet in length require drain connections from both ends.
   4. Pitch drip pans in direction of air flow and to drain.

H. Louver Blank-off Panels: Install blank-off panels on unused portions of louvers.

END OF SECTION

SECTION 23 37 00

AIR OUTLETS AND INLETS

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes:

1. Diffusers and Grilles

1.2 RELATED SECTIONS

A. Division 01, General Requirements

B. Division 23, Heating, Ventilating, and Air Conditioning (HVAC)

C. Section 23 33 00, Duct Accessories

1.3 SUBMITTALS

A. Submit the following:

1. Shop Drawings: Showing dimensions and details of construction.

2. Product Data

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Where only Titus figure numbers are listed, equivalent products by the following manufacturers by using only one:

1. Carnes

2. Price

3. Krueger

4. Tuttle & Bailey

5. Anemostat

6. Nailor

7. Other Manufacturers: Submit substitution request.

2.2 DIFFUSERS AND GRILLES

A. Ceiling Supply Diffuser (C-1):

1. Perforated face modular diffuser with adjustable modular core, steel panel, square or rectangular neck size as indicated, discharge pattern as indicated, lay-in tee bar ceiling, or surface mounted as required (coordinate with architectural reflected ceiling plan).

2. White baked enamel finish, Titus PMC.

B. Ceiling Return/Exhaust Grille (C-2): Perforated face modular ceiling grille, steel panel, with duct adapters for round or rectangular as indicated, lay-in tee bar ceiling, or surface mounted as required (coordinate with architectural reflected ceiling plan), white baked enamel finish, Titus PAR.

C. Wall Supply Grille (H-1):

1. Adjustable aluminum double deflection blades, horizontal front with vertical rear blades, 3/4-inch spacing, 1-1/4-inch border, gasketed around face flange, white baked enamel finish.

2. Titus Model 272FL.

D. Wall Return/Exhaust Grille (H-2):

1. Aluminum 45 degree fixed single deflection, horizontal blades 3/4-inch spacing 1-1/4-inch border, gasketed around face flange, white baked enamel finish.

2. Titus Model 3F manufacturer.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install diffusers tight to their respective mounting surfaces.

B. Installed plumb and true with room dimensions and accurately centered on projections as shown on the Architectural reflected ceiling plans.

C. Install extractors behind duct mounted sidewall supply grilles, and where shown. Turning vanes allowable if condition is the last outlet on a branch.

D. Set pattern control for directions of throw as shown on Drawings prior to air balancer arriving on Project.

E. Paint ductwork behind outlets flat black.

3.2 PERFORMANCE

A. Unit sizing is based on air being introduced at 20 degrees F temperature differential and being diffused at the 5-foot level to a velocity not greater than 50 FPM and a temperature differential not greater than 1.5 degrees F. Units are also selected so as not to exceed the NC-30 curve.

END OF SECTION

SECTION 23 81 00

DECENTRALIZED UNITARY HVAC EQUIPMENT

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes:
   1. Rooftop Mounted Packaged HVAC Unit

1.2 RELATED SECTIONS

A. Division 01, General Requirements

B. Division 23, Heating, Ventilating, and Air Conditioning (HVAC)

C. Section 23 05 48, Vibration and Seismic Controls for HVAC Piping and Equipment

1.3 SUBMITTALS

A. Submit the following:
   1. Shop drawings showing details of construction, dimensions, arrangement of components, isolation, filters, etc.
   2. Product data showing performance data, standard items, and accessories, operating weight.
   3. Flow diagrams and pipe sizing for refrigerant systems.
   4. Operating and maintenance data.
   5. Testing Submittals:
      a. Provide test plan and test procedures for approval.
      b. Explain in detail, step-by-step, actions and expected results to demonstrate compliance with the requirements of this specification and methods for simulating necessary conditions of operation to demonstrate performance of the system.
      c. Test plan and test procedures demonstrate capability of system to monitor and control equipment and to accomplish control and monitoring specified.

1.4 ACCEPTANCE TESTING AND TRAINING

A. Site Testing:
   1. General:
      a. Provide personnel, equipment, instrumentation, and supplies necessary to perform testing by a representative authorized by the manufacturer.
      b. Owner or Owner's representative will witness and sign off on acceptance testing.
   2. Acceptance Test:
      a. Demonstrate compliance of completed control system with contract documents.
      b. Use approved test plan, physical and functional requirements of project

B. Training:
   1. General:

a. A representative authorized by the manufacturer conduct training courses for designated personnel in operation and maintenance of system.
b. Orient training to specific system being installed under this contract.
c. Provide training manuals for each trainee, with two additional copies provided for archival at project site.
d. Manuals include detailed description of the subject matter for each lesson.
e. Copies of audiovisuals delivered to Owner.
f. Training day is defined as 8 hours of classroom instruction, including two 15-minute breaks and excluding lunchtime, Monday through Friday, during normal first shift in effect at training facility.
g. Notification of planned training given to the Owner's representative at least 15 days prior to the training.

2. Operator's Training I:
   a. Teach at a convenient location for a period of one training day.
   b. Upon completion, each student, using appropriate documentation, should be able to perform elementary operations with guidance and describe general hardware architecture and functionality of system.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Rooftop Mounted Packaged HVAC Unit:
   1. Trane
   2. Daikin
   3. Carrier
   4. York
   5. AAON
   6. Other Manufacturers: Submit substitution request.

2.2 ROOFTOP MOUNTED PACKAGED HVAC UNIT (RTU-305, 600, 600A)

A. Description (RTU-305): Roof-mounted, single zone packaged heat pump designed for full curb mounting, electric auxiliary heat, capacities as indicated, factory assembled, wired, piped, tested and shipped in one piece with UL listing.

B. Description (RTU-600, 600A): Roof-mounted, single zone packaged air conditioning unit, natural gas heat, capacities as indicated, factory assembled, wired, piped, tested and shipped in one piece with UL listing.

C. Unit Casing:
   1. Heavy gauge galvanized steel, phosphatized and coated with baked enamel finish, gasketed and insulated with 1-inch 1 pound density glass fiber insulation.

D. Air Conditioning Refrigeration:
   1. Air-cooled with refrigerant line filter drier, thermostatic expansion valve, factory refrigerant charge, high and low pressure cutouts, and loss of charge protection.
   2. Low ambient operation to 40 degrees F.
   3. Provide refrigerant sight glass.

E. Heat Pump Refrigeration (RTU-305):
   1. Air-cooled with heating and cooling refrigerant line filter driers, dual thermostatic expansion valves, factory refrigerant charge, high and low pressure cutouts, loss of charge protection.
   2. Suction line accumulator, refrigerant check valves, heavy duty, high capacity, four-way reversing valve.
   3. Low ambient operation to 20 degrees F.
   4. Activate defrost cycle upon demand only.

F. Compressors:
   1. Hermetic type compressor with positive constant pressure lubrication, current and thermal overloads, crankcase heater, time delay, and anti-recycle relays.
   2. Provide compressor isolation valves.

G. Cooling Coils:
   1. Provide indoor and outdoor coils of non-ferrous construction with aluminum fins mechanically bonded to seamless copper tubing with joints brazed.
   2. Protect coils with plywood covers during shipment and installation.
   3. Evaporator Coil Drain Pan: Stainless steel internally sealed and insulated.

H. Natural Gas Heating (RTU-600, 600A):
   1. AGA approved for intended application and fuel, completely assembled, wired, piped, and tested with threaded gas connections.
   2. Provide stainless steel heat exchanger and burners, forced draft combustion blower, and electronic ignition.
   3. Provide 2 stages of heating.

I. Electric Heating (RTU-305): Factory installed, with capacity and stages as indicated on the drawings, heavy duty nickel chromium elements, internally delta connected on three phase units, automatically resetting high limit controls on each heating unit contactor, individual fusing, conforming to NEC requirements.

J. Fans:
   1. Indoor Fan: Centrifugal type, permanently lubricated, belt driven by a permanently lubricated motor.
   2. Outdoor Fan: Propeller type direct driven by a permanently lubricated motor.

K. Filters:
   1. Provide medium efficiency pleated filters.
   2. Provide one extra set of filters for each unit.

L. Dampers:
   1. Provide motor-operated outside air and return air dampers with spring-return actuators, capable of supplying 0 percent-100 percent outside air.
   2. Outside air damper minimum position adjustable independently of return damper position.

M. Economizer:
   1. Dry bulb controlled type.
   2. Outside air and return air dampers modulate to maintain discharge temperature on call for cooling.
   3. Provide adjustable minimum outside air damper position.
   4. Outside air and relief air dampers, close when indoor fan shuts down.
   5. Provide relief capability equal to 100 percent of supply air with barometric relief damper and weather hood.

N. Powered Exhaust: Provide relief air capability equal to 100 percent of supply air with exhaust fan, counterbalanced backdraft damper, and weather hood.

O. Controls: Configure unit for field installation of DDC control panel and sensors as follows:
1. Provide valves and dampers, actuators, variable frequency drives, starters, compressor capacity controllers, condenser capacity controllers, gas furnace controllers, electric heat staging controllers, and other operating and safety controls for each component. Wire to terminal strip for connection to DDC control panel.
2. Temperature and pressure sensors will be owner furnished, owner installed.

P. Electrical:
1. Furnish magnetic contactors (starters), separate fusing for compressors, condenser fans, evaporator fans and exhaust fans, and control transformer.
2. Arrange unit for single point electrical connection with integral unit mounted disconnect.

Q. Service Outlet:
1. Provide 115 VAC circuit with ground fault interrupter electrical outlet mounted in the unit controls cabinet.
2. Outlet circuit rated at 15A and factory wired to a step down transformer, fuse block, and 115V disconnect.
3. Wire circuit to line side of power block or power switch permitting use of the outlet while power to the unit is shut off.

R. Roof Curb:
1. Formed, 16 gauge galvanized steel with wood nailer strip capable of supporting entire unit weight.
2. Account for roof slope to provide level mounting service for equipment.
3. Provide spring isolated roof curbs where indicated or if fans and compressors are not internally isolated.
4. Curb height accounts for roof insulation depth and flashing requirements.

S. Warranty: One-year on parts.

PART 3 EXECUTION

3.1 ROOFTOP MOUNTED AIR CONDITIONING UNIT AND HEAT PUMP

A. Installation:
1. Coordinate roof penetration with others.
2. Install curb.
3. Furnish 2-inch thick, 2 pcf density insulation along inside of curb. Installation per Section 23 07 00, Insulation for HVAC.
4. Install unit where shown, with air filters in place before operating unit. Comply with manufacturer's recommendation.
5. Provide minimum of 3-inch trap seal on condensate drain connections.
6. Keep access door to roof mounted equipment closed to prevent wind and weather damage.

B. Start-Up:
1. General: Comply with manufacturer's instructions.
2. Start-up of units provided under the direct supervision of the manufacturer's representative with factory-trained personnel.

C. Testing and Adjusting/Performance Test:
   1. Except where initial unit operation clearly shows the performance meets or exceeds the requirements, test to show compliance.
   2. Perform tests by the manufacturer's representative in the presence of the Engineer.

END OF SECTION

SECTION 26 05 00

COMMON WORK RESULTS FOR ELECTRICAL

PART 1 GENERAL

1.1 SUMMARY

A. The intent of Division 26, Electrical Specifications and Drawings is to provide a complete and workable facility, with complete systems as required by applicable codes, as indicated, and as specified.

B. Include work specified in Division 26, Electrical and as indicated on Drawings. Include appurtenances, connections, fasteners, and accessories required to make a complete working system, whether indicated or not indicated.

C. Refer to Division 01, General Requirements.

1.2 RELATED SECTIONS

A. Division 01, General Requirements

B. Division 26, Electrical

1.3 REFERENCES

A. The latest adopted revisions of the publications listed below apply to these Specifications as referenced:

1. IBC International Building Code
2. NEC National Electrical Code
3. NFPA National Fire Protection Association
4. NEMA National Electrical Manufacturers Association
5. NECA National Electrical Contractors Association
6. ANSI American National Standards Institute
7. IEEE Institute of Electrical and Electronic Engineers
8. UL Underwriters Laboratories

1.4 SYSTEM DESCRIPTION

A. Ground Systems:

1. Provide complete ground systems indicated.
2. Include conduit system, transformer housings, switchboard frame, and neutral bus, motors, and miscellaneous grounds required by Contract Documents and by applicable codes.

B. System Identification:

1. Clearly identify elements of the Project electrical system to indicate the loads served, or the function of each item of equipment, connected under this work.
2. Comply with requirements of Division 26, Electrical, and with applicable codes.

C. Drawings:
   1. Drawings are diagrammatic. They do not show every offset, bend, tee, or elbow, which may be required to install work in the space, provided and avoid conflicts with other construction.
      a. Prior to installing work, take field dimensions, and note conditions available for, installation.
      b. Follow the Drawings as closely as practical to do so, and install additional bends, offsets, and elbows where required by installation conditions.
         1) Additional offsets, bends, and other connectors are subject to approval by Project Engineer.
         2) Install additional offsets, bends, and other connectors without additional cost to Owner.
      c. The right to make any reasonable changes in outlet location prior to roughing in is reserved to the Owner's Representative.
   2. Luminaire Designations:
      a. Lower case letters adjacent to devices or luminaires indicate switching arrangement or circuit grouping.
      b. Numbers adjacent to devices indicate circuit connection.
   3. Circuits and Switching:
      a. Do not change branch circuiting and switching indicated; nor combine homeruns, without Engineer's prior approval.
      b. Do not combine or change feeder runs.
   4. Circuit Conductors:
      a. Cross or hash marks on conduit runs indicate quantity of No. 12 copper branch circuit conductors, unless otherwise noted.
      b. Where such marks do not appear, provide quantity of circuit conductors to the outlets shown to perform the control or circuiting indicated.
      c. Include ground, travelers, and switch legs required by the circuiting arrangement indicated.
      d. Provide a dedicated neutral conductor with each circuit. Do not use a shared neutral conductor between phases unless, requested or directed.

1.5 SUBMITTALS

A. Comply with Division 01, General Requirements.

B. Contractor Responsibilities:
   1. Submit submittals one time and in proper order.
   2. Ensure equipment will fit in the space provided.
   3. Deviations from the Drawings and Specifications specifically noted in the submittals. Failure to comply will automatically void any implied approval for use of the equipment on this project.

C. Shop Drawings and Equipment Data:
   1. Combine electrical shop drawings and equipment data in Submittal binders.
   2. Include in Submittal binders:
      a. Complete index of materials and equipment as required by Specifications to be documented by submittals.
      b. Fully describe equipment furnish per manufacturer's detailed specifications.
      c. All deviations from the Drawings and Specifications, noted on the submittals. Failure to comply will automatically void any implied approval for use of the equipment on this project.

D. Installation Drawings:
   1. Submit prior to starting installation.

2. Show outlets, devices, terminal cabinets, conduits, wiring, and connections required for the complete system described.

E. Record Drawings:
1. Keep record drawings up to date as the work progresses.
2. Show changes, deviations, addendum items, change orders, corrections, and other variations from the Contract Drawings.
3. Keep record drawings at the jobsite and available for the Architect's review.
4. At the completion of the work, incorporate all deviations from the installation drawings to indicate as-built conditions.

F. Operation and Maintenance Data:
1. As specified in Division 01, General Requirements.
2. Provide a separate manual or chapter for each system as follows:
   a. Lighting System
   b. Lighting Control System
   c. Description of system.
3. Operating Sequence and Procedures:
   a. Step-by-step procedure for system start-up, including a pre-start checklist.
      1) Refer to controls and indicators by nomenclature consistent with that used on panels and in control diagrams.
   b. Detailed instruction in proper sequence, for each mode of operation (i.e., day-night, staging of equipment).
   c. Emergency Operation:
      1) If some functions of the equipment can be operated while other functions are disabled, give instructions for operations under those conditions.
      2) Include here only those alternate methods of operations (from normal) which the operator can follow when there is a partial failure or malfunctioning of components or other unusual condition.
   d. Shutdown Procedure:
      1) Include instructions for stopping and securing the equipment after operation.
      2) If a particular sequence is required, give step-by-step instructions in that order.
4. Preventive Maintenance:
   a. Schedule for preventive maintenance.
      1) State the recommended frequency of performance of each preventive maintenance task such as cleaning, inspection, and scheduled overhauls.
   b. Cleaning: Provide instructions and schedules for all routine cleaning and inspection with recommended lubricants.
   c. Inspection: If periodic inspection of equipment is required for operation, cleaning, or other reasons, indicate the items to be inspected and give the inspection criteria.
   d. Provide instructions for lubrication and adjustments required for preventive maintenance routines. Identify test points and given values for each.
5. Manufacturers' Brochures:
   a. Include manufacturers' descriptive literature covering devices and equipment used in the system, together with illustrations, exploded views, and renewal parts lists.
   b. Clearly define manufacturers' standard brochures so that the information applying to the actual installed equipment.
6. Results of performance testing, as specified in PART 3 of this Section.

G. Submittals Procedures:
   1. Review and recommendations by the Architect or Engineer are not to be construed as change authorizations.
   2. Either if discrepancies are discovered between the materials or equipment submitted, and the Contract Documents, prior to or after the data is processed, the Contract Documents govern.

1.6 QUALITY ASSURANCE

A. Regulatory Requirements:
   1. Products and equipment comply with Oregon Revised Statute (ORS) 453.005(7)(e) prohibiting pentabrominated, octabrominated, and decabrominated diphenyl ethers. Where products or equipment within this specification contains these banned substances, provide complying products and equipment from approved manufacturers with equal performance characteristics.
   2. Provide work and materials conforming to:
      a. Local and State codes.
      b. Federal and State laws and regulations.
      c. Other applicable laws and regulations.
   3. Obtain and pay for all permits, licenses, and inspection certificates required by authorities having jurisdiction.
   4. Pay any other fees required by governing authorities for work of this Division.

B. Install only electrical products listed by a recognized testing laboratory, or approved in writing by the local inspection authority as required by governing codes and ordinances.

1.7 SITE VISITATION

A. Visit the site prior to bidding and become familiar with existing conditions and other factors which may affect the execution of the work. Complete coordination of installation of equipment with prior bid packages previously issued. Include related costs in the initial bid proposal.

1.8 COORDINATION

A. Coordinate Work of This Division with all other trades to ensure proper installation of electrical equipment.
   1. Review Drawings of other trades or crafts to avoid conflicts with cabinets, counters, equipment, structural members, and other possible impediments to electrical work.
   2. Report potential conflicts to the Architect prior to rough-in.
   3. Proceed with rough-in following Architect's directives to resolve conflicts.
   4. Architectural Drawings govern.

B. Verify the physical dimension of each item of electrical equipment to fit the available space. Contractor's responsibility includes:
   1. Coordination of the equipment to fit into the available space.
   2. Access routes through the construction.

C. Layout Drawings:
   1. Equipment arrangement shown on Drawings is diagrammatic to indicate general equipment sizing and spatial relationship. Include, as part of distribution equipment submittal, a scaled floor plan, which includes equipment shown with their submitted sizes. Include all feeder conduit routing, both aboveground and underground, including termination points at equipment. Submit for Engineer's review prior to commencing work.

2. Provide additional wiring details at switchboards, motor control centers, and other areas where work is of sufficient complexity to warrant additional detailing for coordination.
3. Submit layout drawings for approval prior to commencing field installation.

D. Where electrical connections are required for equipment provided as Work of other Divisions, coordinate rough in and wiring requirements for that equipment with its supplier and installer prior to commencing work. Notify Architect and Engineer of any discrepancies between the actual rough in and wiring requirements, and those identified on Drawings for resolution prior to installation.

E. Arrange raceways, wiring, and equipment to permit ready access to switches, motors, and control components.
1. Keep doors and access panels clear.

F. Coordinate electrical, telephone, and other utility services with the appropriate serving utility.
1. No additional compensation will be allowed the Contractor for connection fees or additional work or equipment required by the serving utility, but not covered in the Drawings or Specifications.

G. Coordinate underground work with other contractors working on the site.
1. Coordinate particularly with contractors installing storm sewer, sanitary sewer, water, and irrigation lines to avoid conflicts.
2. Common trenches may be used with other trades, providing clearances required by codes and ordinances are maintained.

H. Coordinated Shop Drawings.
1. Prepare in two-dimensional format.
2. Include but are not limited to:
   a. Superplot plans of above ground work with a colored overlay of all trades including, but not limited to, HVAC piping, HVAC equipment, plumbing piping and equipment, sprinklers, lighting, lighting controls, cable tray, fire alarm devices, electrical power conduit, and ceiling system to a minimum of 1/2-inch equals 1-foot scale.
   b. Beam penetration drawings indicating beam penetrations meeting the requirements indicated on the floor plans and on the structural drawings to a minimum of 1/4-inch equals 1-foot scale.

1.9 CHANGE ORDERS

A. Supplemental cost proposals by the Contractor accompanied with a complete itemized breakdown of labor and materials. At the Architect's request, make available estimating sheets for the supplemental cost proposals. Separate and allocate labor for each item of work.

1.10 WARRANTY

A. Provide a written warranty covering the work of this Division as required by the General Conditions.
1. Incandescent Lamps: Excluded from this warranty.

B. Apparatus:
1. Free of defects of material and workmanship and in accord with the Contract Documents.
2. Built and installed to deliver its full rated capacity at the efficiency for which it was designed.
3. Operate at full capacity without objectionable noise or vibration.

C. Include in Contractor's warranty for Work of Division 26, Electrical system damage caused by failures of any system component.

1.11 ALLOWANCES

A. Comply with Division 01, General Requirements.

1.12 ALTERNATES

A. Comply with Division 01, General Requirements.

B. Refer to Electrical Drawings for detailed information relating to the appropriate alternates.

PART 2 PRODUCTS

2.1 GENERAL

A. Where specified materials or methods conflict with applicable codes, the more stringent requirement applies.

B. Provide apparatus built and installed to deliver its full rated capacity at the efficiency for which it was designed.

C. Ensure that entire electrical system operates at full capacity without objectionable noise or vibration.

D. Materials and Equipment:
   1. Use materials and equipment that are:
      a. New
      b. Quality meeting or exceeding specified standards.
      c. Free of faults and defects.
      d. Conforming to Contract Documents.
      e. Of size, make, type, and quality specified.
      f. Suitable for the installation indicated.
      g. Manufactured in accordance with NEMA, ANSI, UL, or other applicable standards.
      h. Otherwise as specified in Division 01, General Requirements.
   2. Equipment not meeting all requirements will not be acceptable, even though specified by name.
   3. Where two or more units of the same class of equipment are furnished, use products of the same manufacturer.
      a. Component parts of the entire system need not be products of same manufacturer.
   4. Basis of Design:
      a. Consider the Basis of Design equipment scheduled or specified by performance or model number.
      b. If other equipment is provided in lieu of the Basis of Design equipment, assume responsibility for all changes and costs which may be necessary to accommodate this equipment, including, but not limited to:
         1) Different sizes and locations for connections.
         2) Different dimensions.
         3) Different access requirements.
         4) Other differences.

PART 3 EXECUTION

3.1 INSTALLATION

A. General:
1. Provide a complete properly operating system for each item of equipment specified.
2. Install materials in a neat and professional manner.
3. Comply with equipment manufacturer's written instructions, the best industry practices, and the Contract Documents.
4. Comply with latest published NECA Standard of Installation, and provide competent supervision.

B. Clarification:
1. Where there is a conflict among manufacturer's instruction, best practice, and the Documents, request clarification from the Architect prior to rough-in.
2. Architect's decision will be final.
3. Remove and correct work installed without clarification at no cost to the Owner.

C. Existing concrete, block, or brick walls are considered not accessible and may require use of Surface Mounted Raceway (SMR) if existing concealed raceway and device boxes are not available for reuse or do not meet the intent of the design (i.e., proximity to egress path, point of use, etc.). Coordinate route and installation where SMR is required with the Architect/Engineer prior to rough-in. Responsible for reinstalling SMR routed without such prior approval to the Architect's satisfaction.

D. Existing stud walls (wood or metal) with or without blocking with plaster, plasterboard, or paneling finish are considered accessible with accessible ceiling, attic, tunnel, or crawl space above, below, or adjacent. Remove, patch, and repair finished surface as required to conceal rough in for new device locations. If it is determined that a specific instance will not permit concealment of rough-in due to obstructions such as beams, headers, and other structural elements, prior approval before rough-in from the Architect is required.

3.2 INSTALLATION IN RATED CONSTRUCTION

A. Install intumescent material around ducts, conduits, and other electrical elements penetrating rated construction.

B. Comply with firestop materials manufacturer written instructions to prevent spread of smoke or fire through sleeves or block-outs penetrating rated fire barriers.

C. Provide firestop materials specified in Division 07, and as follows:
1. Capable of passing a 3-hour test per ASTM E-814 (UL 1479).
2. Consisting of material capable of expanding nominally eight times when exposed to temperatures of 250 degrees F-350 degrees F.
3. An alternate method utilizing intumescent materials in caulk or putty complying with Division 07, Thermal and Moisture Protection Section, "Through-Penetration Firestop Systems" may be used.

3.3 EXCAVATION AND BACKFILL

A. Perform all necessary excavation and backfill for the installation of electrical work in compliance with Division 31, Earthwork.

B. Direct Burial Cable or Non-Metallic Conduit:
   1. Minimum 3-inch cover of sand or clean earth fill placed around the cable or conduit on a leveled trench bottom.
   2. Lay steel conduit on a smooth level trench bottom, so that contact is made for its entire length.
   3. Where the electrical conduit is being laid, remove water from trench.

C. Place backfill in layers not exceeding 8-inches deep and compact to 95 percent of maximum density at optimum moisture to preclude settlement.
   1. Interior: Bank sand or pea gravel.
   2. Exterior: Excavated material with final 8-inches clean soil.

D. Following backfilling, grade all trenches to the level of surrounding soil. Dispose excess soil at the site as directed.

E. Provide 6-inches wide vinyl tape marked ELECTRICAL in backfill, 12-inches below finished grade, above all high voltage cable or conduit runs.

F. Coordinate patching of all asphalt or concrete surfaces disturbed by this work with General Contractor.

3.4 NOISE CONTROL

A. Minimize transmission of noise between occupied spaces.

B. Outlet Boxes:
   1. Do not install outlet boxes on opposite sides of partitions back to back.
   2. Do not use straight through outlet boxes, except where indicated.

C. Conduit:
   1. Route conduit along corridors or other “noncritical” space to minimize penetrations through sound rated walls, or through non-sound-rated partitions between occupied spaces.
   2. Grout solid and airtight all penetrations through sound rated partitions.
   3. Use flexible connections or attachments between independent wall structures.
      a. Do not rigidly connect (i.e., bridge) independent wall structures.

D. Do not install contactors, transformers, starters, and similar noise-producing devices on walls that are common to occupied spaces, unless otherwise indicated.
   1. Where such devices are indicated to be mounted on walls common to occupied spaces, use shock mounts, or otherwise isolate them to prevent the transmission of noise to the occupied spaces.

E. Ballasts, contactors, starters, transformers, and like equipment which are found to be noticeably noisier than other similar equipment on the project will be deemed defective and shall be replaced.

3.5 EQUIPMENT CONNECTIONS

A. General:
   1. Provide complete electrical connections for all items of equipment requiring such connections, including incidental wiring, materials, devices, and labor necessary for a finished working installation.
   2. Verify the location and method for connecting to each item of equipment prior to roughing-in.
   3. Check the amperage, maximum overcurrent protection, voltage, phase, and similar attributes of each item of equipment before rough in and connection.

B. Motor Connections:
   1. Make motor connections for the proper direction of rotation.
   2. Minimum Size Flex for Mechanical Equipment: 1/2-inch; except at small control devices where 3/8-inch flex may be used.
   3. Exposed Motor Wiring: Jacketed metallic flex with minimum 6-inches slack loop.
   4. Do not test run pump motors until liquid is in the system.

C. Control devices and wiring relating to the HVAC systems are furnished and installed under Division 23, HVAC; except for provisions or items indicated in Division 26, Electrical Drawings and Specifications.

3.6 EQUIPMENT SUPPORT

A. Minimum Support Capacity:
   1. Provide fastening devices and supports for electrical equipment, luminaires, panels, outlets, and cabinets capable of supporting not less than four times the ultimate weight of the object or objects fastened to or suspended from the building structure.

B. Luminaire Supports:
   1. Support luminaires from the building structure.
   2. Use supports that provide proper alignment and leveling of luminaires.
   3. Where permitted at exposed luminaires, install flexible connections neat and straight, without excess slack, and attached to the support device.

C. Support all junction boxes, pull boxes, or other conduit terminating housings located above the suspended ceiling from the floor above, roof, or penthouse floor structure to prevent sagging or swaying.

D. Conduits:
   1. Support suspended conduits 1-inch and larger from the overhead structural system with metal ring or trapeze hangers and threaded steel rod having a safety factor of four.
   2. Conduits smaller than 1-inch installed in ceiling cavities, may be supported on the mechanical system supports when available space and support capacity has been coordinated with the subcontractor installing the supports.
   3. Anchor conduit installed in poured concrete to the steel reinforcing with No. 14 black iron wire.

E. Powder actuated or similar shot-in fastening devices will not be permitted for any electrical work except by special permission from the Architect.

3.7 ACCESS DOORS

A. Location and size of access doors is Work of Division 26, Electrical.

B. Furnishing and installation of access doors is work of Division 08, Openings.

3.8 ALIGNMENT

A. Install panels, cabinets, and equipment level and plumb, parallel with structural building lines.

B. Install distribution equipment and electrical enclosures fitted neatly, without gaps, openings, or distortion.

C. Properly and neatly, close unused openings with approved devices.

D. Fit surface panels, devices, and outlets with neat, appropriate, trims, plates, or covers without overhanging edges, protruding corners, or raw edges.

3.9 CUTTING AND PATCHING

A. General:
   1. Comply with Division 01, General Requirements.
   2. Restore to original condition new or existing work cut or damaged by installation, testing, and removal of electrical Work.
   3. Patch and finish spaces around conduits passing through floors and walls to match the adjacent construction, including painting or other finishes.
   4. Clean up and remove all dirt and debris.

B. Make additional required openings by drilling or cutting. Use of jackhammer is prohibited.

C. Cut oversize fill holes so that a tight fit is obtained around the objects passing through.
   1. In rated construction, comply with Division 07, Thermal and Moisture Protection.

D. Obtain Architect's permission and direction prior to piercing beams or columns.

E. Where alterations disturb lawns, paving, walks, and other permanent site improvements, repair and refinish surfaces to condition existing prior to commencement of work.

3.10 PROTECTION OF WORK

A. Protect electrical work and equipment installed under this Division against damage by other trades, weather conditions, or any other causes.
   1. Equipment found damaged or in other than new condition will be rejected as defective.

B. Keep switchgear, transformers, panels, luminaires, and electrical equipment covered or closed to exclude dust, dirt, and splashes of plaster, cement, paint, or other construction material spray.
   1. Equipment not free of contamination is not acceptable.

C. Provide enclosures and trims in new condition, free of rust, scratches, and other finish defects.
   1. If damaged, properly refinish in a manner acceptable to the Architect.

3.11 UNINTERRUPTED SERVICE

A. Maintain electrical service to all functioning portions of the building throughout construction.

B. Pre-arrange with Owner outages necessary for new construction.
   1. Comply with Division 01, General Requirements.
   2. Apply for scheduled shutdowns minimum 4 weeks prior to time needed and reconfirm a minimum of 72 hours prior to time needed.
   3. Contractor is liable for any damages resulting from unscheduled outages or for those not confined to the pre-arranged times. Damages include costs incurred by the Owner and by the Owner's tenants.

C. Maintain signal and communication systems and equipment in operation at all times.
   1. Outages of these systems shall be treated the same as electrical power outages.

D. Maintain telephone services in accordance with Division 01, General Requirements.

3.12 DEMOLITION AND SALVAGE

A. General:
   1. Remove or relocate all electrical wiring, equipment, luminaires, etc., as may be encountered in removed or remodeled areas in the existing construction affected by this work.
   2. Disconnect electrical service to hard-wired equipment scheduled for removal under other Divisions of Work.
   3. Wiring which serves usable existing outlets restored and routed clear of the construction or demolition.
   4. Safely cut off and terminate wiring abandoned and removed to leave site clean.

B. Reuse of Existing:
   1. Existing concealed conduits in good condition may be reused for installation of new wiring where available.
   2. Existing undamaged, properly supported surface conduits may be reused where surface conduits are called for, if the installation meets all workmanship requirements of the Specifications.
   3. Where new wiring is added or existing wiring disturbed in existing branch circuit raceways, existing wires replaced with new.

C. Salvage and Disposal:
   1. Removed materials, not containing hazardous waste, not scheduled for reuse shall become the property of the Contractor for removal from the site, except for those items specifically indicated on the Demolition Drawings for salvage or reuse.
   2. Materials containing, or possibly containing, hazardous waste identified for removal and disposal by the Owner's Hazardous Waste Contractor.
   3. Neatly store salvaged items at one location at the site where directed by the Owner's Representative.
   4. Salvage properly operating circuit breakers from panels scheduled for removal and use to replace faulty or inadequate breakers in existing panels scheduled to remain.

3.13 COMPLETION AND TESTING

A. General:
   1. Comply with Division 01, General Requirements.

B. Upon completion, test systems to show that installed equipment operates as designed and specified, free of faults and unintentional grounds.
   1. Schedule system tests so that several occur on the same day.
   2. Coordinate testing schedule with construction phasing.
   3. Conduct tests in the presence of the Architect or its representative.
   4. Notify Architect of tests 48 hours in advance.

C. Engage a journeyman electrician with required tools to conduct equipment tests. Arrange to have the equipment factory representative present for those tests where the manufacturer's warranty could be impacted by the absence of a factory representative.

D. Perform tests per the requirements of each of the following systems:
   1. Lighting System
   2. Lighting Control System
   3. Provide a written record of performance tests and submit with operation and maintenance data.

3.14 COMMISSIONING

A. Complete phases of work so the system, equipment, and components can be checked out, started, calibrated, operationally tested, adjusted, balanced, functionally tested, and otherwise commissioned. Complete systems, including subsystems, so they are fully functional.

B. Perform commissioning as specified in Section 01 91 00, General Commissioning Requirements, the technical sections, and Section 26 08 00, Commissioning of Electrical Systems.
   1. Unless specified otherwise in the technical sections, provide factory startup services for the following items of equipment:
      a. Lighting Control Systems

C. Participation in Commissioning:
   1. Provide skilled technicians to checkout, startup, calibrate, and test systems, equipment, and components.
   2. The Engineer reserves the right to judge the appropriateness and qualifications of the technicians relative to each item of equipment or system.

D. Resolution of Deficiencies:
   1. Complete corrective work in a timely fashion to permit timely completion of the commissioning process. Experimentation to render system performance permitted.

E. Verification and Documentation:
   1. Once each test is performed, have the commissioning manager observe the physical responses of the system and compare them to the specified requirements to verify the test results.
   2. Submit site observation reports for deficiencies in the system.
   3. Record the result of individual checks or tests on the pre-approved checklist, test, and report form from the commissioning plan and submit results for review.

END OF SECTION

SECTION 26 05 19

LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes:
   1. Conductors - 600V
   2. Power Limited Wiring
   3. Conductors - Fire Pump Circuits
   4. MC Branch Circuit Cable
   5. Connectors - 600V and Below

1.2 RELATED SECTIONS

A. Division 01, General Requirements

B. Division 26, Electrical

C. Section 26 05 26, Grounding and Bonding for Electrical Systems

D. Section 26 05 33, Raceways and Boxes for Electrical Systems

E. Section 26 05 53, Identification for Electrical Systems

F. Section 26 05 80, Electrical Testing

1.3 REFERENCED STANDARDS

A. ASTM: American Society For Testing and Materials:
   1. ASTM B 3 Soft or Annealed Copper Wire
   2. ASTM B 8 Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft
   3. ASTM B 33 Tinned Soft or Annealed Copper Wire for Electrical Purposes

B. ICEA: Insulated Cable Engineers Association:
   1. S-95-658 Non-shielded 0-2 kV Cables

C. IEEE: Institute of Electrical and Electronic Engineers:
   1. IEEE 383 Type Test of Class IE Electric Cables, Field Splices, and Connections

D. UL: Underwriters Laboratories:
   1. UL 44 Rubber-Insulated Wires and Cables
   2. UL 83 Thermoplastic-Insulated Wires and Cables
   3. UL 1277 Type TC Power and Control Tray Cable

1.4 SUBMITTALS

A. Submit product data for the following materials:
   1. Single conductor 600V power and control conductors.
   2. Fire Pump Cable
   3. MC Cable

B. Submittals of the following materials consist only of a listing of the manufacturer's name and the applicable catalog numbers of the items to be utilized:
   1. Connectors
   2. Branch Circuit Conductor Splices
   3. Splices with Compression Fitting and Heat-Shrinkable Insulator

C. Submit cable test data per testing requirements of PART 3.

1.5 QUALITY ASSURANCE

A. Copper Conductors: Indicated sizes considered minimum for ampacities and voltage drop requirements.

B. Conductors for special systems as recommended by the equipment manufacturer except as noted.

C. Deliver conductors to the job site in cartons, protective covers, or on reels.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Conductors - 600V:
   1. General
   2. Essex
   3. Southwire
   4. Or approved equal.

B. Conductors - Fire Pump Circuits:
   1. Pryotenax

C. MC Branch Circuit Cable:
   1. AFC Cable Systems
   2. Southwire
   3. Okonite

D. Connectors - 600V and Below:
   1. Burndy
   2. Anderson
   3. Or approved equal

2.2 CONDUCTORS – 600V

A. Type:

1. Copper: 12 AWG minimum size unless noted otherwise. 12 AWG and 10 AWG, solid or stranded, 8 AWG or larger, Class B concentric or compressed stranded.
2. Aluminum: Not allowed.
3. Insulation:
4. THHN/THWN-2 for conductors 6 AWG and smaller.
5. XHHW-2 for conductors 4 AWG and larger.

B. Thru wiring in fluorescent luminaires rated for 90 degree C minimum.

2.3 POWER LIMITED WIRING

A. Copper, stranded or solid as recommended by the system manufacturer.

B. Insulation appropriate for the system and location used.

2.4 MC BRANCH CIRCUIT CABLE

A. Sheath:
1. Steel or Aluminum, of the interlocking metal type, continuous and close fitting.
2. Sheath not considered a current carrying or grounding conductor.

B. Conductors:
1. Solid copper, of the same ampacity as the conduit/wire system indicated for the specific location.
2. Provide separate green insulated grounding conductors in circuits where an isolated ground is called for.

2.5 CONNECTORS – 600V AND BELOW

A. Branch Circuit Conductor Splices:
1. Twist-on wire connectors: 3M Insulated Electrical Spring Connector (312/512), Ideal Industries Wing-Nut, or Buchanan B-Cap.
2. Push in self-locking type connectors, WAGO.

B. Cable Splices:
1. Compression tool applied sleeves, Kearney, Burndy, or equivalent with 600V heat shrink insulation.
2. Submit proposed splice location to the Engineer for review, except where indicated on the plans

C. Terminator Lugs for Stranded Wire:
1. 10 AWG Wire and Smaller: Spade flared, tool applied.
2. 8 AWG Wire and Larger: Compression tool applied.
3. Setscrew type terminator lugs furnished as an integral part of distribution equipment, switches and circuit breakers will be acceptable.

PART 3 EXECUTION

3.1 CONDUCTORS

A. Pulling compounds may be used for pulling conductors. Clean residue from the conductors and raceway entrances after the pull is made.

B. Pulleys or Blocks:
   1. Use for alignment of the conductors when pulling.
   2. Pulling in accordance with manufacturer's specifications regarding pulling tensions, bending radii of the cable, and compounds.

C. Make up and insulate wiring promptly after installation of conductors. Do not pull wire in until bushings are installed and raceways terminations are completed. Do not pull wire into conduit embedded in concrete until after the concrete poured and forms stripped.

D. Provide a dedicated neutral conductor with each branch circuit, do not use a shared neutral conductor between phases unless specifically requested or directed.

3.2 MC CABLE

A. Allowed only for connection to motors or equipment and limited to 8' in length.

B. Do not use as branch circuit homeruns to branch panelboards.

C. Terminate MC cabling within a local junction box and transition to conduit and building wire homerun back to panelboard within the room or as soon as possible.

D. Locate junction box within one of the following spaces:
   1. Ceiling space
   2. Other accessible area of the room
   3. Immediate area where MC cabling is servicing devices.

E. EMT or RMC conduit utilized for branch circuit homeruns to branch panelboards.

F. Provide enclosures and terminals to transition from MC Cable to building wire as required.

3.3 CONNECTORS

A. Terminate control and special systems with a tool applied spade flared lug when terminating at a screw connection.

B. Screw and bolt type connectors made up tight and retightened after an 8-hour period.

C. Apply tool applied compression connectors per manufacturer's recommendations and physically checked for tightness.

3.4 COLOR CODING

A. Color code secondary service, feeders, and branch circuit conductors. Phase color code to be consistent at feeder terminations, A-B-C left-to-right, A-B-C top-to-bottom, or A-B-C front-to-back. Color code is as follows:

120/240V 208Y/120V	Phase
Black	A
Red	B

Blue	C
White	Neutral
Green	Ground**
Pink or Tan	Switchlegs
Purple	Travelers
* or white with colored (other than green) tracer	
**Ground for isolated ground receptacles green with yellow tracer.	

B. Use solid color compound or solid color coating for 12 AWG and 10 AWG branch circuit conductors and neutral sizes.

C. Phase conductors 8 AWG and larger color code using one of the following:
   1. Solid color compound or solid color coating.
   2. Stripes, bands, or hash marks of color specified above.
   3. Colored as specified using 3/4-inch wide tape. Apply tape in half overlapping turns for a minimum of three inches for terminal points and in junction boxes, pull boxes, troughs, manholes, and handholes. Apply the last two laps of tape with no tension to prevent possible unwinding. Apply tags to cable stating size and insulation type where cable markings are tape covered.

D. Color-coding of the flexible wiring system conductors and connectors.

E. For modifications and additions to existing wiring systems, conform color-coding to the existing wiring system.

3.5 FIELD TESTING

A. 600V Rated Conductors: Test for continuity. Conductors 100A and over in meggered after installation and prior to termination. Provide the megger, rated 1,000V DC, and record and maintain the results, in tabular form, clearly identifying each conductor tested.
   1. Replace cables when test value is less than 1 megohms.
   2. Cable test submittal include results, equipment used, and date.

END OF SECTION

SECTION 26 05 26

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes:
   1. Ground Conductors
   2. Connectors
   3. Ground Pads
   4. Ground Rods

1.2 RELATED SECTIONS

A. Division 01, General Requirements

B. Division 26, Electrical

C. Section 26 05 13, Medium Voltage Cables

D. Section 26 05 19, Low Voltage Electrical Power Conductors and Cables

E. Section 26 05 33, Raceways and Boxes for Electrical Systems

F. Section 26 05 80, Electrical Testing

G. Section 26 27 26, Wiring Devices

H. Section 26 29 00, Motor Controllers

1.3 QUALITY ASSURANCE

A. Provide complete ground systems as indicated. Include conduit system, transformer housings, switchboard frame and neutral bus, motors, and miscellaneous grounds required.

B. Provide 600V insulated main bonding jumper for utility company connection between ground bus in switchgear lineup and ground termination point or service ground in transformer vault as directed by the utility.

C. Provide an insulated ground conductor in every conduit or raceway containing power conductors.

D. Continue existing system as specified herein and shown on the Drawings.

PART 2 PRODUCTS

2.1 GROUND CONDUCTORS

A. Green insulated copper for use in conduits, raceways, and enclosures.

B. Bare copper for ground grids and grounding electrode systems.

2.2 CONNECTORS

A. Cast, set screw, or bolted type.

B. Form poured, exothermic welds.

C. Grounding lugs where provided as standard manufacturer's items on equipment.

PART 3 EXECUTION

3.1 INSTALLATION

A. Grounding Conductors: Sized in accordance with Article 250, Tables 250.66 and 250.122 of the National Electrical Code.

B. Grounding Conductor Connectors: Make up tight, located for future servicing, and ensure low impedance.

C. Ground the electrical system, the cold-water service, structural steel, and transformers to the building ground grid.

D. Plug-in Receptacles: Bonded to the boxes, raceways, and grounding conductor.

3.2 EQUIPMENT

A. Provide separate green insulated equipment ground conductor in non-metallic and flexible electrical raceways.

B. Ground luminaires, panels, controls, motors, disconnect switches, exterior lighting standards, and noncurrent carrying metallic enclosures. Use bonding jumpers, grounding bushings, lugs, buses, etc., for this purpose.

C. Provide grounding bushings on feeder conduit entrances to panels and equipment enclosures and bond bushings to enclosures with minimum 10 AWG conductor. Connect the equipment ground to the building system ground. Use the same size equipment ground conductors as phase conductors, up through 10 AWG.

3.3 GROUND RESISTANCE TEST

A. Accomplish with a ground resistance direct-reading single test meter utilizing the Fall-of-Potential method and two reference electrodes. Perform test prior to interconnection to other grounding systems. Orient

the concrete-encased ground electrode to be tested and the two reference electrodes in straight-line spaced 50-feet apart. Drive the two reference electrodes 5-feet deep.

B. Provide test results writing.
   1. Show temperature, humidity, and condition of the soil at the time of the tests.
   2. Where the ground resistance exceeds 5 Ohms, the Engineer will issue additional instructions.

END OF SECTION

SECTION 26 05 29

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes:
   1. Hangers
   2. Pipe Straps
   3. Support of Open Cabling
   4. Rooftop Conduit Supports

1.2 RELATED SECTIONS

A. Division 01, General Requirements

B. Division 26, Electrical

C. Section 26 05 33, Raceways and Boxes for Electrical Systems

D. Section 26 05 36, Cable Trays for Electrical Systems

E. Section 26 22 00, Low Voltage Transformers

F. Section 26 24 13, Switchboards

G. Section 26 24 16, Panelboards

H. Section 26 50 00, Lighting

1.3 REFERENCED STANDARDS

A. International Building Code (IBC)

B. Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)

PART 2 PRODUCTS

2.1 HANGERS

A. Kindorf B-905-2A Channel, H-119-D washer, C105 strap, minimum 1/2-inch rod with ceiling flange, or approved equal.

2.2 PIPE STRAPS

A. Two-hole galvanized or malleable iron.

2.3 SUPPORT OF OPEN CABLING

A. Support of Open Cabling: Label NRTL for support of Category 16 cabling, designed to prevent degradation of cable performance and pinch points that could damage cable.
   1. Support brackets with cable tie slots for fastening cable ties to brackets.
   2. Lacing bars, spools, J-hooks, and D-rings.
   3. Straps and other devices.

2.4 ROOFTOP CONDUIT SUPPORTS

A. Manufacturer:
   1. Cooper B-Line Dura-Blok Rooftop Supports
   2. Erico
   3. Or approved equal.

B. Curb base made of 100 percent recycled rubber and polyurethane prepolymer with a uniform load.

C. Capacity of 500 pounds per linear foot of support.

D. UV Resistant.

E. Steel frame: 14 gauge galvanized strut per ASTM A653 or 12 gauge galvanized strut per ASTM A653 for bridge series.

F. Continuous block channel supports with 1-inch gaps to allow water flow, bridge change supports, extendable height channel supports, and elevated single conduit supports.

G. Attaching hardware: Zinc plated threaded rod, nuts and attaching hardware per ASTM B633 fastened directly into rubber material with weather resistant Type 12 lag screws.

H. Provide load distribution plates as required for concentrated loads.

I. Finish: Black

J. Provide hot dipped galvanized components where exposed to weather.

PART 3 EXECUTION

3.1 INSTALLATION

A. Provide electrical equipment supports.

B. Install vertical support members for equipment, straight and parallel to building walls.

C. Provide independent supports to structural member for electrical fixtures, materials, or equipment installed in or on ceiling, walls, or in void spaces and/or over furred or suspended ceilings.

D. Do not use other trades' fastening devices to support electrical equipment materials or fixtures.

E. Do not use supports and/or fastening devices to support other than one particular item.

F. Support conduits within 18-inches of outlets, boxes, panels, cabinets, and deflections.

G. Provide complete seismic anchorage and bracing for the vertical and lateral restraint of conduit, cable trays, bus ducts, and electrical equipment as required by IBC Chapter 6 and the most recent version of the SMACNA Seismic Restraint Manual for Seismic Hazard Level (SHL) A.

H. Submit shop drawings of bracing systems to the Architect for review and bear the seal of a professional engineer registered in the State the project is located.

3.2 LUMINAIRES

A. Light-Duty Ceiling Systems:
1. Attach 12 gauge hanger wire from each corner of the luminaire to the structure above.
2. Positively and securely, attach luminaire within 6-inches of each corner to the suspended ceiling-framing member by mechanical means.

B. Intermediate-Duty Ceiling Systems:
1. Positively and securely, attach luminaire within 6-inches of each corner to the suspended ceiling-framing member by mechanical means.
2. Attach 12 gauge hanger wire within 3-inches of each corner of each luminaire.
3. Connect two 12 gauge slack wires from the luminaire housing to the structure above for luminaires weighing less than 56 pounds.
4. Support luminaries weighing 56 pounds or more directly from the structure above with approved hangers attached to each corner of the luminaire.

C. Heavy-Duty Ceiling Systems:
1. Positively and securely attach luminaire within 6 inches of each corner to the suspended ceiling-framing member by mechanical means.
2. Connect two 12-gauge slack wires from the luminaire housing to the structure above for luminaires weighing less than 56 pounds.
3. Support luminaries weighing 56 pounds or more directly from the structure above with approved hangers attached to each corner of the luminaire.

3.3 PULL AND JUNCTION BOXES

A. Pull and junction boxes installed within the cavity of a suspended ceiling that is not a fire rated assembly may be attached to the suspended ceiling framing members, provided the following criteria are met:
1. Installation complies with the ceiling system manufacturer's instructions.
2. Pull or junction box is not larger than 100 cubic inches.
3. Support to the main runner with two fastening devices designed for framing member application and positively attach or lock to the member.
4. Serves branch circuits and associated equipment in the area.
5. Pull or junction box is within 6-feet of the luminaires supplied.
6. Framing members are not rotated more than 2 degrees after installation.
7. Install within the cavity of a suspended ceiling may be attached to independent support wires, provided the following criteria are met:
   a. Independent support wires are taut and connected at both ends, one end to the ceiling framing member and the other to the structure above.

NEHS

b. Not larger than 100 cubic inches.
c. Secure to the independent support wires by two fastening devices designed for the application.
d. Independent support wires in a fire-rated ceiling are distinguishable by color, tagging, or other effective means.

3.4 CABLES AND RACEWAY

A. Cables and raceway installed within the cavity of a suspended ceiling may be attached to independent support wires provided the following criteria are met:
1. Independent support wires are taut and connected at both ends, one end to the ceiling framing member and the other to the structure above.
2. Raceways no larger than 1-inch trade size and cables and bundled cables are not larger than 1-inch diameter including insulation.
3. Not more than three raceways or cables supported by independent support wire and supported within the top or bottom 12-inches.
4. Cables for telecommunications, data processing, Class 2 power-limited signaling systems, fiber optics, and other power limited systems are securely fastened within 2 feet of each termination and at intervals not to exceed 5-feet or per the manufacturer's installation instructions.
5. Secure raceways at intervals required for the type of raceway installed.
6. Secure cables and raceway to independent support wires by fastening devices and clips designed for the purpose.
7. Independent support wires are distinguishable by color, tagging, or other effective means.

B. Cables and raceway installed within the cavity of a suspended ceiling may be supported with trapezes constructed of steel rods and channels provided the following criteria are met:
1. The size of the rods, channel, and fastening devices are suitable for the anticipated weight.
2. The spacing of the trapezes meets that required for the type of raceway installed.
3. Secure to a trapeze by straps designed for the purpose.
4. Cables and raceway do not support other raceway or cables.
5. An appropriately sized seismic bracing system is installed.

3.5 ROOFTOP CONDUIT SUPPORTS

A. Coordinate with roofing manufacturer for roof membrane compression capacities. Provide a compatible sheet of roofing material under each support to disperse concentrated loads and provide added membrane protection. Do not use supports that will void roofing warranty,

B. Install in accordance with recommendations and instructions provided by manufacturer.

C. Provide supports such that rooftop raceways are a minimum of 4-inches above roof.

END OF SECTION

SECTION 26 05 33

RACEWAYS AND BOXED FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes:
   1. Metallic Conduits
   2. Non-Metallic Conduits
   3. Wireways
   4. Fittings
   5. Metallic Boxes
   6. Floor Boxes
   7. Non-Metallic Boxes

1.2 RELATED SECTIONS

A. Division 01, General Requirements

B. Division 26, Electrical

C. Section 26 05 13, Medium Voltage Cables

D. Section 26 05 19, Low Voltage Electrical Power Conductors and Cables

E. Section 26 05 26, Grounding and Bonding for Electrical Systems

F. Section 26 05 29, Hangers and Supports for Electrical Systems

G. Section 26 05 53, Identification for Electrical Systems

PART 2 PRODUCTS

2.1 GENERAL

A. Raceways and conduits of specified types for electrical system wiring, except where clearly indicated otherwise.

B. Fittings, boxes, hangers, and appurtenances required for the conduits and raceways.

C. Size raceways and conduits as indicated. Where no size indicated, conduit may be the minimum code permitted size for the quantity of conductors installed, based upon NEC tables for conductors with type THW insulation.

2.2 METALLIC CONDUITS

A. Rigid Metal Conduit (RMC):
1. Smooth surfaced, heavy wall mild steel tube of uniform thickness and temper, reamed and threaded at each end and protected inside and out with galvanizing, sherardizing, or equivalent process.
2. Comply with NEC Article 344.

B. Intermediate Metallic Conduit (IMC):
1. Smooth surface, intermediate wall mild steel tube of uniform thickness and temper, reamed and threaded at each end, and protected inside and out with galvanizing, sherardizing, or equivalent process.
2. Comply with NEC Article 342.

C. Electrical Metallic Tubing (EMT):
1. Smooth surface, thin wall mild steel tube of uniform thickness and temper, galvanized or sherardized on the outside, and enameled on the interior.
2. Comply with NEC Article 358.

D. Flexible Conduits (Flex):
1. Flexible Metallic Conduit:
   a. Interlocking single strip steel construction, galvanized inside and out after fabrication.
   b. Comply with NEC Article 348.
2. Liquid Tight:
   a. Similar to flexible metallic conduit, except encased in a liquid tight polyvinylchloride or equivalent outer jacket over the flexible steel core.
   b. Comply with NEC Article 350.

2.3 NON-METALLIC CONDUITS

A. Rigid Non-Metallic Conduit:
1. Type II PVC Schedule 40 or 80, suitable for use with 90 degree C rated wire.
2. Conform to UL Standard 65l and carry appropriate UL listing for above and below ground use.
3. Comply with NEC Article 352.

2.4 WIREWAYS

A. Troughs: Steel, painted, square in cross section, preformed knockouts on standard spacing, screw cover.

B. Fittings: Tees, elbows, couplings as required for configuration shown on the Drawings.

2.5 FITTINGS

A. RMC and IMC:
1. Threaded Locknuts: Sealing type where used with NEMA 2, 3, 3R, 4, and 12 enclosures.
2. Threaded Bushings: 1-1/4-inch and larger, insulated, grounding type as required under Section 26 05 26, Grounding and Bonding for Electrical Systems.
3. Threaded Couplings:
   a. Standard threaded of the same material and as furnished with conduit supplied.

b. Erickson type couplings may be used where required to complete conduit runs larger than 1-inch.

B. EMT:
1. Connectors:
   a. Steel compression ring or steel set screw type for conduit termination, with insulated throat, suitable for conditions used.
   b. Use lay-in grounding type bushings where terminating grounding conductors.
2. Couplings: Steel compression ring or steel set screw type, concrete tight.

C. Threadless: RMC and IMC couplings and box connectors may be steel threadless, compression ring or set screw type for use with conduits 1-inch and smaller where installed in poured concrete locations or where limited working space makes threaded fittings impractical.

D. Weatherproof Connectors: Threaded

E. Expansion Couplings: Equivalent to O.Z. type EX with jumper.

F. Seal-Offs: With filler fiber, compound, and removable cover.

2.6 METALLIC BOXES

A. Flush and Concealed Outlet Boxes: Galvanized stamped steel with screw ears for device ring mounting, knock-out plugs, mounting holes, fixture studs if required, RACO or equivalent.

B. Surface Outlet Boxes: Galvanized stamped steel same as above for use on ceilings; cast steel or aluminum with threaded hubs or bosses for use on walls.

C. Large Boxes:
1. Boxes exceeding 4-11/16-inches when required welded steel construction with screw cover and painted, steel gauge as required by physical size.
2. Manufacturers:
   a. Hoffman
   b. Circle AW
   c. Or equivalent.

D. Systems:
1. Boxes for systems devices as recommended by the systems manufacturer, suitable for the equipment installed.
2. Equip with grounding lugs, brackets, device rings, etc., as required.

2.7 NON-METALLIC BOXES

A. PVC, molded enclosures, threaded hubs.

PART 3 EXECUTION

3.1 INSTALLATION

A. Conceal conduits in finished spaces. Concealed conduits run in a direct line with long sweep bends and offsets. Where RMC and IMC embedded is in concrete below grade or in damp locations make watertight by painting the entire male thread with Rustoleum metal primer or equivalent before assembly.

B. Route exposed conduit parallel or at right angles to structural building lines and neatly offset into boxes. Conduits attached directly to building surfaces closely follow the surfaces. Conduit fittings used to saddle under beams. Coordinate drilling or notching of existing beams, trusses on structural members with Architect prior to commencing.

C. Rigidly secure RMC and IMC terminations at boxes, cabinets, and general wiring enclosures with double locknuts and bushings or approved fittings. Screw in conduit and engage at least five threads in hub where conduit boxes with threaded hubs or bosses are used. Use insulating bushings for conduits 1-1/4-inches or larger.

D. Keep conduit and raceways closed with suitable plugs or caps during construction to prevent entrance of dirt, moisture, concrete, or foreign objects. Clean and dry raceways before installation of wire and at the time of acceptance.

E. Pack spaces around conduits with polyethylene backing rods and seal with polyurethane caulking to prevent entrance of moisture where conduits are installed in sleeves or block-outs penetrating moisture barriers.

3.2 CONDUIT

A. RMC:
1. Use in areas for wiring systems.
2. Install for exposed runs of medium voltage circuits outside of the electrical rooms.
3. Install where subject to mechanical injury.
4. Install with threaded fittings made up tight.

B. IMC:
1. Use for medium voltage circuits where concealed or where exposed in the electrical rooms.
2. Use for circuits rated 600V and less where not in contact with earth or fill.
3. Install with threaded fittings made up tight.

C. EMT:
1. Use in other dry protected locations for circuits rated 600V and less.
2. Securely support and fasten whether exposed or concealed at intervals of nominally every 8-feet and within 24-inches of each outlet, ell, fitting, panel, etc.

D. Flex:
1. Use for connections to vibration producing equipment and where installation flexibility is required with a minimum 12-inches slack connection.
2. Limit flex length to 36-inches for exposed equipment connections and 72-inches in concealed ceiling and wall cavities.
3. Use PVC jacketed flex in wet locations, areas subject to washdown, and exterior locations.

E. PVC:
1. Type II Schedule 40 and 80 PVC may be used underground and in and under interior slabs, poured concrete walls, and where scheduled or noted on the Drawings.
2. Make connections with waterproof solvent cement.
3. Provide RMC at 60 degree and larger bends and where penetrating slabs.

3.3 RACEWAYS

A. Surface metal wireways may be installed at locations to serve motor starters or other control devices where required by a multitude of wiring interconnections or physical layout.

3.4 FITTINGS

A. Assemble continuous and secured metallic raceways and conduits to boxes, panels, etc., with appropriate fittings to maintain electrical continuity. Cut square and reamed smooth conduit joints with fittings drawn up tight.

B. Do not use Crimp-on, tap-on, indenter type, malleable iron, or cast set screw fittings.

3.5 BOXES

A. General:
1. Outlet Boxes: Code required size to accommodate wires, fittings, and devices.
2. Provide multi-gang boxes as required to accept devices installed with no more than one device per gang.
3. Equip metallic boxes with grounding provisions.

B. Size and Type:
1. Flush wall switch and receptacle outlets used with conduit systems 4-inches square, 1-1/2-inches or deeper, with one or two-gang plaster ring, mounted vertically. Where three or more devices are at one location, use one piece multiple gang tile box or gang box with suitable device ring.
2. Wall bracket and ceiling surface mounted luminaire outlets 4-inch octagon 1-1/2-inches deep with 3/8-inch fixture stud where required. Wall bracket outlets have single gang opening where required to accommodate luminaire canopy. Provide larger boxes or extension rings where quantity of wires installed requires more cubic capacity.
3. Junction boxes installed in accessible ceiling or wall cavities or exposed in utility areas minimum of 4-inches square, 1-1/2 inches deep with appropriately marked blank cover.
4. Boxes for the special systems suitable for the equipment installed. Coordinate size and type with the system supplier.

C. Pull Boxes:
1. Provide pull boxes where shown for installation of cable supports or where required to limit the number of bends in conduits to not more than three 90-degree bends.
2. Use galvanized boxes of code-required size with removable covers installed so that covers will be accessible after work is completed.

D. Installation:
1. Mount boxes and outlets at nominal centerline heights shown on the drawings.
2. Adjust heights in concrete masonry unit (CMU) walls to prevent devices or finish plates from spanning masonry joints.

3. Recessed Boxes:
   a. Flush with finished surfaces or not more than 1/8-inch back, level and plumb.
   b. Long screws with spacers or shims for mounting devices will not be acceptable.
   c. No combustible material exposed to wiring at outlets.
4. Covers for flush mounted boxes in finished spaces extend a minimum of 1/4-inch beyond the box edge to provide a finished appearance. Finish edge of cover to match cover face.
5. Boxes installed attached to a stud in sheet rock walls equipped with opposite side box supports equivalent to Caddy 760. Install drywall screw prior to finish taping. Methods used to attach boxes to studs not to cause projections on the face of the stud to prevent full-length contact of sheet rock to the stud face.

3.6 PULL WIRES

A. Install nylon pull lines in empty conduits larger than 1-inch where routing includes 25-feet or more in length or includes 180 degrees or more in bends.

B. Where conduits requiring pull lines are stubbed out and capped, coil a minimum of 36-inches of pull line and tape at termination of conduit for easy future access. Label pull lines as to conduit starting or terminations point and intended future use.

END OF SECTION

SECTION 26 05 40

SURFACE METALLIC RACEWAYS FOR ELECTRICAL SYSTEM

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes:
   1. Raceways

1.2 RELATED SECTIONS

A. Division 01, General Requirements

B. Division 26, Electrical

C. Section 26 05 19, Low Voltage Electrical Power Conductors and Cables

D. Section 26 05 26, Grounding and Bonding for Electrical Systems

E. Section 26 05 53, Identification for Electrical Systems

F. Section 26 27 26, Wiring Devices

1.3 SUBMITTALS

A. Shop Drawing Submittals:
   1. Submit Shop Drawings of the complete system.
   2. Include sizes and lengths of raceways as verified with laboratory furniture Shop Drawings, end caps, raceway cover spacing's, grounding, branch circuiting and wiring including locations of service entrances, receptacle types and manufacturers, receptacle spacing, receptacle labeling with proper voltage, phase, circuit and panelboard designations as indicated on the drawings.
   3. Accompany at the same time of the submittal, by floor plans showing raceway locations, with each piece numbered the same as the corresponding number of the raceway piece number in the submittal.

PART 2 PRODUCTS

2.1 GENERAL

A. Provide a complete surface metallic raceway system for standard receptacles to include receptacles, devices, supports, fittings, and accessories necessary to complete the installations indicated.

B. In the event the Contractor chooses to furnish and install a system or item of equipment of different arrangement from the system herein specified, provide additional labor and material required by the system at no additional cost to the Owner, and obtain prior approval.

C. Tests and operational check determine the suitability for energization.

D. Schedule tests and give a minimum of one week's advance notice of time and date to the Architect and Owner for any major systems tests specified in this Section.

2.2 RACEWAYS

A. Factory pre-assembled complete including bases, covers, end plates, wiring, receptacles, fittings and connections, to exact lengths to match the lengths of the cabinets and shelving as indicated on laboratory furniture Shop Drawings since the lengths shown on electrical drawings are illustrative and diagrammatic only and are not accurate, also see island bench details on the drawings.

B. Receptacle circuits to be prewired for the entire length of the section, leaving 2-foot pigtail for field connection and properly tagged for circuit identification in field.

C. Tap splicing of wires using twist-on wire connectors, 3M insulated spring connector (312/512), Ideal Industries Wing-Nut, Buchanan B-Cap wire connectors, or equivalent.

D. Raceway base, cover and end plates to be constructed of extruded aluminum 6063-T5, 0.060 inch minimum wall thickness. Finish to be clear anodized AA-C22A31 Architectural Class II.

E. Blank snap-in raceway covers to be precut to 12-inch sections. Each cover plate able to withstand 45 pound cord pull pressure. Regardless, raceway covers stay on when pulling off any receptacle plug. Support receptacles in the raceway from the raceway covers by countersunk screws, and independent of the raceway bases or main body. Covers to be provided with receptacles mounted and identified by means of engraved 3/16 inch black letters indicating receptacle voltage, phase, and amperage for receptacles other than the regular 20A, 120V receptacles (i.e., 208V, 1-phase, 30A) at top of receptacle. Receptacles have panel and circuit designation (i.e., LPA22) at bottom of receptacle. Dedicated 20A, 120V receptacles labeled DEDICATED at top of receptacles. Receptacles on optional standby circuits labeled as STANDBY.

F. Where raceways are shown connected at right angles to each other, the end plate of the raceway overlapping the faceplate of the other raceway regressed flush with the ends of the raceway base/body.

G. Raceway Type A a minimum 6 inches high by 2-1/2 inches deep Series ALA4800 as manufactured by The Wiremold Company ISOduct Prewired Raceway Systems, Post Glover/Halsey Versa-Duct Series 255 with devices mounted to cover plate with countersunk screws. Provide with a barrier to divide the raceway interior into 2 equal sections. Each sections has its own cover. Where raceways are shown on the Drawings with telecom outlets, verify outlet openings configuration at raceway covers in the telecom compartment with the telecom Section of the specifications. Do the same for knockout cutout configuration for future punch-out where no outlets are shown at the raceways on the Drawings (provide one knockout for each raceway length).

PART 3 EXECUTION

3.1 GENERAL

A. Raceway Type A to receive receptacles of type, quantity, and spacing as indicated on Plans.

B. Raceways to be mounted on walls and casework parallel to or at right angles to structure and casework.

C. The number of conductors installed in any raceway not greater than the number for which the raceway is approved.

D. Ground continuity maintained throughout the entire raceway length by means of factory installed separate insulated Code-size grounding conductors. Each equipment grounding conductor in a conduit homerun entering the raceway connected to the ground terminals of the receptacles and to the ground stud in the raceway interior. Bonded receptacle cover plates.

E. Each 20A, 120V circuit of an individual or multi-circuit wiring in a raceway provided with individual 12 AWG neutral conductor for each circuit.

F. In multi-wire branch circuits, the continuity of a grounded conductor (neutral) not dependent upon device connections, such as receptacles, etc., where the removal of such devices would interrupt the continuity.

G. At least 6-inches of free conductors left at each outlet, junction and switch point for splices or the connection of fixtures or devices.

END OF SECTION

SECTION 26 05 45

SEISMIC RESTRAINTS FOR ELECTRICAL RACEWAYS AND EQUIPMENT

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes:
   1. Seismic Bracing
   2. Channel Type Elements
   3. Bolting Accessories

1.2 RELATED SECTIONS

A. Division 01, General Requirements

B. Division 26, Electrical

C. Section 26 05 29, Hangers and Supports for Electrical Systems

1.3 REFERENCED STANDARDS

A. The following are the referenced standards:
   1. SMACNA Sheet Metal and Air Conditioning Contractor's National Association
   2. AISC American Institute of Steel Construction
   3. ASTM American Society for Testing and Materials
   4. AWS American Welding Society
   5. IBC International Building Code
   6. ICC International Code Council
   7. OSHPD Office of Statewide Health Planning and Development
   8. ASCE 7-16 Minimum Design Loads and Associated Criteria for Buildings and Other Structures

1.4 QUALITY ASSURANCE

A. General Requirements:
   1. Provide seismic restraints for equipment, both supported and suspended, conduits, and cable tray systems.
   2. Bracing of conduits and cable trays in accordance with the provisions set forth in the SMACNA seismic restraint manual and the requirements set in ASCE 7 Section 13.2.
   3. Review and approve structural requirements for restraints, including their attachment to the building structure by a registered structural engineer in the same state as the project.
   4. Attachments to supported or suspended equipment must be coordinated with the equipment manufacturer.

B. Bracing of Conduits:
   1. Provide seismic bracing of conduit as detailed below:
      a. Brace electrical conduits 2-1/2 inch nominal diameter or larger.

b. Brace conduits located in electrical rooms, boiler rooms, mechanical equipment rooms, and refrigeration mechanical rooms that are 1-1/4-inch nominal diameter and larger.

2. Exception: Conduits suspended by individual hangers 12-inches or less in length, as measured from the top of the conduit to the bottom of the support where the hanger is attached, need not be braced.

C. Suspended Equipment and Raceways:
1. Cable Method: The seismic restraint shall consist of a combination of stranded steel aircraft cable with an added nut and neoprene and steel washer.
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.

D. Seismic restraints, including anchors to building structure, designed by a registered professional structural engineer licensed in the state of Oregon. Design includes:
1. Number, size, capacity, 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. For units weighing greater than 2500 pounds, or curbs more than 10 feet long, provide substantiating calculations the curb can accept the prescribed seismic forces.
2. Number, size, capacity, and location of seismic restraint devices and anchors for vibration-isolation and suspended equipment. Provide calculations, test data, or California OSHPD approval number verifying the horizontal and vertical ratings of the seismic restraint devices.
3. Number, size, capacity, and location of braces and anchors for suspended raceways, bus ducts, and cable trays on as-built plan drawings.
a. Select a single seismic restraint system pre-designed to meet the requirements of the latest edition of the IBC such as the 1999 Mason Industries Seismic Restraint Guidelines for Suspended Piping, Ductwork, and Electrical Systems.
b. Details or designs from separate seismic restraint guidelines are not acceptable. Installation not addressed by the selected system shall be designed, detailed, and submitted alone with the as-built plan drawings.
c. Maximum seismic loads shall be indicated on drawings at each brace location. Drawings shall bear the stamp and signature of the registered professional structural engineer licensed in the state of Oregon who designed the layout of the braces.

E. Supports, Hangers, and Anchors: Comply with the requirements of Section 26 05 29, Hangers and Supports for Electrical Systems meet the requirements of ASCE 7 Section 13.2 based on the Seismic Design Criteria located on the structural drawings.

1.5 SUBMITTALS

A. Product Data: Submit product data for products specified herein.

B. Shop Drawings:
1. Submit shop drawings complying with the requirements of the Quality Assurance article of this Section.
2. Stamp shop drawings by a professional structural engineer licensed in the state of Oregon
3. Approve submittals prior to rack fabrication and installation.

C. Calculations:
   1. Submit seismic calculations indicating restraint loadings resulting from the design seismic forces presented in the Quality Assurance article of this Section.
   2. Include anchorage details that include the diameter, embedment, and material grade of the material in which the anchor is placed.
   3. Stamped by a professional structural engineer licensed in the state of Oregon.

D. Certifications:
   1. Submit certification of seismic restraint's and building structural member's capability to safely accept loads resulting from seismic forces calculated in the previous paragraph.
   2. Tests in three planes clearly showing ultimate strength and appropriate safety factors performed by independent laboratories and certified by a professional structural engineer licensed in the state of Oregon or calculations by a professional structural engineer licensed in the state of Oregon are acceptable.

PART 2 PRODUCTS

2.1 SEISMIC BRACING:

A. Steel fabrication, in accordance with AISC Steel Manual, with structural steel shapes of ASTM A 36 steel.

B. Welding in accordance with AWS D1.1.

C. Design and sizes as required.

D. Fastenings, bracing, and assembly selected by a professional structural engineer licensed in the state of Oregon.

E. Show that the maximum stress in any structural steel member will not exceed 18,000 psi.

2.2 CHANNEL TYPE ELEMENTS

A. 12 gauge formed steel, 1-5/8-inch square prime painted or chromate dip finish. Use spring-in nuts with grooves.

2.3 BOLTING ACCESSORIES

A. Machine bolts with semi-finished nuts.

PART 3 EXECUTION

3.1 INSTALLATION

A. Provide support assemblies to meet the seismic zone indicated. Equipment shall be braced and anchored to conform to the requirements listed under the Quality Assurance article of this Section.

B. Seismically brace raceways, cable trays, and suspended bus duct to conform to the requirements listed under the Quality Assurance article of this Section.

C. Provide pipeline seismic flexible connectors where piping crosses building earthquake joints. Arrange raceways and connectors for the amount of motion required. Maintain continuity of the grounding system for each of the joints.

D. Do not use powder-actuated inserts.

E. Seismic Restraints:
   1. Attach to structural members of the building, which are capable of withstanding the design load of the seismic restraint.
   2. Ensure load capacity of the structural members is greater than or equal to the capacity of the seismic restraint.

END OF SECTION

SECTION 26 05 53

IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes:
   1. Labels

1.2 RELATED SECTIONS

A. Division 01, General Requirements

B. Division 26, Electrical

C. Section 26 05 19, Low Voltage Electrical Power Conductors and Cables

D. Section 26 05 33, Raceways and Boxes for Electrical Systems

E. Section 26 27 26, Wiring Devices

F. Section 26 50 00, Lighting

PART 2 PRODUCTS

2.1 LABELS

A. Pre-printed:
   1. Permanent material pre-printed with black on white, with adhesive backing.
   2. Manufacturer:
      a. Brady
      b. 3M
      c. Or equal.

B. Engraved Laminated Plastic:
   1. 3-ply laminated plastic, colors indicated herein, with beveled edges, engraved letters, and stainless steel screw attachment.
   2. Nameplate length to suit engraving.
   3. Adhesive attachment is not acceptable.

C. Clear Plastic Tape:
   1. Black (normal) or red (emergency or standby) 12 point Helvetica medium text, clear adhesive backing, field printed with proper equipment for device labeling.
   2. Manufacturers:
      a. Brother P-Touch
      b. Dyno-tape
      c. Kroy

d. Or equal.

D. Wire Markers:
1. White with black numbers, adhesive-backed tape on dispenser roll.
2. Manufacturers:
a. Brady
b. 3M
c. Or equal.

E. Feeder Conduit Marking:
1. Provide one-piece snap-around vinyl feeder conduit markers for feeder conduits.
2. Provide custom label, black letters on orange background indicating destination equipment, 1-1/4-inch high letters (minimum) – Seton Setmark Pipe Marker Series.
3. Provide additional one-piece snap-around vinyl label, black letters on orange background for voltage designation (i.e., 277/480V, 120/208V).
4. Secure labels to conduits using plastic tie wrap, two per label.

F. Marker Pen: Black permanent marker suitable for writing on metallic surfaces.

PART 3 EXECUTION

3.1 GENERAL

A. Nameplate and text coloring:
1. Normal Black nameplate with white lettering.

3.2 MOTOR CONTROL CENTERS

A. Provide engraved laminated plastic nameplates for main and feeder protective devices indicating the function or the load served (e.g., ELEV-5, PANEL 4HA, AHU-5, or SPARE) and the protective device trip rating (i.e., 175A). Text height: 3/8-inch.

B. Provide engraved laminated plastic nameplate for bussed spaces indicating the maximum ampere rating of future breaker, switch, or starter that may be installed (e.g., SPACE (225A)). Text height: 3/8-inch.

C. Provide engraved laminated plastic nameplate on the face of equipment enclosure as follows:
1. Line 1: Equipment identification (e.g., MDP, SDP, or MCC 4H). Text height: 3/4-inch.
2. Line 2: Equipment voltage, phase and wire quantity (e.g., 480Y/277V, 3-Phase, 4W). Text height: 1/2-inch.

D. Provide additional engraved laminated plastic nameplate to indicate upstream source and location of upstream source as follows:
1. Line 1: Upstream source equipment (e.g., FED FROM MDP). Text height: 3/8-inch.
2. Line 2: Location of upstream source (e.g., MAIN ELEC ROOM 102). Text height: 3/8-inch.
3. Confirm final room designations with Architect and Owner prior to procurement of nameplates.

3.3 EQUIPMENT

A. Provide engraved laminated plastic nameplate on the face of disconnect switches, motor starters, relays, contactors, and etc., indicating equipment served (e.g., AHU-1) and equipment load (e.g., 20 hp). Provide additional engraved laminated plastic nameplate indicating serving panel designation and circuit number.

B. Provide clear plastic tape label for relays, contactors, time switches, and miscellaneous equipment provided under this Division of work indicating equipment served.

3.4 FEEDER CONDUIT

A. Provide feeder conduit marker for electrical feeders.

B. Provide markers when exiting source equipment and located along the entire conduit length 20-feet on centers in exposed areas, above ceilings, and upon entering or leaving an area or room.

3.5 DEVICES

A. Label each receptacle plate with preprinted clear plastic tape indicating serving panel and circuit number (e.g., PANEL 2PA-5). Clean oils, dirt, and foreign materials from plate prior to label application. Label receptacles connected to a GFCI protected circuit downstream from the protecting device.

3.6 RACEWAYS AND BOXES

A. Label pull boxes and junction boxes for systems with paint or marker pen on box cover identifying system. Where box covers are exposed in finished areas, label inside of cover.

B. Color label covers as follows:

1.	208Y/120V wiring	Black
2.	Fire Alarm	Red
3.	Communications	Green
4.	Security	Blue

C. Label each end of pull wires left in empty conduits with tags or tape indicating location of other end of wire.

3.7 SYSTEMS

A. Complex control circuits may utilize combination of colors with each conductor identified throughout using wraparound numbers or letters. Use the number or letters shown where the Drawings or operation and maintenance data indicate wiring identification.

B. Label the fire alarm and communication equipment zones, controls, indicators, etc., with machine-printed labels or indicators appropriate for the equipment installed as supplied or recommended by the equipment manufacturer.

3.8 EXISTING EQUIPMENT

A. Provide new nameplates and labels for existing distribution equipment in accordance with panel descriptions shown on the Drawings. Provide new labels for feeder devices where labels are non-existent, incorrect, or confusing on existing distribution panels affected by this work.

B. Equip existing branch circuit panelboards scheduled to remain with new, accurate, typed, circuit directories where circuiting changes are made.

END OF SECTION

SECTION 26 09 23

LIGHTING CONTROL DEVICES

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes:
   1. Control Stations
   2. Standalone Room Controllers
   3. Occupancy/Vacancy Sensors
   4. Photosensor
   5. Relays, Switchpacks, and Room Controllers
   6. Power Supplies and Transformers
   7. Emergency Lighting Control Relays
   8. Low Voltage Control Wiring
   9. Test Equipment

B. Responsibilities and participation under Division 26, Electrical in the automatic dimming system installation and commissioning process.

C. Installation, connection, adjustment, and testing of the equipment including labor, materials, tools appliances, wire, junction boxes and equipment necessary for and incidental to the delivery, installation and furnishing of a completely operational lighting control system

1.2 RELATED SECTIONS

A. Division 01, General Requirements

B. Division 26, Electrical

C. Section 26 27 26, Wiring Devices

D. Section 26 50 00, Lighting

1.3 GENERAL REQUIREMENTS

A. Provide qualified personnel for participation in commissioning tests, including seasonal testing required after the initial commissioning.

B. Providing equipment, materials, and labor necessary to correct deficiencies found during the commission process which fulfill contract and warranty requirements.

C. Provide Operating and Maintenance Data and Record Drawings to the Test Engineer for verification, organization, and distribution.

D. Provide assistance to the Test Engineer to develop and edit descriptions of system operation.

E. Providing training for the systems specified in this Division with coordination by the Test Engineer and Commissioning Agent.

1.4 SUBMITTALS

A. Shop drawings:
   1. Submittal drawings with a complete system diagram to show quantity of devices, location in the building, dimensions and required wiring.
   2. Occupancy sensors, show the required quantity to cover the space controlled (note: this may be more than the quantity shown on the drawings.
   3. The locations shown on the drawings are for reference only and coordinated with the manufacturer and Architect for final quantity and location during the bid process to allow for allowance of proper quantity, wiring lengths and installation coordination)
   4. Provide physical samples of user interface devices and visually exposed control devices for approval by Owner and Architect.

B. Product data with wiring schematics for system and user interface components

C. Installation and Record Drawings

D. Operation and Maintenance Manuals:
   1. Include product data of system components, one line diagrams of installed components and their locations throughout the building, a final floor plan noting the locations of devices installed above ceilings, behind access panels or in concealed but accessible spaces and the lighting zones or devices they control.
   2. Final relay schedule with the zone of control, location of control zone, voltage, power feed, time clock setting, photocell set point, switch, or dimmer stations controlling the relay, and sweep function set points will be provided by the contractor.

1.5 DEFINITIONS

A.	BACNET	Protocol for integration with BAS/BMS/EMS
B.	BAS / BMS / EMS	Building Automated System, Building Management System, Energy Management System
C.	CS	Control Station
D.	D	Dimming Wall Switch
E.	DT	Dual Technology (PIR + U)
F.	FC	Footcandles. The metric for measuring light levels / illuminance levels
G.	GUI	Graphic User Interface
H.	LCP	Lighting Control Panel
I.	LED	Light Emitting Diode

J. LonWorks Protocol for integration with BAS/BMS/EMS

K. OS/VS Occupancy Sensor / Vacancy Sensor,
1. Occupancy sensors provide automatic on and automatic shut-off.
2. Vacancy sensors provide automatic shut-off only, and require manual-on.

L. PC Photocell

M. PIR Passive Infrared Technology

N. RS RS-232 Connection for AV Integration

O. SC Scene Control

P. TC Timeclock, or astronomical timeclock

Q. U Ultrasonic Technology

R. WS Wall Switch

S. WS/O Wallbox Occupancy Sensor Switch
1. Wall Switch with integrated Occupancy Sensor

1.6 SYSTEM DESCRIPTION

A. Control Stations:
1. Control Station Types:
a. Provide control stations for occupant lighting control as scheduled on the drawings and may include and/or combine the following type of individual control type within a single station:
1) On/Off Switching
2) Dimming Raise/Lower
3) Occupancy/Vacancy Sensor

B. Relays, Switchpacks, and Room Controllers:
1. Analog and Digital: Room controller devices to accept line voltage input as well as input from any combination of control stations, occupancy/vacancy sensors and/or daylight sensors and produce the required effect (switching or dimming) on up to four zones of connected lighting.

C. Occupancy/Vacancy Sensing:
1. Reduce electric energy consumption by reducing or eliminating lighting energy use in unoccupied spaces by switching lighting off with occupancy and/or vacancy sensors.

D. Photoelectric Daylight Harvesting:
1. Daylit Areas:
a. Reduce electric energy consumption during daylight hours by reducing the light output of the electric lighting system via continuous dimming power supply in response to measured lighting levels provided by daylight within the building interior.
b. Dimming zones will correlate with the distribution of daylight within the space as noted on plans.

NEHS

E. Emergence Override: Provide automatic load control relay devices for controlling egress lighting circuiting.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design Manufacturer:
   1. Wattstopper

B. Approved Basis of Design Alternate Manufacturers:
   1. Cooper Controls
   2. Wattstopper
   3. Lutron

C. Products described in this section are to be provided by the single BOD (basis of design), or approved alternate, manufacturer, listed above, or by a compatible, BOD approved third party alternate manufacturer.
   1. Manufacturer series numbers are identified herein to establish the minimum level of quality for each product.
   2. Comparable products that meet the requirements of the specification by other acceptable manufacturers identified herein are acceptable with prior approval.
   3. Other or equivalent Manufacturers and Products: Submit Substitution Request, complying with requirements of Division 00, Procurement and Contracting Requirements.

2.2 CONTROL STATIONS

A. Control Station Types:
   1. Scene Select: Provide scene selection control station including discrete, engraveable pushbuttons allowing on/off and raise/lower control of entire space and means for occupants to select from scenes indicated on drawings
   2. On/Off:
      a. Provide individual pushbuttons
      b. Controls lighting in entire space if no zones indicated on plans.
   3. Dimming/Raise Lower:
      a. Provide individual pushbuttons for on and off control of zones indicated on plans.
      b. Controls lighting in entire space if no zones indicated on plans.
      c. Dimming accomplished by and hold the ON and OFF buttons for dimming up and down respectively.
   4. Integral Occupancy:
      a. Automatically switches lighting on when occupant enters space.
      b. Switches lights off after predetermined period of vacancy.
      c. Controls lighting in entire space.
   5. Integral Vacancy:
      a. Includes pushbuttons for occupant manual on/off and dimming control of lighting in space.
      b. Automatically switches lights off after predetermined period of vacancy.
      c. Includes provision to revert to occupancy control in absence of configurable amount of daylight.
      d. Controls lighting in entire space.

B. Line Voltage Dimming Switches:
   1. Architectural grade, line voltage, 20A rated, single pole, preset style, slide up to brighten and down to dim, with on/off rocker style switch, decora style, wattage rating and lamp/power supply compatibility as required.
   2. Forward Phase, Reverse Phase, 0-10V.

C. Wallbox Occupancy Sensor Switches:
   1. 180 degree coverage, type as shown on plan (PIR, ultrasonic or dual-technology), configurable automatic-on or manual on operation, 3-wire type, daylight override, adjustable time-out, selectable walk-through mode and override off switch. Single or dual relay type as required or as shown on Drawings.
   2. Provide 3-way type where shown on plan.
   3. WattStopper PW series.

D. Digital Control Stations:
   1. Provide control stations with configuration as indicated or as required to control the loads as indicated.
   2. General Requirements:
      a. Power: Class 2 (low voltage).
      b. UL listed.
      c. Provide faceplates with concealed mounting hardware, with matching finish.
      d. Borders, logos, and graduations to use laser engraving or silk-screened graphic process that chemically bonds graphics to faceplate, resistant to removal by scratching and cleaning. Self-Adhesive labels not permitted.
      e. Finish: As specified for wall controls in this Section.
   3. Single-Zone or Single-Group:
      a. Turn an individual fixture or group of fixtures as shown on plans on and off via button press.
      b. Raise and lower light levels via press and hold button.
         1) Separate buttons for dimming and on/off functions not allowed.
   4. Multi-Scene or Multi-Group:
      a. General Requirements:
         1) Allows control of any devices part of the lighting control system as indicated on plans.
         2) Controls can be programmed with different functionality through system software without any hardware changes. Allows contextual functions based upon button press and press and hold input.
         3) Allows for easy reprogramming without hardware replacement.
         4) System will automatically update programming without direct human interaction upon replacement of any component.
         5) Communications: Utilize RS485 or similar wiring for low-voltage communication.
         6) To help occupants understand how to use the lighting control system, engraving requirements should be included for controls. Engraving details should include text size and style.
         7) Engrave keypads with button, zone, and scene descriptions as indicated on the drawings.
         8) Software Configuration:
            a) Single defined action.
            b) Buttons can be programmed to perform defined action on press and defined action on release.
            c) Buttons can be programmed using conditional logic off of a state variable such as time of day or partition status.
            d) Buttons can be programmed to perform automatic sequence of defined actions.

e) Capable of deactivating select keypads to prevent accidental and/or unwanted changes to light levels and other settings.
f) Buttons can be programmed for raise/lower of defined loads.
g) Buttons can be programmed to toggle defined set of loads on/off.

9) Status LEDs:
a) Upon button press, LEDs to immediately illuminate.
b) Time delays inherent in large systems can cause short delays between button press and system confirmation. To avoid any confusion and prevent multiple button presses, keypads should immediately show that the button has been pressed for visual confirmation.
c) LEDs to reflect the true system status. LEDs to remain illuminated if the button press was properly processed or LEDs to turn off if the button press was not processed.
d) Support logic that defines when LED is illuminated:
(1) Scene logic (logic is true when zones are at defined levels).
(2) Room logic (logic is true when at least one zone is on).
(3) Pathway logic (logic is true when at least one zone is on).
(4) Last scene (logic is true when spaces are in defined scenes).

b. Wired Keypads:
1) Style:
a) Mounting: Wall box or low-voltage mounting bracket; provide wall plates with concealed mounting hardware.
2) Design keypads to allow field-customization of button color, configuration, and engraving using field-changeable replacement kits.
3) Terminal block/connector inputs to be over-voltage and miswire-protected against wire reversals and shorts.
4) LEDs next to each button are used during programming and provide feedback when the buttons are pressed.
5) Available with status LEDs.
6) Available in several button configurations and finishes.

2.3 STANDALONE ROOM CONTROLLERS

A. General:
1. Provides a common, standalone interface via dimming and/or switching to a group of 0-10V Dimming or Fixed Output Ballasts and/or 0-10V LED Drivers.
2. Direct conduit connection or provision for mounting to junction box.
3. Physical barriers provided between Class 1 and Class 2 wiring as well as between normal power and emergency power wiring.
4. Dual voltage 120/277V, 60HZ operation, 20A rating for each relay Relays utilize zero crossing technology for increased life.
5. Plenum Rated.

B. Digital Room Controllers and Switchpacks:
1. Replacement of any component requires no reconfiguration or reprogramming.
2. Low voltage connections via CAT5/6 and RJ-45 connectors.
3. On board power supply for a minimum of six accessory devices including, but not limited to occupancy sensors and control stations.
4. Up to four on-board relays and accompanying 0-10V dimming channels.
5. Provision for IR or RF remote for configuration and editing of connected device settings.
a. Provide means to copy settings from on system to another.

NEHS

6. Field configurable to support, occupancy (automatic on) and vacancy (manual on) control protocol. Daylight harvesting feature for any number of zones.
7. Room Controller: WattStopper LMRC Series
8. Switchpack: WattStopper LMZC Series

C. Analog Room Controllers and Power Packs:
1. On board power supply for a minimum of six accessory devices including, but not limited to occupancy sensors.
2. Up to four on-board relays and accompanying 0-10V dimming channels.
3. Provision for IR or RF remote for configuration and editing of connected device settings.
   a. Provide means to copy settings from on system to another.
4. Field configurable to support, occupancy (automatic on) and vacancy (manual on) control protocol with optional daylight harvesting feature.

2.4 OCCUPANCY/VACANCY SENSORS

A. General Requirements:
1. Power Failure Memory: Settings and learned parameters to be saved in non-volatile memory and not lost should power be interrupted and subsequently restored.
2. Furnished with necessary mounting hardware and instructions.
3. NEC Class 1 or 2 devices, refer to plans.
4. Ceiling-Mounted Sensors: Indicate viewing directions on mounting bracket.
5. Wall-Mounted Sensors: Provide swivel-mount base.
6. Ceiling-Mounted Sensors: Provide customizable mask to block off unwanted viewing areas.
7. Isolated Relay: Provide ceiling mounted sensors with an internal isolated relay with Normally Open, Normally Closed, and Common outputs rated at 1A at 30VDC/VAC for use with HVAC control, Data Logging and other control options.
8. Line Voltage sensors accept line voltage input and output switched line voltage directly to controlled luminaires.
   a. Line voltage sensors must be capable of occupancy or vacancy control. Operation is to be determined by onboard device settings.
   b. Sensor configuration to be made by integral pushbutton or dial controls.
   c. Types:
      1) PIR: utilize invisible light to determine occupancy.
      2) Ultrasonic/Microphonic: utilize audible or subaudible sound to determine occupancy.
      3) Dual-Tech: utilize a combination of the above technologies to determine occupancy.
         a) Detection of vacancy by both ultrasonic and PIR sensors required to turn lights off.
9. Low Voltage sensors are paired with a switch pack or room controller. Provide digital sensors compatible with room controller/switchpack and balance of system.
   a. Low voltage sensors must be capable of occupancy or vacancy control. Operation is to be determined by overall system configuration and/or device settings.
   b. Sensor configuration to be made by IR or wireless handheld configuration tool.
   c. Types:
      1) Dual-Tech: Utilize a combination of the above technologies to determine occupancy.
         a) Detection of vacancy by both ultrasonic and PIR sensors required to turn lights off.

B. Ceiling Mounted: 360 degree coverage:
1. Automatic-on operation, light-level sensing, adjustable time-out, automatic sensing/adjustment for optimal time-out delay setting, selectable walk-through mode.
2. Low- or line-voltage as shown on Drawings

NEHS

3. Surface mounted, provide power packs as required.
    a. Dual Technology Type:
        1) Low Voltage: WattStopper DT-300 Series.
        2) Line Voltage: WattStopper DT-355 Series
    b. Passive infrared type:
        1) Low Voltage: WattStopper CI-300 Series
        2) Line Voltage: WattStopper CI-355 Series
    c. Ultrasonic type:
        1) Low Voltage: WattStopper UT-300 Series
        2) Line Voltage: WattStopper UT-355 Series

C. Ceiling/Wall Mounted/Corner: 180 degree coverage:
1. Automatic-on operation, light-level sensing, adjustable time-out, automatic sensing/adjustment for optimal time-out delay setting, selectable walk-through mode,
2. Low-voltage with power pack, surface mounted as required.
    a. Dual Technology type: WattStopper DT-200 series.
    b. Passive infrared type: WattStopper CX-100 series.

D. Provide multiple contacts and/or power packs for Low Voltage occupancy sensors that:
1. Control both normal and emergency lighting and require separation of branch circuit wiring systems. In case of occupancy sensor failure, emergency lighting fail to the on state.
2. Control separate lighting control zones. Unless otherwise noted, occupancy sensors are intended to control light in a designated zone or room. Contractor is responsible for providing the required power packs to insure functionality of the system.
3. Provide UL924 listed relay or power pack for to bypass occupancy sensors in event of power failure. During normal operation, relay to operate lighting in conjunction with adjacent normal power lighting.

E. Low Temperature/Wet Location Occupancy Sensor:
1. Provide line voltage occupancy sensors where shown on plans.
2. Automatic-on operation, light-level sensing, adjustable time-out, automatic sensing/adjustment for optimal time-out delay setting, selectable walk-through mode.
3. Temperature Range at least -40 degrees F to +95 degrees F. With a minimum IP 65 rating.
4. Surface mounted, provide auxiliary contacts if required.
    a. Passive infrared type: WattStopper CB-100 Series

2.5 PHOTOSENSOR

A. General Requirements:
1. Use NEC Class 2 wiring for low voltage communication.
2. Can be replaced without reprogramming.
3. Photopically corrected to approximate human vision.
4. Daylight sensing equipment will be digital, full range type, self or manually calibrated.
5. Provide proper photocell type(s) as required to:
    a. Measure lighting levels on an affected interior surface. Illumination contribution to this measured surface will include both daylighting and electric lighting (closed-loop system).
    b. Measure light levels entering space through glazing. Illumination contribution to this measured surface will include daylighting only (open-loop system).

c. Measure light levels on affected interior surface and entering space through glazing. Illumination contribution to these measured surfaces will include both daylight and electric lighting (combination open and closed loop/dual loop system).

6. Independently control multiple zone(s) of luminaires for maximum energy savings while maintaining even task illumination across the entire area between zones. Refer to drawings for control groupings.
7. Incorporate time delay logic to prevent cycling due to clouds and other short-term influences to lighting levels.
8. Accept indoor, skylight, and outdoor photo sensing heads. Photo sensing control permit the user to specify the actual footcandle level where desired switching occurs.

B. Indoor:
1. Stable output over temperature from 32 degrees F (0 degrees C) to 104 degrees F (40 degrees C).
2. Open Loop:
   a. Adjustable aiming angle to accommodate various glazing configurations
   b. Provide linear response from 0 to minimum 1000 foot-candles.
   c. Mountable on lighting fixtures or recessed acoustical ceiling tiles.
   d. Wattstopper LMLS-500 Series.
3. Closed Loop:
   a. Indoor sensors have a Fresnel lens, with a minimum 60 degree cone of response.
   b. Provide linear response from 0 to minimum 500 foot-candles.
   c. Partially shielded for accurate detection of available daylight to prevent fixture lighting and horizontal light component from skewing sensor detection.
   d. Mountable on lighting fixtures or recessed acoustical ceiling tiles.
   e. Wattstopper LMLS-400 Series.
4. Dual Loop (Skylight/Atrium):
   a. Indoor sensors have a Fresnel lens, with a minimum 60 degree cone of response.
   b. Partially shielded for accurate detection of available daylight to prevent fixture lighting and horizontal light component from skewing sensor detection.
   c. Atrium:
      1) Translucent dome with a 180 degree field of view.
      2) Sensor range from 2 to 2,500 FC.
   d. Skylight:
      1) Sensors have a translucent dome with a 180 degree field of view.
      2) Range between 10 and 7,500 FC.
   e. Wattstopper LMLS-600 Series.

C. Analog: Interior/Exterior: PLC CES Series

2.6 RELAYS, SWITCHPACKS AND ROOM CONTROLLERS

A. Analog:
1. Devices interconnected via low voltage cabling.
2. Configurable to produce the following sequences of operation by handheld IR or RF remote
   a. Occupancy control: Automatically turns lights on when occupant is detected in space. Automatically turns lights off after a configurable period of vacancy.
   b. Vacancy Control: Occupant must manually turn lights in space on, automatically turns lights off after a configurable period of vacancy.
   c. Timeclock

d. Daylight Harvesting:
   1) Occupant must manually turn lights in space on, automatically turns lights off after a configurable period of vacancy.
   2) Accepts input from analog daylight sensing equipment and adjusts light level settings accordingly.

B. Digital:
1. Devices interconnected by pre-terminated CAT5e/CAT6 Cabling
2. Configurable to produce the following sequences of operation by handheld IR or RF remote.
   a. Occupancy Control:
      1) Automatically turns lights on when occupant is detected in space.
      2) Automatically turns lights off after a configurable period of vacancy.
   b. Vacancy Control: Occupant must manually turn lights in space on, automatically turns lights off after a configurable period of vacancy.
   c. Timeclock
   d. Daylight Harvesting
      1) Occupant must manually turn lights in space on, automatically turns lights off after a set period of vacancy.
      2) Accepts input from daylight sensing equipment and adjusts light level settings accordingly.
3. Provides additional capability or accessories to integrate with AV, BAS, HVAC, and/or shade control systems.

2.7 POWER SUPPLIES AND TRANSFORMERS

A. Provide from same manufacturer of equipment served.

B. Compatible with specified photocells and dimming control station protocols.

C. Refer to Section 26 50 00, Lighting, for product specification on luminaire power supplies and transformers.

2.8 EMERGENCY LIGHTING CONTROL RELAYS

A. Manufacturers:
1. Bodine
2. Nine 24
3. Wattstopper
4. Or approved equivalent.

B. General Requirements
1. Comply with UL924 requirements:
   a. If controlled off, must turn on automatically.
   b. Provide required egress illuminance along entire egress path.
   c. Must not be able to be overridden by building occupants.
2. Device can be integral to other components listed above or operate in conjunction with other lighting control components as a discrete component, but must be fed via UL 1008 compliant power source, such that in event of a power failure, control and dimming signals are bypassed and lighting operates at full power. Fed via the UL 1008 source.

C. Description:
1. Normally closed, electrically held relay, arranged for wiring in parallel with manual or automatic switching contacts.
2. UL924 listed for connected load of 10A at 277V or 120V.
3. UL rated N.C. contacts, minimum 10A rating.
4. Integral surge protection.
5. Two separate status emergency lighting indicators for troubleshooting:
   a. Amber LED indicates presence of normal utility power.
   b. Red LED indicates presence of unswitched emergency power.
6. Manual and/or automatic diagnostic testing feature.
7. Self-contained enclosure UL listed for installation in indoor or damp locations.

2.9 LOW VOLTAGE CONTROL WIRING

A. 18 gauge shielded cable or as recommended by the manufacturer.

2.10 TEST EQUIPMENT

A. Provide multi-function digital Illuminance meter with detachable receptor head with the following characteristics:
1. Receptor: Silicon photocell type
2. Illuminance Units: Lux or footcandles (switchable)
3. Measuring range: 0.1 to 19,990 lux, 0.01 to 1,999 footcandles
4. Accuracy: ±4 percent ±1 digit of displayed value
5. Cosine Correction Characteristics: Within ±1 percent at 10 degrees; within ±5 percent at 60 degrees.
6. Measuring functions: Illuminance, integrated illuminance, average illuminance.
7. Temperature/humidity drift: Within ±3 percent ±1 digit (of value displayed at 68 degrees F) within operating temperature/humidity range.
8. Operating conditions: 32 degrees F to 104 degrees F) at less than 85 percent humidity.

B. Provide proof of calibration within 12 months of use. Calibration performed by an independent calibration lab approved by the manufacturer of the meter.

PART 3 EXECUTION

3.1 INSTALLATION

A. Submittal data required prior to ordering and installation.

B. General Testing:
1. Functionally test control devices to ensure that control devices, components, equipment and systems are calibrated, adjusted and operate in accordance with approved drawings, specifications, and manufacturers installation instructions.
2. Prepare and complete report of test procedures and results and file with the Owner.
3. Install items per manufacturers written instructions.

C. Control Stations:
1. Control Stations to be combined wherever possible to minimize quantity of discrete gangs.
2. Combine under common cover plates wherever shown together on plans.

D. Low Voltage Wiring:
   1. Install in conduit where running through inaccessible areas. Provide plenum rated wiring in accessible ceiling spaces.
   2. Test CAT5/6 cables terminated on site prior to wiring of digital lighting control systems. Provide evidence of successful testing to engineer and owner. Factory pre-terminated cabling is not subject to this requirement.
   3. Coordinate low voltage wiring connection and location with luminaires to be controlled.

E. Photocell:
   1. Install surface mounted on recessed junction box in location best suited for accurate measurement. Avoid placement in high traffic or confined spaces.

F. Occupancy Sensors:
   1. For installation of low voltage occupancy sensors in inaccessible ceiling systems, coordinate power pack locations with Architect prior to installation coordinate access panel locations with Architect.
   2. Sensor locations identified on Drawings are diagrammatic and are meant to indicate only that occupancy sensing within a given space is required. Locate sensors as required by the manufacturer to provide maximum coverage of the room, to operate as someone enters the room, and to avoid false operation due to persons outside the room passing an open door.
      a. Provide additional sensing heads as necessary or per manufacturer's recommendation to achieve complete coverage of each room.
   3. Set sensitivity as required to provide small movement coverage throughout the room without extending coverage beyond the room.
   4. System performance testing done with the sensor timing set to the time delay indicated by space type in Section 26 09 93, Sequence of Operations for Lighting Controls.
   5. Upon Completion of installation and prior to turning space over to Owner, Contractor reset occupancy sensor automatic self-adjustment settings to insure proper time delay self-adjustment for Owner occupant schedule and room use.
   6. Allow for up to 24 hours of callback sensor adjustments to be made by the contractor or occupancy sensor manufacturer qualified installer for up to six months after the owner has taken occupancy of the space.

G. Emergency Lighting Control Relays:
   1. Provide unswitched emergency circuit, and unswitched and switched normal circuit to UL924 relay for control of emergency luminaires with remaining room luminaires on normal power.
   2. Install each relay within dedicated 4-11/16-inch junction box with double-gang plaster ring for wall or ceiling flush-mount or in a self-contained enclosure from the manufacture, as indicated on Drawings.
   3. Where location in ceiling would interfere with removal of ceiling tiles, install relay flush-mounted in nearest wall at ceiling level.
   4. Do not locate behind wall switch.

3.2 WORK PRIOR TO COMMISSIONING

A. Complete phases of work so the system can be powered, tested, adjusted, and otherwise commissioned. Under Division 26, Electrical, complete systems, including subsystems, so they are fully functional. This includes the complete installation of equipment, materials, wire, controls, etc., in accordance with the contract documents and related directives, clarifications, change orders, etc.

B. A commissioning plan will be developed by the Test Engineer and approved by the Commissioning Agent. Under Division 26, Electrical, assist the Test Engineer and Commissioning Agent in preparing the commissioning plan by providing necessary information pertaining to the actual equipment and

installation. If system modifications and clarifications are in the contractual requirements of this and related sections of work, they will be made at no additional cost to the Owner. If Contractor initiated system changes have been made that alter the commissioning process, the Commissioning Agent will notify the Owner.

C. Specific pre-commissioning responsibilities under Division 26, Electrical are as follows:
   1. Factory startup services for the following items of equipment:
      a. Lighting Control System
   2. Normal startup services required to bring each system into a fully operational state. This includes complete installation and cleaning. The Test Engineer will not begin the commissioning process until each system is documented as being installed complete.

D. Begin commissioning after installation of interior and exterior finishes including but not limited to adjacent roofing, finished floor, wall, and ceiling systems including final painting, furniture and book stacks in place, and other building systems which have direct or indirect influence on the performance and distribution of the daylight and electric lighting systems.

E. Start of commissioning before such items are complete will not relieve Contractor from completing those systems in accordance with the Construction Schedule.

3.3 SEQUENCE OF COMMISSIONING

A. Provide to Architect prior to start of commissioning layout drawings indicating proposed location of measurement points. Proceed with commissioning after review and acceptance by Architect.

B. Illuminance measurements oriented horizontal, facing up, at 30-inches above finished floor. Measurements for a control group occurs at the same location. Ensure constancy of local surface reflectance conditions throughout commissioning of each control group.

C. Ensure no personnel or outside influence affects the amount of flux striking the receptor head during the recording session.

D. Document measurements in clearly understandable format for review by the Architect. Include time of measurement, temperature, and relative humidity.

E. Measure illuminance at least two hours after local sunset with full output of electric lighting. Record integrated illuminance and average illuminance for a 2 hour period.

F. During daylight hours, measure illuminance with electric lighting off, including emergency and nightlight circuits. Record integrated illuminance and average illuminance for a two hour period. Document in clearly understandable format for review by the Architect.

G. Set each photocell to 150 percent of electric-only lighting contribution.

H. After initial setpoint has been set, measure illuminance in 10 minute increments from 1 hour before to 1 hour after local sunset.

I. Submit recorded data to Architect for review.

3.4 TESTING FOR SEASONAL VARIATIONS

A. Timing of Commissioning:
   1. Initial Commissioning:
      a. Perform to best suit the current time-of-year and cloud cover conditions.
      b. Conduct as done as soon as contract work is completed regardless of season.
   2. Seasonal Commissioning: Test under full sunlight and full overcast conditions during summer and winter solstice, as well as similar conditions at the spring or fall equinox.
   3. Subsequent Commissioning: Ascertain adequate performance during the four seasons.

3.5 PARTICIPATION IN COMMISSIONING

A. Provide skilled technicians to start up systems within Division 26, Electrical. The same technicians made available to assist the Test Engineer and Commissioning Agent in completing the commissioning program as it relates to each system and their technical specialty. Work schedules, time required for testing, etc., will be requested, and coordinated by the Test Engineer. Under Division 26, Electrical, ensure that the qualified technician(s) are available and present during the agreed upon schedules and for sufficient duration to complete the necessary tests, adjustments, and problem resolutions at no additional cost to the Owner.

B. System problems and discrepancies may require additional technician time, Test Engineer time, Commissioning Agent time, redesign, and reconstruction of systems and system components. The additional technician time made available for the subsequent commissioning periods until the required system performance is obtained at no additional cost to the Owner.

C. Commissioning Agent reserves the right to judge the appropriateness and qualifications of the technicians relative to each item of equipment or system. Qualifications of technicians include expert knowledge relative to the specific equipment involved, adequate documentation and tools to service the commission the equipment, and a willingness to work with the Test Engineer and Commissioning Agent to get the job done. Remove technicians from the project at the request of either the Test Engineer or Commissioning Agent.

3.6 RESOLUTION OF DEFICIENCIES

A. In some systems, misadjustments, misapplied equipment, and deficient performance will result in additional work required to commission the systems.

B. Complete work under the direction of the Architect, with input from the Contractor, equipment supplier, Test Engineer, and Commissioning Agent.

C. Whereas members will have input and the opportunity to discuss the work and resolve problems, the Architect will have final jurisdiction on the necessary work to be done to achieve performance.

D. Complete corrective work in a timely fashion to permit timely completion of the commissioning process.

E. Experimentation to render system performance is permitted. If the Commissioning Agent deems the experimentation work to be ineffective or untimely as it relates to the commissioning process, the Commissioning Agent will notify the Owner, indicating the nature of the problem, expected steps to be taken, and the deadline for completion of activities.

F. If deadlines pass without resolution of the problem, the Owner reserves the right to obtain supplementary services, equipment, or both, to resolve the problem.

G. Costs incurred to solve the problems in an expeditious manner will be the Contractor's responsibility.

3.7 TRAINING

A. Participate in the training of Owner's engineering and maintenance staff, as required in Divisions 01 through 28, on each system and related components.

B. Conduct training in a classroom setting, with system and component documentation, and suitable classroom training aids.

C. Training classroom sessions and file demonstrations will be videotaped and copies of this material will be provided as part of closeout requirements.

D. Training will be conducted jointly by the test engineer, commissioning agent, the contractor, and the equipment suppliers.

E. Test engineer responsible for highlighting system peculiarities specific to this project.

3.8 SYSTEMS DOCUMENTATION

A. In addition to the requirements of Division 01, General Requirements, update contract documents to incorporate field changes and revisions to system designs to account for actual constructed configurations.

B. Division 26, Electrical, record drawings include architectural floor plans and the individual daylight control systems in relation to actual building layout.

C. Provide in AutoCAD .dwg format for transmittal to the test engineer.

END OF SECTION

SECTION 26 27 26

WIRING DEVICES

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes:
   1. Line Voltage Wall Switches
   2. Receptacles
   3. Plates

1.2 RELATED SECTIONS

A. Division 01, General Requirements

B. Division 26, Electrical

C. Section 26 05 19, Low Voltage Electrical Power Conductors and Cables

D. Section 26 05 26, Grounding and Bonding for Electrical Systems

E. Section 26 05 33, Raceways and Boxes for Electrical Systems

F. Section 26 05 53, Identification for Electrical Systems

G. Section 26 09 23, Lighting Control Devices

1.3 SUBMITTALS

A. Product Data

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Line Voltage Wall Switches:
   1. Hubbell
   2. Leviton
   3. Arrow-Hart
   4. Pass & Seymour

B. Receptacles:
   1. Use same manufacture as the Line Voltage Wall Switches.
   2. Hubbell
   3. Leviton
   4. Arrow-Hart
   5. Pass & Seymour

C. Plates:
   1. Hubbell
   2. Leviton
   3. Arrow-Hart
   4. Pass & Seymour

2.2 MATERIALS

A. Extra heavy duty grade wiring devices, with special devices as noted on the Drawings. Should the Drawings indicate a device other than those listed. Device of same grade and manufacture as specified below. Furnish a matching plug connector for special purpose devices that do not have the common 120V NEMA 5-20R configuration.

B. Lighting switches and duplex receptacles installed have similar appearance characteristics unless noted otherwise.

2.3 LINE VOLTAGE WALL SWITCHES

A. Line Voltage Switches:
   1. 20A rated, 277V, quiet type, extra heavy duty, heavy duty nylon toggle handle, back, and side wired with screw terminal connections.
   2. As noted on the drawings provide:
      a. Pilot light switch: lighted clear toggle.
      b. Momentary Contact Switches: 15A, SPDT, center off.
      c. Key Switches: 20A, 277V, back and side wired with screw terminal connections.

B. Except as noted herein, device exposed finish color as follows:
   1. Normal Power: as selected by Architect
   2. Emergency Power: Red
   3. Standby Power: Red

2.4 RECEPTACLES

A. Standard Straight Blade Duplex Receptacle:
   1. 3-wire, 2-pole with grounding, extra heavy duty, 20A rated, NEMA 5-20R configuration, back and side wired with screw terminal connections.
      a.
      b. Provide tamper-resistant as noted on the drawings or NEC required.
   2. Ground Fault Interrupting straight blade duplex receptacle:
      a. Heavy duty, 3-wire, 2 pole with grounding, self-testing, green “ON” LED to indicate power, red “ON” LED to indicate ground fault condition, 20A rated, NEMA 5-20R configuration, back and side wired with screw terminal connections.
      b. Provide tamper-resistant as noted on the drawings or where NEC required.
      c. Provide weather-resistant rating at exterior locations as required by NEC.

B. Exposed Device Color, unless otherwise noted, is as follows:
   1. Normal power: Gray or as selected by Architect.

2.5 PLATES

A. Flush Finish Plates:
   1. Selected by Architect.
   2. Smooth nylon or polycarbonate] [0.04-inch thick, Type 302 stainless steel, brush finish.

B. Surface Covers:
   1. Galvanized or cadmium plated steel, 1/2-inch raised industrial type with openings appropriate for device installed.

C. Identification:
   1. Identify receptacle plates with a pre-printed label indicating serving panel and branch circuit number.
   2. Refer to Section 26 05 53, Identification for Electrical Systems.

PART 3 EXECUTION

3.1 INSTALLATION

A. Devices and finish plates installed plumb with building lines. Install wall mounted receptacles vertically at centerline height shown on the Drawings.

B. Finish plates and devices are not installed until final painting is complete. Scratched or splattered finish plates and devices will not be accepted.

C. Switches, receptacles and/or other devices ganged into a common enclosure provided with a separation barrier between devices where the combined circuit voltages within the enclosure exceeds 300V.

D. Provide GFCI receptacles as shown on the drawings or as NEC required. Provide a GFCI type duplex receptacle in each required location, do not sub-feed normal receptacles downstream of the GFCI receptacle to obtain the GFCI rating.

E. Provide receptacles with GFCI, tamperproof, weather-resistant or hospital grade ratings as shown on the drawings, appropriate for the installation or required by NEC.

3.2 CORD CAPS

A. Special plugs provided with the receptacles given to the Owner in their cartons with a letter stating the date and the Owner's representative that received the materials.

3.3 COORDINATION

A. Electrical Drawings indicate the approximate location of devices. Refer to Architectural elevations, sections, and details for exact locations.

B. Coordinate with equipment installer the locations and methods of connection to devices mounted in cabinets, counters, work benches, service pedestals, and similar equipment.

END OF SECTION

SECTION 26 50 00

LIGHTING

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes:
1. Lenses
2. Reflector Cones
3. Housings
4. Finish
5. Suspension
6. Lamps and Sockets
7. Power Supplies
8. Emergency LED Drivers
9. Transformers
10. Track Lighting Systems
11. Custom Luminaires
12. Exterior Luminaires
13. Extra Material
14. Disposal and Replacement

1.2 RELATED SECTIONS

A. Division 01, General Requirements

B. Division 26, Electrical

C. Section 26 05 19, Low Voltage Electrical Power Conductors and Cables

D. Section 26 05 26, Grounding and Bonding for Electrical Systems

E. Section 26 09 23, Lighting Control Device

F. Section 26 27 26, Wiring Devices

1.3 DEFINITIONS

A.	BACNET	Protocol for integration with BAS/BMS/EMS
B.	BAS	Building Automation System
C.	BMS	Building Management System
D.	EMS	Energy Management System
E.	CCT	Correlated Color Temperature

F. CRI Color Rendering Index

G. CS Control Station

H. D Dimming Wall Switch

I. DT Dual Technology (PIR + U)

J. FC Footcandles
   1. The metric for measuring illuminance light levels

K. GUI Graphic User Interface

L. LCP Lighting Control Panel

M. LED Light Emitting Diode

N. LonWorks Protocol for integration with BAS/BMS/EMS

O. MTBF Minimum Time Between Failures
   1. Total hours of testing / Number of failures

P. OS/VS Occupancy Sensor / Vacancy Sensor,
   1. Occupancy sensors provide automatic on and automatic shut-off.
   2. Vacancy sensors provide automatic shut-off only, and require manual-on.

Q. PC Photocell

R. PIR Passive Infrared Technology

S. Power Supply Ballasts and LED drivers

T. RS RS-232 Connection for AV Integration

U. SC Scene Control

V. TC Timeclock, or astronomical timeclock

W. U Ultrasonic Technology

X. WS Wall Switch

Y. WS/O Wallbox Occupancy Sensor Switch
   1. Wall Switch with integrated Occupancy Sensor

1.4 QUALITY ASSURANCE

A. The lighting design for this project was based on luminaire types and manufacturers as specified.

B. Basis of Design manufacturers are pre-qualified to bid on products where specified. Inclusion of manufacturer and product series does not relieve specified manufacturer from providing product as described in luminaire schedule; modifications to standard product, if required, include with initial bid.

C. Alternate manufacturers listed in the Luminaire Schedule do not require prior approval but included with the shop drawing submittal. Inclusion of manufacturer and product series as an alternate does not relieve the manufacturer from providing product equivalent to the basis of design as described in luminaire schedule; modifications to standard product, if required, include with initial bid.

D. Or Approved or Pre-Bid Approved Equal:
   1. Submit Substitution Request prior to bid, complying with requirements of Division 01, General Requirements.
   2. Approval determined by review of the following luminaire characteristics where applicable. Lack of pertinent data on characteristic constitutes justification for rejection of the submittal.
      a. Performance:
         1) Distribution
         2) Utilization
         3) Average brightness/maximum brightness.
         4) Spacing to mounting height ratio.
         5) Visual comfort probability.
      b. Construction:
         1) Engineering
         2) Workmanship
         3) Rigidity
         4) Permanence of materials and finishes.
      c. Installation Ease:
         1) Captive parts and captive hardware.
         2) Provision for leveling.
         3) Through-wiring ease.
      d. Maintenance:
         1) Relamping ease.
         2) Ease of replacement of ballast and lamp sockets.
      e. Appearance:
         1) Architectural integration.
         2) Light tightness.
         3) Neat, trim styling.
         4) Conformance with design intent.

1.5 GENERAL REQUIREMENTS

A. Provide lighting outlets indicated on the Drawings with a luminaire of the type designated and appropriate for the location.

B. Where a luminaire type designation has been omitted and cannot be determined by the Contractor, request a clarification from the Architect in writing and provide a suitable luminaire type as directed.

C. Coordinate installation of luminaires with the ceiling installation and other trades to provide a total system that is neat and orderly in appearance.

D. Luminaires located in fire rated assemblies rated for use in such assemblies or have assembly maintained by the installer through the use of appropriate construction techniques to maintain the assembly rating. It is the responsibility of the contractor to maintain the assembly rating and provide required components during construction. Coordinate luminaires impacted with Division 01, General Requirements, and life safety documents.

E. Install remote power supplies and transformers in enclosures as required by luminaire specified. Locate remote power supplies and transformers as shown on drawings; where no location is shown, provide recommendation for approval prior to commencing field installation. Locate remote mounted power supplies and transformers within the distance limitations specified by the manufacturer.

F. Coordinate voltage requirements to each luminaire as indicated on drawings.

G. Verify luminaires carry a valid UL or ETL listing. Luminaires located in outdoor locations to carry and appropriate wet or damp listing as required for the mounting application.

H. Procure luminaires through a distributor located within 200 miles of the project site with a valid business license in the state the project is located.

I. Upon request of the Architect, Engineer, or Owner, provide back-up pricing in a unit cost breakdown per luminaire. Back-up pricing includes distributor net pricing, contractor net pricing, final owner pricing and mark-ups and discounts (lot price or all-or-none) associated with the luminaires.

J. Lighting related change orders to include back-up pricing noted above for review by the Engineer and Lighting Designer.

K. Provide manufacturer's warranty covering 5 years on drivers from date of purchase. Luminaire manufacture to operate driver at or below the required driver warranty temperature. Luminaire manufacturers failing to operate the driver, at the project required ambient temperature and within the driver manufacturer warranty parameters, will be responsible for driver warranty related costs over the warranty period.

L. 80 percent of the luminaire material by weight at a minimum should be recyclable at end of life. Design luminaire for ease of component replacement and end-of-life disassembly.

1.6 SUBMITTALS

A. Submit the following in accordance with Section 26 05 00, Common Work Results for Electrical:
   1. Shop Drawings, to include:
      a. Product Data:
         1) Provide manufacturer's published product data information.
         2) This information is to be relevant to the specified product only.
         3) Submittals limited to not more than three sheets for each type specified.
         4) They are specifically not to have configurations available included for review.
         5) Submittals that contain information that is not relevant to the product specified will be rejected in total and resubmission will be required.
      b. Luminaire dimensions on a fully dimensioned line drawing.

c. Lamp information, including array configuration:
   1) For LED lamps: proof of conformance with the following: ANSI C78.377-2015, IES LM 79-2008, IES LM 80-2008, IES LM 82-2012, IES LM 84-14, IES LM 85-14, IES TM 21-2011, IES TM 28-14 and special certifications required by the contract documents.
d. Lamp socket information.
e. Power supply and transformer information using ballast manufacturers published product data information. Multiple power supplies or transformers may be submitted for single luminaire if compatible with specification included in contract documents. Include certification of lamp and power supply and transformer compatibility for submitted.
f. Mounting details including clips, canopies, supports, and methods for attachment to structure. Provide equipment required for row configurations.
g. UL/ETL Labeling Information
h. Manufacturer's Warranty
i. Photometric Reports consisting of the following:
   1) Candlepower distribution curves: Provide five plane candlepower distribution data at no more than 5 degree vertical angle increments.
   2) Coefficient of utilization table.
   3) Zonal lumen summary including overall luminaire efficiency.
   4) Luminaire luminance: Provide measured maximum brightness data for luminaires with reflectors and average brightness data for luminaires with refractors.
   5) Spacing to mounting height ratio. If parallel and perpendicular ratios differ, provide data on each plane.
   6) Pole information to include maximum supported effective projected area (EPA) and weight for the design wind speed, as well as structural calculations for each pole proposed.
   7) VCP calculations (where applicable): For general office lighting luminaires, provide typical VCP calculations for ceiling heights between 9-feet and 12-feet at 1-foot increments, for room sizes 20-feet by 20-feet and 30-feet by 30-feet.
j. Special requirements of the specification.

2. Operation and Maintenance Data:
   a. Prepare two copies of a Lighting Systems Maintenance Manual consisting of the following in a hard-cover binder for review. After review, Architect will deliver one copy to Owner. Manual to include:
      1) One complete set of final submittals of actual product installed, including product data and shop drawings. Include product data for actual power supply and transformer installed where applicable.
      2) List of lamps used in Project, cross-referenced to fixture types, with specific manufacturer's names and ordering codes.
      3) Re-lamping instructions for lamps that require special precautions (LED, tungsten halogen, metal halide, etc.).
      4) Lighting fixture cleaning instruction, including chemicals to be used or avoided.
      5) Parts list of major luminaire components and ordering information for replacement
      6) Copies of manufacturer warranties on product.
3. Manufacturer's Installation Instructions:
   a. Indicate application conditions and limitations of use stipulated by product testing agency.
   b. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product.
4. Closeout Submittals:
   a. Project Record Documents: Record actual connections and locations of pole foundations, luminaires, and any pull or junction boxes.
   b. Operation and Maintenance Data: Instructions for each product including information on replacement parts.

c. Maintenance Materials: Furnish for Owner's use in maintenance of project.

PART 2 PRODUCTS

2.1 GENERAL

A. Luminaires new and complete with mounting accessories, junction boxes, trims, and lamps.

B. Luminaire assemblies UL listed.

C. Luminaires UL listed appropriate to mounting conditions and application.

D. Install recessed luminaires in fire rated ceilings and use a fire rated protective cover thermally protected for this application and carry a fire rated listing.

E. Luminaires installed under canopies, roofs, or open areas and similar damp or wet locations to be UL listed and labeled as suitable for damp or wet locations.

2.2 LENSES

A. Mechanically secured from within the housing.

B. Interior linear prisms with smooth exterior.

C. Prismatic Acrylic:
1. 12-inch by 24-inches and Larger: Extruded of clear virgin acrylic plastic, 0.125-inch minimum overall thickness, 0.1-inch nominal unpenetrated thickness, Pattern 12 with flat sided female prisms running at 45 degrees off panel axis unless otherwise specified in the luminaire schedule. Concave prisms are not acceptable.
2. As specified in the Luminaire Schedule.

D. Opal Acrylic:
1. Extruded or injection molded of virgin acrylic plastic, 0.08-inch minimum overall thickness.
2. As specified in the Luminaire Schedule.

E. Opal Acrylic Overlay: High transmittance type, extruded of virgin acrylic plastic, 0.04-inch overall thickness, with minimum 80 percent light transmittance.

2.3 REFLECTOR CONES

A. Spun of uniform gauge aluminum, free of spinning marks or other defects.

B. Integral trim flange.

C. Color and finish as specified in Luminaire Schedule.

D. White Reflectors: Steel or aluminum, minimum 22 gauge, with hard baked white enamel finish with minimum 85 percent reflectance.

E. Alzak Reflectors:
   1. Low iridescent semi-specular or as indicated in the luminaire schedule, Alzak or Coilzak with minimum reflectance of 90 percent.
   2. Supply luminaires using Alzak reflector cones by the same manufacturer unless directed otherwise in Luminaire Schedule.

2.4 HOUSINGS

A. Dimensions: Proper for the various wattage noted on the plans and as recommended by the luminaire manufacturer or as specified in the luminaire schedule.

B. Extruded Aluminum Housing:
   1. One piece housing of AA 6063 T5 extruded aluminum with 0.14 minimum thickness smooth and free of tooling lines in one uninterrupted section of 1-foot to 24-foot with the cross sectional dimensions as indicated in the Luminaire Schedule.
   2. Section lengths as shown on the drawings and able to be transported into and out of the installation location after final construction without building demolition being required.

C. Steel Housing:
   1. 20 gauge minimum, free of dents, scratches, or other defects.
   2. Fill and sand exposed weld marks, joints, and seams smooth before finishing. Clean and dress edges to remove sharp edges or burrs.
   3. Section lengths as shown on the drawings comprised of 1-foot to 12-foot lengths.

D. Sheet Metal Housings: Minimum 22 gauge cold-rolled steel, with welded joints. Exposed weld marks and seams filled and ground smooth.

E. Door Frames for lensed luminaires: White painted, flat aluminum with mitered corners, rotary cam or spring assisted latches to hinge from either side.

F. End Plates: Mechanical attach die cast end plates without exposed fasteners. End caps, minimum 0.125-inch thick.

G. Provide an internal alignment spline where housing sections are joined together to form a continuous row.

H. Recessed Luminaires:
   1. Rated for use in recessed applications.
   2. If required by the owner or design team, provide test data proving the product is rated for use in recessed applications.
   3. Equip with through wire junction box. Box, power supply, and replaceable components accessible from the ceiling opening of the luminaire.

I. For wet and damp use, LED-based luminaire to be sealed, rated, and tested for appropriate environmental conditions and may not be accomplished by using an additional housing or enclosure

2.5 FINISH

A. Visible surfaces to be of color and texture as directed in Luminaire Schedule.
   1. Baked white dry polyester powder, if not specified, with a minimum average reflectance of 85 percent on exposed and light reflecting surfaces.

B. Concealed interior and exterior luminaire surfaces to be Matte black or as recommended by the luminaire manufacturer.

C. Exposed aluminum surfaces:
   1. Satin etched and anodized in the color as indicated in the Luminaire Schedule.
   2. Treat with an acid wash and clear water rinse prior to painting.
   3. Electrostatically paint or powder coat and oven bake in the color indicated in the Luminaire Schedule.

D. Exposed steel surfaces:
   1. Treat with acid wash and clear water rinse, then prime coat.
   2. Electrostatically paint or powder coat and oven bake in the color indicated in the Luminaire Schedule.

2.6 SUSPENSION

A. Suspension Devices, type as specified in the Luminaire Schedule:
   1. Aircraft Cable:
      a. Stainless steel type: 3/32-inch nominal diameter, stranded, with positive pressure, field adjustable clamp at fixture connection.
   2. Rigid Pendant:
      a. 1/2-inch nominal diameter or as specifically shown on drawings.
      b. Supplied by fixture manufacturer when available as standard product.
      c. At fixture end of stems, provide earthquake type swivel fitting to permit 45 degree swing in any direction away from vertical.
      d. Flat canopy to permit splice inspection after installation.
   3. Chain Hangers:
      a. Length to suit fixture mounting height if shown or as field conditions dictate.
      b. Use two heavy duty chains with S hooks at each suspension point.
      c. Length to suit mounting height as shown on Drawings.
   4. Suspension system must permit ±1/2-inch minimum vertical adjustment after installation.

B. Supports:
   1. Provide internal safety cable from fixture body to structure.
   2. Carry fixture weight to structure and provide horizontal bracing from suspension points to ceiling framing to prevent sideways shifting. Provide diagonal seismic restraint wires per code.

C. Feed Point:
   1. Flat-plate canopy to cover outlet box, with holes for support cable and power cord, concealed fasteners to permit splice inspection after installation.
   2. At the electrified connection provide straight cord feed. Provide a separate feed point where emergency feed is required.
   3. Power Cord: White multi-conductor cord, parallel to support cable (aircraft cable); within pendant (rigid pendant); or flexible conduit (chain hanger).
   4. Provide a separate fee point where emergency feed is required.

D. Non-feed Points:
   1. 1/2-inch OD polished chrome end sleeve, inside threaded 1/4-inch-20, with 2 –inch diameter. Flat white plate to cover hole in ceiling. Top of cable with ball swaged on end, to fit inside sleeve.
   2. Provide support above ceiling as required.

E. Suspension method allows adjustment to be made in hanging length to allow for variance in ceiling height.

F. Exposed paintable suspension components have the same finish and color as the luminaire housing.

2.7 LAMPS AND SOCKETS

A. Lamp each luminaire with the suitable lamp cataloged for the specific luminaire type and as indicated by the manufacturer, or as specifically indicated in the Luminaire Schedule, or as specified herein.

B. Lamps to be field replaceable.

C. Lamp sockets to be of configuration and design to accept standard LED lamps and circuit boards.

D. LED lamps to meet or exceed 50,000 hours as defined by LM-80-08 based on both the ambient temperature listed and the LEDs B10L70 performance curve as published by the LED lamp manufacturer.

E. LED lamps to be high brightness and proven quality from established and reputable LED manufacturers, including:
1. Nichia
2. Osram-SemiOpto
3. Cree
4. Philips Lumileds
5. Seoul Semiconductor
6. Bridgelux
7. General Electric Gelcore
8. Xicato
9. Osram

F. Replacement Lamps:
1. Sorra
2. Toshiba

G. LED lamps that are integral into the housing; light bars, diodes, boards and other, to be rated and tested for use in the fixture specified and compatible with the driver tested and compatible with that fixture.

H. Screw-In Base Replacement LED Lamps:
1. Manufacturer to provide wattage restriction label on socket, equivalent to specified wattage on LED replacement lamp.
2. LED replacement lamps not to be placed in air-tight enclosures or in insulated air tight (ICAT) rated luminaire enclosures without dedicated heat dissipation and thermal management of the luminaire system.

I. Color Rendering Index (CRI):
1. As indicated in the luminaire schedule

J. Adjustable Lamp Mechanisms: Include aiming stops which can be permanently set to position lamp vertically and rotationally.

K. High power LED luminaire thermally protected using one or more of the following thermal management techniques: metal core board, gap pad, and/or internal monitoring firmware

L. Operating Temperature:
   1. -22 degrees F to 115 degrees F.
   2. Operate below manufacturer's published die junction temperatures when operated at 1W at 350 mA in an elevated ambient of 46 degrees C.

M. Utilize quick-connect connections to replaceable boards to meet ANSI and UL/ETL and NEMA requirements.

2.8 POWER SUPPLIES

A. UL recognized under the component program and modular for simple field replacement.

B. Rate for use with the LED array specified:
   1. Warranty array and driver as an assembly.
   2. 5 year full replacement, non-pro-rated warranty is required on electronic components.

C. Luminaires requiring more than one driver are not permitted, unless specified in the luminaire schedule.

D. Power supplies used in enclosed and gasketed luminaires listed for use in wet locations, Type 1 construction.

E. Rate for the expected ambient temperature in which they are installed.
   1. Exterior installed power supplies rated to start the lamps at 0 degrees F.

F. Operate for a (+/- 10 percent) supply voltage of 120V at 60Hz.

G. Power Factor: 0.9 minimum

H. Lifetime minimum:
   1. 50,000 hours at full load and 77 degrees F ambient
   2. Ten-year expected life while operating at maximum case temperature and 90 percent non-condensing relative humidity.

I. Minimum time between failures (MTBF) greater than 300,000 hours at full load and 77 degrees F ambient, in accordance with MIL-HDBK-217.

J. Driver and luminaire electronics deliver illumination that is free from objectionable flicker as measured by flicker index (ANSI/IES RP-16-10).
   1. Flicker index to be less than 5 percent at frequencies below 1000 Hz.

K. Label systems using tandem wired luminaires be labeled accordingly. Locate label in the lamp compartment of each luminaire and identify the function of that luminaire. Do not make the label visible from room.

L. Total Harmonic Distortion less than 20 percent and meet ANSI C82.11 maximum allowable THD requirements at full output. Imbalance current is not allowed to exceed full output THD at any point in the dimming curve.

M. Meet or exceed $30mA^2s$ at 277VAC for up to 50Ws of load and 75A at 240us at 277VAC for 100 watts of load.

NEHS

N. Withstand up to a 1,000V surge without impairment of performance as defined by ANSI C62.41 Category A.

O. Housing have circuit diagrams and lamp connections applied thereto.

P. Reduction of Hazardous Substances (RoHS) compliant.

Q. Provide no light output when the analog control signal drops below 0.5 V, or the DALI/DMX digital signal calls for light to be extinguished and consume 0.5 watts or less in this standby. Control deadband between 0.5V and 0.65V included to allow for voltage variation of incoming signal without causing noticeable variation in fixture to fixture output.

R. Support automatic adaptation, allowing for future luminaire upgrades and enhancements and deliver improved performance:
   1. Adjustment of forward LED voltage, supporting 3V through 55V.
   2. Adjustment of LED current from 200mA to 1.05A at the 100 percent control input point in increments of 1mA
   3. Adjustment for operating hours to maintain constant lumens (within 5 percent) over the 50,000 hour design life of the system, and deliver up to 20 percent energy savings early in the life cycle.

S. Remote: Driver may be remote mounted up to 300-feet depending on power level and wire gauge.

T. Dimming Drivers:
   1. Dimming power supplies controlled by a common controller by the same manufacturer.
   2. Manufacturer to have minimum 5 years of experience in manufacturing dimmable electronic lighting drivers.
   3. LED dimming to be equal in range and quality to a commercial grade incandescent dimmer. Quality of dimming to be defined by dimming range, freedom from perceived flicker or visible stroboscopic flicker, smooth and continuous change in level (no visible steps in transitions), natural square law response to control input, and stable when input voltage conditions fluctuate over what is typically experience in a commercial environment.
      a. Demonstration of this compliance to dimming performance will be necessary for substitutions or prior approval.
   4. Provide step-free, continuous dimming to black from 100 percent to 0.1 percent and 0 percent relative light output, or 100 – 1 percent light output and step to 0 percent where indicated. Driver responds similarly when raising from 0 percent to 100 percent.
      a. Driver to be capable of 20 bit dimming resolution for white light LED drivers or 15 bit resolution for RGBW LED drivers.
   5. Track evenly across multiple fixtures at light levels, and provide input signal to output light level that allow smooth adjustment over the entire dimming range.
   6. Limit inrush current.
   7. No visible change in light output with a variation of plus/minus 10 percent line voltage input.
   8. Configure a linear or logarithmic dimming curve, allowing fine grained resolution at low light levels
   9. Basis of Design Product: eldoLED or subject to compliance and prior approval with specified requirements of this section, one of the following:
      a. eldoLED
      b. Philips
      c. Osram Sylvania
      d. Tridonic
      e. General Electric

10. Dimming Protocols:
    a. If not otherwise noted on the luminaire schedule, dimming LED drivers to be 0-10V.
    b. 4-Wire (0-10V DC Voltage Controlled) Dimming Drivers:
        1) Meet IEC 60929 Annex E for General White Lighting LED drivers.
        2) Connect to devices compatible with 0 to 10V Analog Control Protocol, Class 2, capable of sinking 0.6 ma per driver at a low end of 0.3V. Limit the number of drivers on each 0-10V control output based on voltage drop and control capacity.
        3) Must meet ESTA E1.3 for RGBW LED drivers
        4) 0-10V input protected from line voltage miswire, and immune and output unresponsive to induced AC voltage on the control leads.
        5) .
    c. As indicated in the luminaire schedule.

2.9 EXTRA MATERIAL

A. Furnish extra materials described below. Match product installed and packaged with protective covering for storage and identified with labels describing contents.
    1. Glass and plastic lenses, covers, louvers, globes, guards, and other removable fixture parts: 5 percent or one dozen (whichever is less) of each type and rating installed. Furnish at least one of each type.
    2. Control gear: 5 percent or one dozen (whichever is less) of each field-replaceable control module, driver, ballast, or individual fixture transformer. For fixtures with non-easily replaceable control gear provide 5 percent or one dozen (whichever is less) extra fixtures. Confirm non-replaceable products during submittal process.
    3. For non-decorative LED lights: provide 2 percent additional fixtures, or minimum two fixtures.

2.10 DISPOSAL AND REPLACEMENT

A. LED manufacturer is responsible for the disposal of expired LED arrays and heat sinks. Clearly label fixture with return information, disposal procedures and manufacturer disposal contact information.

B. Owner will pay for shipping.

C. Manufacturer is required to inform the owner of new power requirements and /or lumen output values if new replacement components prior to shipping replacement parts.

D. Label disposal and replacement information inside the luminaire and in the project operation and maintenance manuals along with O&M requirements listed in Division 01, General Requirements.

PART 3 EXECUTION

3.1 INSTALLATION

A. Meet general requirements of NFPA 70, National Electric Code.

B. Mounting heights specified on drawings:
    1. Wall Mounted Luminaires: Centerline of luminaire.
    2. Pendant Mounted Luminaires: Bottom of luminaire unless specifically identified in the Luminaire Schedule or on drawings.

C. Support:
   1. Support by separate means from the building structure and not from the ceiling system, ductwork, piping, or other systems.
   2. Final decision as to adequacy of support and alignment will be given by the Architect.

D. Power Supplies:
   1. Do not install equipment until following conditions can be maintained in spaces to receive equipment:
      a. Ambient temperature: -4 degrees to 122 degrees F.
      b. Relative humidity: Maximum 90 percent, non-condensing.
      c. Protected from dust and excess moisture during installation.
   2. Install per manufacturers prescribed methods.
   3. Located remote mounted power supplies and transformers within the distance limitations specified by the power supply manufacturer.

E. Level luminaires, align in straight lines, and locate as shown on the architectural elevations and reflected ceiling plan.

F. Manufacturer's labels or monograms not visible after luminaire is installed, but must be included for future reference.

G. Recessed Luminaires:
   1. Trims which fit neatly and tightly to the surfaces in which they are installed without light leaks or gaps.
   2. Install heat resistant non-rubber gaskets to prevent light leaks or moisture from entering between luminaires trim and the surface to which they are mounted.

3.2 COORDINATION OF WORK

A. Architectural Reflected Ceiling Plans take preference as to the exact placement of the luminaires in the ceiling.

B. Determine ceiling types in each area and provide suitable accessories and mounting frames where required for recessed luminaires. Luminaire catalog numbers do not necessarily denote specific mounting accessories for type of ceiling in which a luminaire may be installed.

3.3 PROJECT CLOSEOUT

A. Leave luminaires clean at the time of acceptance of the work. If luminaires are deemed dirty by the Architect at completion of the work, clean them at no additional cost. Protective plastic wrap is to be removed from parabolic luminaires just prior to owner acceptance.

B. Provide fixtures with new lamps operating at time of final acceptance. Exception: For fluorescent dimming fixtures, provide minimum 100 hour/maximum 200 hour, continuously lit lamps or per ballast manufacturer’s recommendations.

C. Where incandescent lamps are used for construction lighting, replace the lamps with new lamps just prior to occupancy by the owner.

END OF SECTION

SECTION 28 30 00

FIRE DETECTION AND ALARM

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes:
   1. Strobe Synchronization
   2. Detection Devices
   3. Manual Pull Stations
   4. Annunciation Devices
   5. Addressable Accessories
   6. Controlled Devices
   7. Cable

1.2 RELATED SECTIONS

A. Division 01, General Requirements

B. Section 26 05 19, Low Voltage Electrical Power Conductors and Cables

C. Section 26 05 33, Raceways and Boxes for Electrical Systems

D. Section 26 05 53, Identification for Electrical Systems

1.3 SUBMITTALS

A. Shop drawings produced in AutoCAD with Fire Marshal's stamp of approval.

B. Product data with wiring schematics.

C. AutoCAD wiring diagrams of each type of device.

D. AutoCAD riser diagram of the complete systems.

E. Battery and voltage drop calculations based on intended routing and wiring.

F. Prepare shop drawings of the system by the manufacturer in AutoCAD and submitted to the Fire Marshal for approval. The approved shop drawings will be utilized as the installation drawings. The shop drawings show actual conduit routing and conductors as to be installed. Update drawings to include revisions and changes to the system during construction and installation.

1.4 QUALITY ASSURANCE

A. Approve and install equipment in accordance with NFPA, ADA and IBC requirements and UL listed both in individual components and as a system. ISO-9000 certified; UL and FM listed and meet NFPA 72.

B. Furnish evidence that there is an experienced and efficient service organization which carries a stock of repair parts for the system to be furnished and that the organization is capable of providing repair service within 24 hours of a trouble call.

C. Install system by an electrical contractor experienced in the installation of addressable fire alarm systems and certified by the National Institute for Certification in Engineering Technologies (NICET) for fire alarm systems. Obtain services of the control equipment factory representative to provide engineered system floor plans and point-to-point drawings on AutoCAD. Representative to supervise the installation, system start-up, programming, make final adjustments and provide testing of the completed system. Factory representative to provide a letter of system certification to the Architect.

1.5 CONTRACTOR DESIGN

A. Equipment shown on the contract drawings indicate the general nature of the fire alarm system, but does not necessarily show components required. Provide a complete fire alarm and communications system as needed to meet applicable codes and requirements under this section.

B. Review various sets of drawings for initiating and notification devices, and add devices if needed to comply with the requirements of NFPA 72.

C. Raceway, routing, and wiring for field devices are not shown on the drawings except for a few specific design requirements.

1.6 SYSTEM DESCRIPTION

A. Automatic fire detection systems operate in a local, supervised non-coded fashion. Low voltage operating at 24V DC. Fully addressable with analog technology for sensors. Signal circuits either class A or B without changing modules. Design system Class B. Load circuits to 75 percent capacity maximum.

B. Signal, visual and audible alarms, flow and tamper module circuits supervised for opens, shorts and grounds. Open, short or ground causes a trouble on the system, sound the audible trouble sounder and annunciate at the control and remote annunciator: the device, location, and nature of the trouble condition.

1.7 SYSTEM OPERATION

A. Operation of manual or automatic initiating device cause an audible and visual alarm to sound, activate the control-by-event program and perform auxiliary functions.

B. Annunciate fault in the circuits at the control panel and the remote annunciators.

C. Utilize a single pair of wires to power, transmit, and receive data from the addressable analog initiating devices and to transmit commands to the remote control points. Size wire for the length of communications loop but in no event less than number 18-2 wire size.

1.8 SEQUENCE OF OPERATION

A. The system alarm operation subsequent to the alarm activation of manual station, automatic initiating device, or sprinkler flow/pressure switch is to be as follows:
   1. Audible alarm indicating appliances sound a digitized tone until silenced by the alarm silence switch at the control panel.
   2. Visual alarm indicating appliances (xenon strobes) display a continuous pattern until extinguished by the alarm silence switch.
   3. Doors normally held open by door control devices release. Signal door lock systems to unlock.
   4. A supervised signal to notifies an approved central station to activate.
   5. Combination fire/smoke dampers de-energizes to normally closed position.

B. Control panel has a dedicated supervisory service indicator and a dedicated supervisory service acknowledge switch.

C. The activation of standpipe or sprinkler valve tamper switch activates the system supervisory service audible signal and illuminate the indicator at the control panel.
   1. Activating the supervisory service acknowledge switch will silence the supervisory audible signal while maintaining the supervisory serviced LED on indicating the tamper contact is still in the off-normal state.
   2. Restoring the valve to the normal position cause the supervisory service indicator to extinguish thus indicating restoration to normal position.

D. The activation of sprinkler pre-action system pressure or low air switch activate the system supervisory service audible signal and illuminate the indicator at the control panel.
   1. Activating the supervisory service acknowledge switch will silence the supervisory audible signal while maintaining the supervisory service indicator on indicating the pressure/air contact is still in the off-normal state.
   2. Restoring the air pressure to the normal causes the supervisory service indicator to extinguish thus indicating restoration to normal position.

E. Immediately display alarm and trouble conditions on the control panel front alphanumeric display and of remote annunciators. If more alarms or troubles are in the system the operator may scroll to display new alarms.

F. Alarm list key that will allow the operator to display alarms, troubles, and supervisory service conditions with the time of occurrence.

G. In normal operation, fire alarm system close combination fire/smoke dampers when corresponding fan system is OFF. Fire alarm system open combination fire/smoke dampers when corresponding fan system is ON.

1.9 CONNECTION TO EXISTING NETWORK

A. General: Communication between peer-to-peer fire alarm control panels via TCP/IP over existing Ethernet, RS-485, RS-232 or other previously established panel system communication protocol.

B. Provide hardware, software and system integration to seamlessly integrate to the existing server for common system graphics, alarming, paging out of alarms via existing system.

C. Provide upgrade to existing control monitoring to accept new alarm points.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Siemens

B. Edwards

C. Notifier

D. Simplex

E. Or approved equal.

2.2 GENERAL

A. Furnish labor, materials, and equipment required for a complete and operating system of manual and automatic initiating devices, control panels, auxiliary relays, power supplies with batteries and accessories necessary to accomplish the desired sequence of events.

B. Fully electronic and addressable systems as described below with monitoring and annunciation of system alarms and troubles.

2.3 STROBE SYNCHRONIZATION

A. Synchronize strobes to 1Hz flash to comply with the Americans with Disabilities Act (ADA).

2.4 DETECTION DEVICES

A. Analog photoelectric smoke detectors provide for individual addressing of each detector. Sensor is constantly monitored to measure change in its sensitivity due to the environment caused by dirt, aging, temperature, humidity, etc.

B. Give an advanced indication to the control panel of the need for maintenance and be specific as to where the maintenance is needed. It is to be mounted on a two wire standard device base. Photoelectric detectors located within the elevator shaft rated for installation within a pressurized shaft.

C. Duct smoke detector housing assemblies accommodate the mounting of an analog/addressable detector along with a standard, relay or isolator detector mounting base. Housing protects the measuring chamber from damage and insects. Utilize an air exhaust tube and an air sampling inlet tube that extends into the duct air stream up to twelve feet. Provide drilling templates and gaskets to facilitate locating and mounting the housing.
   1. Provide sampling tube length as required to accommodate air duct width.
   2. Provide remote status/alarm LED indicator and keyswitch test station for each duct smoke detector.
   3. Duct smoke detector air velocity range includes design air velocity of the ductwork in which the duct smoke detector is to be installed.

D. Analog thermal detectors consist of a dual thermistor sensing circuit for fast response. Sensor is continually monitored to measure changes in their sensitivity due to temperature. Advanced indication to the control panel of the need for maintenance and can be specific as to where the maintenance is needed. Mount on a two wire standard device base. Equip thermal detectors in elevator shafts and machine rooms with a set of auxiliary contacts for elevator equipment use. Rate thermal detectors located within elevator shaft for installation within a pressurized shaft.

E. Projected Beam Type Smoke Detectors:
1. 4-wire 24 VDC and powered from the control panel four-wire smoke power source.
2. Consists of a separate transmitter and receiver capable of being powered separately or together.
3. Operate in either a short range of 30-feet to 100-feet or a long range of 100-feet to 300-feet.
4. Feature a bank of four alignment LEDs on both the receiver and transmitter that are used to ensure proper alignment without the use of special tools.
5. The beam detector features automatic gain control that compensate for gradual signal deterioration from dirt accumulation on lenses. Ceiling or wall mount as shown on the drawings. Carry out testing out using calibrated test filters. Provide a key activated remote test station.
6. Provide monitor modules for alarm and trouble and control relay module for reset.

F. Provide addressable monitor modules an address for a single, normally open initiating device such as a waterflow switch, manual station, etc. UL approved to extend the sensor loop to lengths up to 2,500-feet.

2.5 MANUAL PULL STATIONS

A. Single action, addressable, constructed of metal construction with a key reset switch for positive authorized resetting action. The unit to be keyed the same as the control unit.

B. Covers for manual pull stations. Cover includes local audible notification powered by a replaceable battery.

2.6 ANNUNCIATION DEVICES

A. Horn and Combination Horn/Strobe:
1. Mount to a recessed box with an extension ring.
2. Front of the unit allows for candela light levels as required by ADA for the spacing as installed.
3. Horns provide a 100 dba peak sound output with field adjustable output level.
4. Finish [As selected by Architect.

B. Strobe Lights:
1. Triangular with FIRE on white plastic lens, polarized 24 VDC, mounting single gang on four square box.
2. Front of the unit allows for candela light levels as required by ADA for the spacing as installed.
3. Strobe candela level adjustable field from 15-110 CD.
4. Mount at 80-inches or as shown on drawings.
5. Finish: As selected by Architect.
6. The candela rating of each strobe installed apparent to the Fire Marshal and to qualified service personnel either as installed or with the removal of the faceplate. If faceplates are interchangeable between strobes of different ratings the indication of candela rating not on the faceplate.

2.7 ADDRESSABLE ACCESSORIES

A. Control Modules:
1. Connects to the same loop as the initiating devices and provides a form C relay contact.

2. Program module to transfer from either a trouble or alarm input from any or combination of any addressable device.

2.8 CONTROLLED DEVICES

A. Mechanical control system for control of air handlers and smoke/fire rated dampers.

B. Fire protection tamper, flow, dry system and preaction system.

2.9 CABLE

A. Plenum rated as recommended by System Manufacturer and the building construction methods.

PART 3 EXECUTION

3.1 INSTALLATION

A. General:
1. Install in accordance with code, UFC, UBC, NFPA 72, 101 and the manufacturer's instructions.
2. Review proper installation of each type of device with manufacturer's agent.
3. Install wiring, raceway and outlet boxes required for a complete system as indicated in the Contract Documents.
4. Comply with applicable requirements of Section 26 05 33, Raceways and Boxes for Electrical Systems, for boxes and surface mounted raceways.

B. Typical Wiring:
1. Install manufacturer's recommended listed cable to connect devices as recommended by the manufacturer.
2. Run cable in conduit where exposed to physical damage.

C. Detectors:
1. Locate 48-inches clear of supply air vents and 12-inches clear of lights and sprinkler heads.
2. Install detector heads not more than two weeks prior to substantial completion.
3. Verify the design locations shown conform to the actual construction.
4. Do not locate detectors in close proximity to air supply vents.
5. Bring cases of uncertain applicability to the attention of the Architect for resolution prior to roughing in.

D. Duct Smoke Detectors
1. Provide/maintain working access to duct smoke detectors.
2. Locate duct smoke detectors in accordance with code requirements. Locations must ensure adequate airflow within the duct housing.
3. Locate remote status/alarm LED indicator and keyswitch test station at readily accessible location out of general viewdirectly below duct smoke detector location. Identify locations on fire alarm shop drawings prior to installation.

E. Provide auxiliary power supplies as required and extend the 120V power to the power supply as required and per NEC.

F. Provide visual devices and alarm devices as required. Device locations are diagrammatic showing intent of area coverage. The exact placement, sound or light level is to be per the requirements and the listing of the manufacturer's equipment and NFPA 72 installation requirements for the device(s) installed and the building conditions at and adjacent to the device(s).

3.2 LABELING

A. Label alarm initiating devices with 1/2-inch by 1-inch lamicoid nameplates, indicating control panel point designation. Locate nameplates in the vicinity of the device as approved by the Owner.

B. Provide Brady type wire markers to identify conductors at each junction or terminal. Use numbers indicated on the wiring diagrams.

3.3 TESTS

A. Provide the service of a competent, factory-trained technician authorized by the manufacturer of the fire alarm equipment to technically supervise and participate during the programming, final connections, adjustments and tests for the system.

B. When the system is complete and prior to the substantial completion, furnish testing equipment and perform the following tests:

C. Before energizing system, check for correct wiring connections and test for short circuits, ground faults, continuity, and insulation.

D. Test the insulation on installed wiring by standard methods as recommended by the equipment manufacturer.

E. Open supervised circuits to see if the trouble signal activates.

F. Ground supervised circuits and verify response of trouble signals.

G. Check installation, supervision, operation, and sensitivity of smoke detectors as recommended by the manufacturer to ascertain that they will avoid false alarm signals yet provide the required automatic detection.

H. Test each device for proper operation and auxiliary function.

I. Submit a print out of the entire test procedure to the engineer with the letter of certification for the completed fire alarm system.

J. When defects in the work are detected, make repairs and repeat the tests as required.

K. Test system for NFPA standby and alarm runtime for the actual load on the system batteries and recharge time of system batteries.

L. Perform required and necessary verification of the system operating functions with the Architect and Owner's facility staff prior to turnover of the complete system for final test observed by the Fire Department. Perform tests in the presence of the Owner or the Owner's Representative. A System Certification verifying the proper system operation is required prior to acceptance. Instruct Owner's

personnel in system operation, maintenance and programming for a minimum of 20 hours. The cost of retesting as a result of the failure of the system to operate in accordance with these specifications, drawings, or applicable codes paid for by the contractor to the Owner.

3.4 WARRANTY SERVICE AND INSTRUCTION

A. The fire alarm system will be checked on a monthly basis by the fire alarm system service organization for a period of one year after beneficial occupancy. The monthly checks will consist of reviewing the operation of the system with the Owner's operating and maintenance personnel, providing additional hands on instruction, and assisting in execution of programming revisions. Each monthly visit will consist of not less than two hours of on-site time and no more than four hours. The monthly visits will be scheduled with the Owner not less than one week in advance.

3.5 EXTRA STOCK/SPARE PARTS

A. Provide the following equipment to be turned over to the owner with the operation and maintenance manuals.
   1. Two photoelectric smoke detector heads.
   2. Two thermal heat detector heads.
   3. One addressable dry contact modules.
   4. Two horns.
   5. Two horns/strobes.
   6. One manual pull stations.
   7. One complete set of fuses to match panel counts.

3.6 TRAINING

A. Provide operation and maintenance training for Owner's personnel.

B. Conduct a minimum of two maintenance training sessions upon completion of the work. Maintenance training sessions include the following:
   1. Walk-thru of the completed facilities identifying the location.
   2. Address\
   3. Means of access to every device monitored by the fire alarm system.

C. Conduct training sessions for two operator levels.

D. Operator training: Provide a minimum of three refresher and system update training sessions of on-the-job training.

E. Supervisor training: Provide a system update training session for supervisory functions.

F. Training sessions with fully qualified, trained representative, of the equipment manufacturer who is thoroughly knowledgeable of the specific installation.

END OF SECTION