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engineers
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Project Manual

MADONNA UNIVERSITY
UNIVERSITY CENTER TOILET / SHOWER
RENOVATIONS

MADONNA UNIVERSITY
144012

LIVONIA, MICHIGAN
March 6, 2012

Minnesota
Illinois
Michigan
Colorado
Iowa

of 1

Set No: _____
Comm No: 144012

SECTION 00 01 01

PROJECT IDENTIFICATION PAGE

PROJECT MANUAL

PROJECT IDENTIFICATION

BIDDING REQUIREMENTS

CONDITIONS OF THE CONTRACT

GENERAL REQUIREMENTS

AND SPECIFICATIONS FOR:

MADONNA UNIVERSITY TOILET RENOVATION

**36600 SCHOOL CRAFT ROAD
LIVONIA, MICHIGAN 48150**

MADONNA UNIVERSITY
LIVONIA, MICHIGAN 48150

Bid Time: 10:00 a.m.

Bid Date: March 26, 2015

Bid Place: Madonna University
36600 School Craft Road
Livonia, Michigan 48150

SECTION 00 01 03

TITLE PAGE

PROJECT TITLE AND LOCATION:	MADONNA UNIVERSITY TOILET RENOVATION 36600 SCHOOL CARFT ROAD LIVONIA, MICHIGAN 48150
OWNER:	MADONNA UNIVERSITY
ARCHITECTS:	Wold Architects and Engineers 333 West Seventh Street, Suite 320 Royal Oak, Michigan 48067 Tel. (248) 284-0611
MECHANICAL ENGINEER:	MacMillan and Associates 714 East Midland Street Bay City, Michigan 48706 Tel. (989) 894-4300
ELECTRICAL ENGINEER:	MacMillan and Associates 714 East Midland Street Bay City, Michigan 48706 Tel. (989) 894-4300
DATE:	March 6, 2015

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Wold Architects and Engineers would like to report the upcoming project.

PROJECT INFORMATION:

Project Title: Madonna University Center Toilet Renovation
Project Location: Livonia, Michigan
Owner: Madonna University
Architect Contact: Victoria Lichocki-Smith, Wold A&E
Mechanical Engineer Contact: Gary Steffen, MacMillan Associates, Inc.
Electrical Engineer Contact: Jay Fox, MacMillan Associates, Inc.

BUILDING TYPE:

- | | | |
|---|---|---|
| <input type="checkbox"/> Industrial | <input type="checkbox"/> Additions | <input type="checkbox"/> Tenant Improvement |
| <input checked="" type="checkbox"/> Educational | <input type="checkbox"/> Alteration | <input type="checkbox"/> Civil |
| <input type="checkbox"/> Institutional | <input type="checkbox"/> New Construction | <input type="checkbox"/> Other |

COST ESTIMATE:

Approximate Construction Cost: \$ _____

DESCRIPTION OF WORK: Architectural, mechanical and electrical renovations/upgrades at Dormitory toilet and shower rooms and a set of male and female toilet rooms.

CONSTRUCTION DELIVERY METHOD:

- | | |
|--|---|
| <input checked="" type="checkbox"/> General Contractor | <input type="checkbox"/> Construction Manager |
| <input type="checkbox"/> QuestCDN.com eBidDoc# _____ | |

ORDERING PLANS:

Plans are available from: ☒ American Reprographic Company on March 9, 2015
1009 W. Maple Rd., Clawson, MI 48017
(248) 288-5600

- ☒ Viewed and ordered online at www.e-arc.com
(PlanWell Public Plan Room)

BIDDING INFORMATION:

Bid Date and Time: March 26, 2015 at 10:00am
Bid Location: Madonna University, 36600 School Craft Road, Livonia, Michigan 48150

Mandatory pre-bid walk through: March 19, 2015

Wold Architects and Engineers, 710 North Crooks Road, Clawson, Michigan 48017 P: (248) 284-0611 F: (248) 284-0615

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INSTRUCTIONS TO BIDDERS

The Instructions to Bidders, AIA Document A701, 1997 is attached after this section.

END OF SECTION 00 21 13

AIA[®] Document A701[™] – 1997

Instructions to Bidders

for the following PROJECT:

(Name and location or address):

Madonna University Toilet Renovation
36600 School Craft Road
Livonia, Michigan 48150

THE OWNER:

(Name and address):

Madonna University
36600 Schoolcraft Road
Livonia, Michigan 48150

THE ARCHITECT:

(Name and address):

Wold Architects and Engineers
710 North Crooks Road
Clawson, Michigan 48017

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. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

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ARTICLE 1 DEFINITIONS

§ 1.1 Bidding Documents include the Bidding Requirements and the proposed Contract Documents. The Bidding Requirements consist of the Advertisement or Invitation to Bid, Instructions to Bidders, Supplementary Instructions to Bidders, the bid form, and other sample bidding and contract forms. The proposed Contract Documents consist of the form of Agreement between the Owner and Contractor, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications and all Addenda issued prior to execution of the Contract.

§ 1.2 Definitions set forth in the General Conditions of the Contract for Construction, AIA Document A201, or in other Contract Documents are applicable to the Bidding Documents.

§ 1.3 Addenda are written or graphic instruments issued by the Architect prior to the execution of the Contract which modify or interpret the Bidding Documents by additions, deletions, clarifications or corrections.

§ 1.4 A Bid is a complete and properly executed proposal to do the Work for the sums stipulated therein, submitted in accordance with the Bidding Documents.

§ 1.5 The Base Bid is the sum stated in the Bid for which the Bidder offers to perform the Work described in the Bidding Documents as the base, to which Work may be added or from which Work may be deleted for sums stated in Alternate Bids.

§ 1.6 An Alternate Bid (or Alternate) is an amount stated in the Bid to be added to or deducted from the amount of the Base Bid if the corresponding change in the Work, as described in the Bidding Documents, is accepted.

§ 1.7 A Unit Price is an amount stated in the Bid as a price per unit of measurement for materials, equipment or services or a portion of the Work as described in the Bidding Documents.

§ 1.8 A Bidder is a person or entity who submits a Bid and who meets the requirements set forth in the Bidding Documents. **"A bidder is defined as the "bidding entity," i.e. the corporation, partnership or other entity in whose name a bid is submitted. Experience qualifications required of "the bidder" will refer, first, to the bidding entity rather than the experience, either individual or aggregate, of the individuals who make up the company. The experience of key personnel (the persons assigned as Project Manager and Project Superintendent) will also be considered in the process of evaluating the bidding entity."**

§ 1.9 A Sub-bidder is a person or entity who submits a bid to a Bidder for materials, equipment or labor for a portion of the Work.

ARTICLE 2 BIDDER'S REPRESENTATIONS

§ 2.1 The Bidder by making a Bid represents that:

§ 2.1.1 The Bidder has read and understands the Bidding Documents or Contract Documents, to the extent that such documentation relates to the Work for which the Bid is submitted, and for other portions of the Project, if any, being bid concurrently or presently under construction.

§ 2.1.2 The Bid is made in compliance with the Bidding Documents.

§ 2.1.3 The Bidder has visited the site, become familiar with local 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.

§ 2.1.4 The Bid is based upon the materials, equipment and systems required by the Bidding Documents without exception.

ARTICLE 3 BIDDING DOCUMENTS

§ 3.1 COPIES

§ 3.1.1 Bidders may obtain complete sets of the Bidding Documents from the issuing office designated in the Advertisement or Invitation to Bid in the number and for the deposit sum, if any, stated therein. The deposit will be refunded to Bidders who submit a bona fide Bid and return the Bidding Documents in good condition within ten days after receipt of Bids. The cost of replacement of missing or damaged documents will be deducted from the deposit. A Bidder receiving a Contract award may retain the Bidding Documents and the Bidder's deposit will be refunded when

the Architect's Office receives notification from the contractor holding a contract with the Owner within the time limits specified on the advertisement for bids.

§ 3.1.2 Bidding Documents will not be issued directly to Sub-bidders unless specifically offered in the Advertisement or Invitation to Bid, or in supplementary instructions to bidders.

§ 3.1.3 Bidders shall use complete sets of Bidding Documents in preparing Bids; neither the Owner nor Architect assumes responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.

§ 3.1.4 The Owner and Architect may make copies of the Bidding Documents available on the above terms for the purpose of obtaining Bids on the Work. No license or grant of use is conferred by issuance of copies of the Bidding Documents.

§ 3.2 INTERPRETATION OR CORRECTION OF BIDDING DOCUMENTS

§ 3.2.1 The Bidder shall carefully study and compare the Bidding Documents with each other, and with other work being bid concurrently or presently under construction to the extent that it relates to the Work for which the Bid is submitted, shall examine the site and local conditions, and shall at once report to the Architect errors, inconsistencies or ambiguities discovered.

§ 3.2.2 Bidders and Sub-bidders requiring clarification or interpretation of the Bidding Documents shall make a written request which shall reach the Architect at least seven days prior to the date for receipt of Bids.

§ 3.2.3 Interpretations, corrections and changes of the Bidding Documents will be made by Addendum. Interpretations, corrections and changes of the Bidding Documents made in any other manner will not be binding, and Bidders shall not rely upon them.

§ 3.3 SUBSTITUTIONS

§ 3.3.1 The materials, products and equipment described in the Bidding Documents establish a standard of required function, dimension, appearance and quality to be met by any proposed substitution.

§ 3.3.2 No substitution will be considered prior to receipt of Bids unless written request for approval has been received by the Architect at least ten days prior to the date for receipt of Bids. Such requests shall include the name of the material or equipment for which it is to be substituted and a complete description of the proposed substitution including drawings, performance and test data, and other information necessary for an evaluation. A statement setting forth changes in other materials, equipment or other portions of the Work, including changes in the work of other contracts that incorporation of the proposed substitution would require, shall be included. The burden of proof of the merit of the proposed substitution is upon the proposer. The Architect's decision of approval or disapproval of a proposed substitution shall be final.

§ 3.3.3 If the Architect approves a proposed substitution prior to receipt of Bids, such approval will be set forth in an Addendum. Bidders shall not rely upon approvals made in any other manner.

§ 3.3.4 No substitutions will be considered after the Contract award unless specifically provided for in the Contract Documents.

§ 3.3.5 Where the Contractor chooses to use an item approved by request but other than one shown on the details or specified, he shall be responsible for the coordination of any necessary changes in other work, and shall bear the cost of such changes.

§ 3.4 ADDENDA

§ 3.4.1 Addenda will be transmitted to all who are known by the issuing office to have received a complete set of Bidding Documents.

§ 3.4.2 Copies of Addenda will be made available for inspection wherever Bidding Documents are on file for that purpose.

§ 3.4.3 Addenda will be issued no later than four days prior to the date for receipt of Bids except an Addendum withdrawing the request for Bids or one which includes postponement of the date for receipt of Bids.

§ 3.4.4 Each Bidder shall ascertain prior to submitting a Bid that the Bidder has received all Addenda issued, and the Bidder shall acknowledge their receipt in the Bid.

ARTICLE 4 BIDDING PROCEDURES

§ 4.1 PREPARATION OF BIDS

§ 4.1.1 Bids shall be submitted in duplicate on the forms included with the Bidding Documents as produced by Wold Architects and Engineers, 710 North Crook Road, Clawson, MI 48017.

§ 4.1.2 All blanks on the bid form shall be legibly executed in a non-erasable medium.

§ 4.1.3 Sums shall be expressed in both words and figures. In case of discrepancy, the amount written in words shall govern.

§ 4.1.4 Interlineations, alterations and erasures must be initialed by the signer of the Bid.

§ 4.1.5 All requested Alternates shall be bid. If no change in the Base Bid is required, enter "No Change."

§ 4.1.6 Where two or more Bids for designated portions of the Work have been requested, the Bidder may, without forfeiture of the bid security, state the Bidder's refusal to accept award of less than the combination of Bids stipulated by the Bidder. The Bidder shall make no additional stipulations on the bid form nor qualify the Bid in any other manner.

§ 4.1.7 Each copy of the Bid shall state the legal name of the Bidder and the nature of legal form of the Bidder. The Bidder shall provide evidence of legal authority to perform within the jurisdiction of the Work. Each copy shall be signed by the person or persons legally authorized to bind the Bidder to a contract. A Bid by a corporation shall further give the state of incorporation and have the corporate seal affixed. A Bid submitted by an agent shall have a current power of attorney attached certifying the agent's authority to bind the Bidder.

§ 4.1.8 All Bids shall be accompanied by a sworn and notarized statement disclosing any familial relationship that exists between the Owner(s) or any employee of the bidder and any member of the University. The University will not accept a bid that does not include a sworn and notarized familial relationship disclosure statement.

§ 4.2 BID SECURITY

§ 4.2.1 No bid will be considered, unless it is accompanied by a certified check or acceptable Bid Bond payable without condition to the Owner in an amount equal to five percent (5%) of the total bid. The certified check or Bid Bond which must accompany each bid is required as a guarantee that the bidder will enter into a contract with the Owner for the work described in the proposal and furnish a performance and payment bond and certificates of insurance as specified after notice by the Owner or Architect that contracts have been awarded to him and are ready for execution.

§ 4.2.2 If a surety bond is required, it shall be written on AIA Document A310, Bid Bond, unless otherwise provided in the Bidding Documents, and the attorney-in-fact who executes the bond on behalf of the surety shall affix to the bond a certified and current copy of the power of attorney.

§ 4.2.3 The Owner will have the right to retain the bid security of the three lowest Bidders to whom an award is being considered until either (a) the Contract has been executed and bonds, if required, have been furnished, or (b) the specified time has elapsed so that Bids may be withdrawn or (c) all Bids have been rejected. The Bid Security of other bidders will be returned by the Owner within a reasonable time after the opening of bids.

§ 4.3 SUBMISSION OF BIDS

§ 4.3.1 All copies of the Bid, the bid security, if any, and any other documents required to be submitted with the Bid shall be enclosed in a sealed opaque envelope. The envelope shall be addressed to the party receiving the Bids and shall be identified with the Project name, the Bidder's name and address and, if applicable, the designated portion of the Work for which the Bid is submitted. If the Bid is sent by mail, the sealed envelope shall be enclosed in a separate mailing envelope with the notation "SEALED BID ENCLOSED" on the face thereof.

§ 4.3.2 Bids shall be deposited at the designated location prior to the time and date for receipt of Bids. Bids received after the time and date for receipt of Bids will be returned unopened.

§ 4.3.3 The Bidder shall assume full responsibility for timely delivery at the location designated for receipt of Bids.

§ 4.3.4 Oral, telephonic, telegraphic, facsimile or other electronically transmitted bids will not be considered.

§ 4.4 MODIFICATION OR WITHDRAWAL OF BID

§ 4.4.1 A Bid may not be modified, withdrawn or canceled by the Bidder for a period of thirty (30) days following the time and date designated for the receipt of Bids, and each Bidder so agrees in submitting a Bid.

§ 4.4.2 Prior to the time and date designated for receipt of Bids, a Bid submitted may be modified or withdrawn by notice to the party receiving Bids at the place designated for receipt of Bids. Such notice shall be in writing over the signature of the Bidder. Written confirmation over the signature of the Bidder shall be received, and date- and time-stamped by the receiving party on or before the date and time set for receipt of Bids. A change shall be so worded as not to reveal the amount of the original Bid.

§ 4.4.3 Withdrawn Bids may be resubmitted up to the date and time designated for the receipt of Bids provided that they are then fully in conformance with these Instructions to Bidders.

§ 4.4.4 Bid security, if required, shall be in an amount sufficient for the Bid as resubmitted.

ARTICLE 5 CONSIDERATION OF BIDS

§ 5.1 OPENING OF BIDS

At the discretion of the Owner, if stipulated in the Advertisement or Invitation to Bid, the properly identified Bids received on time will be publicly opened and will be read aloud. An abstract of the Bids may be made available to Bidders.

§ 5.2 REJECTION OF BIDS

The Owner shall have the right to reject any or all Bids. A Bid not accompanied by a required bid security or by other data required by the Bidding Documents, or a Bid which is in any way incomplete or irregular is subject to rejection.

§ 5.3 ACCEPTANCE OF BID (AWARD)

§ 5.3.1 It is the intent of the Owner to award a Contract to the lowest qualified Bidder provided the Bid has been submitted in accordance with the requirements of the Bidding Documents and does not exceed the funds available. The Owner shall have the right to waive informalities and irregularities in a Bid received and to accept the Bid which, in the Owner's judgment, is in the Owner's own best interests.

§ 5.3.2 The Owner shall have the right to accept Alternates in any order or combination, unless otherwise specifically provided in the Bidding Documents, and to determine the low Bidder on the basis of the sum of the Base Bid and Alternates accepted.

ARTICLE 6 POST-BID INFORMATION

§ 6.1 CONTRACTOR'S QUALIFICATION STATEMENT

Bidders to whom award of a Contract is under consideration shall submit to the Architect, upon request, a properly executed AIA Document A305, Contractor's Qualification Statement, unless such a Statement has been previously required and submitted as a prerequisite to the issuance of Bidding Documents.

§ 6.2 OWNER'S FINANCIAL CAPABILITY

The Owner shall, at the request of the Bidder to whom award of a Contract is under consideration and no later than seven days prior to the expiration of the time for withdrawal of Bids, furnish to the Bidder reasonable evidence that financial arrangements have been made to fulfill the Owner's obligations under the Contract. Unless such reasonable evidence is furnished, the Bidder will not be required to execute the Agreement between the Owner and Contractor.

§ 6.3 SUBMITTALS

§ 6.3.1 The Bidder shall, as soon as practicable or as stipulated in the Bidding Documents, after notification of selection for the award of a Contract, furnish to the Owner through the Architect in writing:

- .1 a designation of the Work to be performed with the Bidder's own forces;
- .2 names of the manufacturers, products, and the suppliers of principal items or systems of materials and equipment proposed for the Work; and
- .3 names of persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for the principal portions of the Work.

§ 6.3.2 The Bidder will be required to establish to the satisfaction of the Architect and Owner the reliability and responsibility of the persons or entities proposed to furnish and perform the Work described in the Bidding Documents.

§ 6.3.3 Prior to the execution of the Contract, the Architect will notify the Bidder in writing if either the Owner or Architect, after due investigation, has reasonable objection to a person or entity proposed by the Bidder. If the Owner or Architect has reasonable objection to a proposed person or entity, the Bidder may, at the Bidder's option, (1) withdraw the Bid or (2) submit an acceptable substitute person or entity with an adjustment in the Base Bid or Alternate Bid to cover the difference in cost occasioned by such substitution. The Owner may accept the adjusted bid price or disqualify the Bidder. In the event of either withdrawal or disqualification, bid security will not be forfeited.

§ 6.3.4 Persons and entities proposed by the Bidder and to whom the Owner and Architect have made no reasonable objection must be used on the Work for which they were proposed and shall not be changed except with the written consent of the Owner and Architect.

ARTICLE 7 PERFORMANCE BOND AND PAYMENT BOND

§ 7.1 BOND REQUIREMENTS

§ 7.1.1 Refer to Section 00 72 00 General Conditions of the Contract for Construction for Bond requirements.

(Paragraphs deleted)

ARTICLE 8 FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR

Unless otherwise required in the Bidding Documents, the Agreement for the Work will be written on AIA Document A101, Standard Form of Agreement Between Owner and Contractor Where the Basis of Payment Is a Stipulated Sum.

SECTION 00 41 13

BID FORM

**BID PROPOSAL FOR: MADONNA UNIVERSITY TOILET RENOVATION
36600 SCHOOL CRAFT ROAD
LIVONIA, MICHIGAN 48150**

BID TO: Madonna University
Business Office 2001
36600 School Craft Road
Livonia, Michigan 48150

BID FROM: _____

We have examined the Contract Documents for the proposed Madonna University Toilet Renovation as prepared by Wold Architects and Engineers, Clawson, Michigan, and the conditions affecting the work.

In accordance therewith the undersigned proposes to furnish all labor and materials for Construction as set forth in the Contract Documents, including Addenda Nos. _____ issued thereto.

1. Accompanying this proposal is a Bid Security for all work, required to be furnished by Contract Documents, the same being subject to forfeiture in the event of default by the undersigned.
2. Accompanying this proposal is a Familial Affidavit of Bidder.
3. Accompanying this proposal is a Non-Iran Linked Business Certification.
4. I agree to complete the Project, provided a contract is executed within 30 calendar days, by July 31, 2015 for Phase I and July 29, 2016 for Phase II.
5. I understand the Owner reserves the right to reject any or all bids, and it is agreed that this bid may not be withdrawn for a period of thirty (30) days from the opening thereof.

A. Base Bid

1. The Bidder agrees to perform all work including General, Mechanical and Electrical Construction for the Base Bid Sum of:

_____ Dollars \$ _____

DATE _____

FIRM NAME _____

OFFICIAL ADDRESS _____

TELEPHONE NUMBER _____ () _____

FAX NUMBER _____ () _____

BY _____

TITLE _____

END OF SECTION 00 41 13

SECTION 00 41 15

FAMILIAL AFFIDAVIT OF BIDDER

The undersigned, the owner or authorized officer of _____ (the "Bidder"), pursuant to the familial disclosure requirement hereby represent and warrant, except as provided below, that no familial relationships exist between the owner(s) or any employee of _____ (the "Bidder") and any member of the University.

List any Familial Relationships:

BIDDER:

By: _____

Its: _____

STATE OF MICHIGAN)
)ss.
COUNTY OF _____)

This instrument was acknowledged before me on the _____ day of _____, 2009, by
_____.

_____, Notary Public
_____ County, Michigan

My Commission Expires: _____

Acting in the County of: _____

END OF SECTION 00 41 15

SECTION 00 41 16

NON-IRAN LINKED BUSINESS CERTIFICATION

The undersigned, the owner or authorized officer of _____ (the "Bidder"), pursuant to the Iran Economic Sanction Act of 2012, Public Act 517, hereby represent and warrant, that the Bidder is not an Iran Linked Business.

The Act defines an Iran Linked Business as: 1) a person engaging in investment activities in the energy sector of Iran, including a person that provides oil or liquefied natural gas tankers or products used to construct or maintain pipelines used to transport oil or liquefied natural gas for the energy sector of Iran; or 2) a financial institution that extends credit to another person, if that person will use the credit to engage in investment activities in the energy sector of Iran.

If the public entity determines, using credible information available to the public, that a person or entity has submitted a false certification, the public entity must provide written notice to the person or entity of its determination and of its intent not to enter into or renew the contract. The notice must include information on how to contest the determination. The notice must also specify that the individual or entity may become eligible for future contracts with the public entity if the activities that caused it to be an Iran Linked Business are ceased.

BIDDER:

By: _____

Its: _____

STATE OF MICHIGAN)
)ss.
COUNTY OF _____)

This instrument was acknowledged before me on the _____ day of _____, 2013, by
_____.

_____, Notary Public
_____ County, Michigan

My Commission Expires: _____

Acting in the County of: _____

END OF SECTION 00 41 16

SECTION 00 72 00
GENERAL CONDITIONS

The "General Conditions of the Contract for Construction", AIA Document A201, Fifteenth Edition, 2007 is attached after this section.

END OF SECTION 00 72 00

AIA® Document A201™ – 2007

General Conditions of the Contract for Construction

for the following PROJECT:

(Name and location or address)

Madonna University Toilet Renovation
36600 School Craft Road
Livonia, Michigan 48150

THE OWNER:

(Name and address)

Madonna University
36600 School Craft Road
Livonia, Michigan 48150

THE ARCHITECT:

(Name and address)

Wold Architects and Engineers
710 North Crooks Road
Clawson, Michigan 48017

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Init.

14 TERMINATION OR SUSPENSION OF THE CONTRACT

15 CLAIMS AND DISPUTES

Init.

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(Numbers and Topics in Bold are Section Headings)

Acceptance of Nonconforming Work

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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. 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, (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 ARCHITECT/INITIAL DECISION MAKER

The Architect/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.

§ 1.2 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.

§ 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. In the event of conflicts or discrepancies among the Contract Documents, interpretations will be based on the following priorities:

1. The Agreement
2. Change Orders and Supplemental Instructions.
3. Addenda, with those of later date having precedence over those of earlier date.
4. The Supplementary Conditions.
5. The General Conditions of the Contract for Construction.
6. Drawings and Specifications.

In the case of an inconsistency between Drawings and Specifications or within either Document not clarified by addendum, the better quality or great quantity of Work shall be provided in accordance with the Architect's interpretations.

§ 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.

§ 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. After the Owner furnishes the evidence, the Owner shall not materially vary such financial arrangements without prior notice to the Contractor.

§ 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 and pay for necessary approvals, easements, assessments and charges required for construction, use or occupancy of permanent structures or for permanent changes in existing facilities.

§ 2.2.3 The Owner shall furnish surveys describing physical characteristics, legal limitations and utility locations for the site of the Project, and 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 with the exception of utilities to be field verified by the Contractor. The Contractor shall be responsible to have public and private utilities located within the areas being disturbed to implement the work on site.

§ 2.2.4 The Owner shall furnish information or services required of the Owner by the Contract Documents with reasonable promptness. The Owner shall also furnish any other information or services under the Owner's control and relevant to the Contractor's performance of the Work with reasonable promptness after receiving the Contractor's written request for such information or services.

§ 2.2.5 Unless otherwise provided in the Contract Documents, the Contractor will be furnished free of charge, such copies of the Contract Documents as are reasonably necessary for execution of the Work. Following the initial issue of Drawings and Project Manuals, additional copies requested by the Contractor will be furnished at the cost of reproduction, postage and handling.

[OR]

§ 2.2.5 Unless otherwise provided in the Contract Documents, the Owner shall furnish to the Contractor up to (8) eight copies of the Contract Documents. Following the initial issue of Drawings and Project Manuals, additional copies requested by the Contractor will be furnished at the cost of reproduction, postage and handling.

§ 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

§ 2.4.1 Prior to substantial completion, if the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a ten-day period after receipt of written notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may, without prejudice to other remedies the Owner may have, 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. Such action by the Owner and amounts charged to the Contractor are both subject to

prior approval of the Architect. If payments then or thereafter due the Contractor are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner.

§ 2.4.2 After substantial completion, if the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails to correct such deficiencies within 3 days of receipt of written notice from the Architect or Owner, the Owner may, without prejudice to other remedies the Owner may have, 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. Such action by the Owner and amounts charged to the Contractor are both subject to prior approval of the Architect. If payments then or thereafter due the Contractor are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner.

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 Architect in the Architect's administration of the Contract, or by tests, inspections or approvals required or performed by persons or entities other than the Contractor.

§ 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.

§ 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 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 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.

§ 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 unless the Contractor recognized such error, inconsistency, omission or difference and knowingly failed to report it to the Architect.

§ 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, unless the Contract Documents give other specific instructions concerning these matters. 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. If the Contractor is then instructed to proceed with the required means, methods, techniques, sequences or procedures without acceptance of changes proposed by the Contractor, the Owner shall be solely responsible for any loss or damage arising solely from those Owner-required means, methods, techniques, sequences or procedures.

§ 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.

§ 3.4 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 consent of the Owner, after evaluation by the Architect and in accordance with a Change Order or Construction Change Directive. After the Contract has been executed, the Owner and Architect will consider a formal request for the substitution of products in place of those specified only under the conditions set forth in Section 01 25 00 – Substitutions and Product Options.

§ 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.

§ 3.5 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, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

§ 3.6 TAXES

The Contractor shall pay sales, consumer, use and similar taxes for the Work provided by the Contractor 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 Unless otherwise provided in the Contract Documents, the Contractor shall secure and pay for the building permit as well as for other permits, fees, licenses, and inspections by government agencies necessary for proper

execution and completion of the Work that are customarily secured after execution of the Contract and legally required at the time bids are received or negotiations concluded.

The Owner will pay City Development Fees, Sewer Availability Charge (SAC), Water Availability Charge (WAC), and Electrical Connection Charges.

§ 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 superintendent and necessary assistants who shall be in attendance at the Project site during performance of the Work. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor. Important communications shall be confirmed in writing. Other communications shall be similarly confirmed on written request in each case.

§ 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 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 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 superintendent to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not change the 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 as required by Section 01 32 00 Construction Scheduling. 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 as required by Section 01 32 00 Construction Scheduling, 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 Architect's 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.

§ 3.11 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 Architect reviewed 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.

§ 3.12 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. Shop drawings submitted prior to issuance of the building permit are at the Contractors risk.

§ 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. Submittals which are not marked as reviewed for compliance with the Contract Documents and approved by the Contractor may be returned by the Architect without action.

§ 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 reviewed 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 review 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 review 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 review 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, 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 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, provided the Owner and Architect have specified to the Contractor all performance and design criteria that such services must satisfy. 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

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. The Contractor shall accept the site as it exists. The care, custody and control of the project site shall be vested in the Contractor, subject to the rights of the Owner.

§ 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), 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 which 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.

§ 3.19 PROJECT MANAGER

§ 3.19.1 The Contractor shall employ a competent project manager who shall be present and run all construction progress meetings. The project manager shall be responsible for providing accurate and up-to-date construction and submittal schedules at each construction progress meeting.

§ 3.19.2 When requested by the Owner or Architect, the project manager shall:

- a. Assist in resolving scope conflicts between sub-contractors in a timely fashion to ensure project progress matches published construction schedule.
- b. Have sub-contractors attend construction progress meetings.

- c. Manage the resolution of issues that arise during the punchlist/closeout/warranty period when the job superintendent is no longer on site.

§ 3.19.3 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. 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 or (2) that the Architect required additional time to review. Failure of the Architect to reply within the 14 days period shall constitute notice of no reasonable objection.

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

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. The term "Architect" means the Architect or the Architect's authorized representative.

§ 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. Consent shall not be unreasonably withheld.

§ 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 end of the warranty period which ends one year from 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 at intervals appropriate to the stage of construction, or as otherwise agreed with the Owner, to become generally 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, when fully completed, 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 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) known deviations from the Contract Documents and from the most recent construction schedule submitted by the Contractor, and (2) defects and deficiencies observed 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. 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 take one of the following actions Reviewed; Rejected; Review Comments; Revise and Resubmit 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 submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, the Architect will determine review timelines. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, coordinating the work, 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 intent of, and reasonably inferable from, the Contract Documents and will be in writing or in the form of drawings. When making such interpretations and decisions, the Architect will endeavor to secure faithful performance by both Owner and Contractor, will not show partiality to either and will not be liable for results of interpretations or decisions rendered in good faith.

§ 4.2.13 The Architect's decisions on matters relating to aesthetic effect 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 Unless otherwise stated in the Contract Documents or the bidding requirements, the Contractor, as soon as practicable after award of the Contract, 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 20 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 20 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.

§ 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 Upon such assignment, if the Work has been suspended for more than 30 days, the Subcontractor's compensation shall be equitably adjusted for increases in cost resulting from 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.

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, 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, 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.

§ 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.

§ 7.3 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, and overhead as provided in Section 7.5.
- .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;
- .4 Costs of premiums for all, permit fees, and sales, use or similar taxes related to the Work; and

§ 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.

§ 7.5 CHANGES IN CONTRACT SUM

§ 7.5.1 For any adjustments to the Contract Sum based on other than the unit prices method, the Contractor agrees to charge and accept payment for his overhead, bond, insurance, office project management, estimating time, field supervision, as-built modification and profit at the following percentages of the cost attributable to the change in the Work:

1. Ten percent (10%) for Work (labor, labor insurance and materials by the Contractor not involving subcontractors;
2. Five percent (5%) for Work (labor, labor insurance and materials) by subcontractors;
3. When both additions and credits are involved in any one proposal request, the allowance for overhead, bond, insurance, office project management, estimating time, field supervision, as-built modification and profit shall be figured on the basis of the net increase, if any;
4. For additional Work ordered as described above which will be executed by Subcontractors of the Contractor, it is agreed Subcontractors will be permitted to charge ten percent (10%)

for work not involving sub-subcontractors and five percent (5%) for Work by sub subcontractors. to the net subcontract amount the Contractor may add five percent (5%).

§ 7.5.2 A breakdown of material and an hourly breakdown of labor must be submitted with each request for additional compensation.

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 arbitration or litigation as provided for herein; or by other causes that the Architect determines may justify delay, then the Contract Time shall be extended by Change Order for such reasonable time as the Architect may determine.

§ 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.

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 four copies to the Architect, before the first Application for Payment, 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.

§ 9.2.2 Projects with multiple sites or multiple phased projects, provide separate schedule of values for each building, phase or site.

§ 9.2.3 The schedule of values shall include the following line items with values calculated as follows:

Operations and maintenance manuals	.125% of contract value
As-built drawings	.0625% of contract value
Training	.125% of contract value
Attic stock materials	.0625% of contract value
Mechanical/Electrical Coordination Drawings	.0625% of contract value

§ 9.2.4 The schedule of values shall be broken down with separate line items for labor and materials corresponding to each specification section.

§ 9.3 APPLICATIONS FOR PAYMENT

§ 9.3.1 At least ten days before the date established for each progress payment, the Contractor shall submit four copies to the Architect an itemized Application for Payment (AIA Document G702 and G703) 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, , 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 Until Substantial Completion, the Owner shall make progress payments in the amount of ninety-five percent (95%) of the amount due the Contractor.

§ 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.

§ 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.

§ 9.6 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 ten 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.

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§ 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

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.

§ 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. **If the Work is to be followed by construction by the Owner or by the separate contractors, Substantial Completion shall be defined as the readiness of the Work for the commencement of such construction.**

§ 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 which the Contractor shall complete all items on the list accompanying the Certificate **to sixty (60) calendar days. The Contractor will submit a punchlist completion schedule within ten (10) days of receipt of Certificate of Substantial Completion. Any cost incurred by the Architect or Architect's consultants (after 60 calendar days of substantial completion) to close out the project will be deducted from the Contractor's contract by change order.** 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. Warranties on punchlist items will commence on the date of final payment.

§ 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,

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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. **The payment shall be sufficient to increase the total payments to one hundred percent (100%) of the Contract Sum, less such amounts as the Owner and Architect shall determine for incomplete work and unsettled claims. The Owner has no obligation to make incremental retainage reductions after the initial determination for the incomplete work and unsettled claims.**

§ 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 and will not be canceled or allowed to expire until at least 30 days' prior written notice has been given to the Owner, (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 and (5), 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 posting danger signs and other warnings against hazards, promulgating safety regulations and notifying owners and users of adjacent sites and utilities.

§ 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.

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§ 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.

§ 10.3 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 a 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, 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; **which are sustained (1) by a person as a result of an offense directly or indirectly related to employment of such person by the Contractor, or (2) by another person;**
- .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; and
- .8 Claims involving contractual liability insurance applicable to the Contractor's obligations under Section 3.18.
- .9 **Liability insurance shall include all major divisions of coverage and be on a comprehensive basis including:**
 - a. Premises Operations (including X, C, and U coverages as applicable).
 - b. **Independent Contractors' Protective.**
 - c. **Products and Completed Operations.**
 - d. **Personal Injury Liability with Employment Exclusion deleted, or Employment Practices Liability.**
 - e. **Contractual – including specified provision for Contractor's obligations under Paragraph 3.18.**
 - f. **Owned, non-owned and hired motor vehicles.**
 - g. **Broad Form Property Damage including Completion Operations.**
 - h. **Umbrella Excess Liability.**
- .10 **A General Liability or Umbrella Liability Policy on a claims-made basis will not be accepted.**

§ 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.

- a. **Workers' Compensation:**
 - 1) **Michigan Statutory**
 - 2) **Employer's Liability:**

	\$1,000,000 per accident
	\$1,000,000 disease, policy limit
	\$1,000,000 disease, each employee
- b. **Comprehensive or Commercial General Liability (including Premises-Operations; Independent Contractor's Protective; Products and Completed Operations; Broad Form Property Damage):**
 - 1) **Bodily Injury:**

	\$1,000,000 each occurrence
	\$2,000,000 aggregate
 - 2) **Property Damage:**

	\$1,000,000 each occurrence
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- 3) Products and Completed Operations to be maintained for 2 years after final payment:
 - \$2,000,000 aggregate
- 4) Property Damage Liability Insurance shall provide X, C and U coverage.
- 5) Broad Form Property Damage Coverage shall include Completed Operations.
- c. Contractual Liability
 - 1) Bodily Injury
 - \$1,000,000 each occurrence
 - \$2,000,000 aggregate
 - 2) Property Damage:
 - \$1,000,000 each occurrence
 - \$2,000,000 aggregate
- d. Personal Injury, with Employment Exclusion deleted:
 - \$2,000,000 aggregate
- Employment Practices Liability
 - \$1,000,000 aggregate
- e. Business Auto Liability (including owned, non-owned and hired vehicles):
 - 1) Bodily Injury:
 - \$1,000,000 each person
 - \$1,000,000 each occurrence
 - 2) Property Damage:
 - \$1,000,000 each occurrence
- f. If the General Liability coverages are provided by a Commercial Liability policy, the:
 - 1) General Aggregate shall be not less than \$2,000,000 and it shall apply, in total, to this Project only.
 - 2) Fire Damage Limit shall be not less than \$100,000 on any one fire.
 - 3) Medical Expense Limit shall be not less than \$5,000 on any one person.
- g. Umbrella Excess Liability:
 - \$3,000,000 over primary insurance.
 - \$10,000 retention for self-insured hazards, each occurrence.

§ 11.1.3 Certificates of insurance acceptable to the Owner shall be filed with the Owner prior to commencement of the Work and thereafter upon renewal or replacement of each required policy of insurance. These certificates and the insurance policies required by this Section 11.1 shall contain a provision that coverages afforded under the policies will not be canceled or allowed to expire until at least 30 days' prior written notice has been given to the Owner. An additional certificate evidencing continuation of liability coverage, including coverage for completed operations, shall be submitted with the final Application for Payment as required by Section 9.10.2 and thereafter upon renewal or replacement of such coverage until the expiration of the time required by Section 11.1.2. Information concerning reduction of coverage on account of revised limits or claims paid under the General Aggregate, or both, shall be furnished by the Contractor with reasonable promptness. **If this insurance is written on the Comprehensive General Liability policy form, the Certificates shall be AIA Document G705, Certificate of Insurance. If this insurance is written on a Commercial General Liability policy form, ACORD form 25S will be acceptable. In addition to the required certificates, copies of policy endorsements indicating the Owner as Additional Insured shall be provided to the Owner.**

§ 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 caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's completed operations. The policy limits shall be not less than \$1,500,000.

§ 11.1.5 The insurance required by subparagraph 11.1.1 shall include an Indemnification clause as respect to General Liability and Worker's Compensation coverages.

§ 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 (Special Form) in the amount of the initial Contract Sum as well as subsequent modifications thereto for the entire work at the site on a replacement cost basis. The Contractor shall be responsible for payment of all deductibles resulting from losses under the coverage provided herein. Such insurance will cover damage to work completed, materials installed and awaiting installation, and all materials in transit for the Project. 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 all phases are substantially complete or until no person or entity other than the Owner has an insurable interest in the property required by this Paragraph 11.4 to be covered, whichever is earlier. This insurance shall include interests of the Owner, Architects, Engineers, Architect's consultants, Contractor, Subcontractors and Sub-subcontractors in the Work. The form of policy for this coverage shall be completed Value. If the Owner is damaged by the failure of the Contractor to maintain such insurance, then the contractor shall bear all reasonable costs properly attributable thereto.

§ 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.

(Paragraphs deleted)

§ 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. The testing exclusion shall be removed from this policy.

§ 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.

(Paragraph deleted)

§ 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 Before an exposure to loss may occur, the Contractor shall file with the Owner through the Architect, two certified copies of the policy or policies providing this Property Insurance Coverage, each containing those endorsements specifically related to the Project.

§ 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 covered by 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 this property insurance shall be adjusted by the Contractor as fiduciary and made payable to the Contractor 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.

§ 11.3.9 If required in writing by a party in interest, the Contractor as fiduciary shall, upon occurrence of an insured loss, give bond for proper performance of the Contractor's duties. The cost of required bonds shall be charged against proceeds received as fiduciary. The Contractor shall deposit in a separate account proceeds so received, which the Contractor shall distribute in accordance with such agreement as the parties in interest may reach, or as determined in accordance with the method of binding dispute resolution selected in the Agreement between the Owner and 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 as fiduciary 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, arbitrators shall be chosen as provided in Paragraph 15.4. The Contractor as fiduciary shall in that case make settlement with insurers or, in accordance with the directions of the arbitrators.

§ 11.3.11 In the event of partial occupancy or use in accordance with Paragraph 9.9, the Contractor shall notify the insurance company and obtain a "Use and Occupancy Waiver" such that the policy will not be invalidated by occupancy.

§ 11.3.12 All insurance policies shall contain a provision stating that coverages afforded under any of the aforesaid insurance policies shall not be cancelled or materially changed without at least thirty (30) days prior written notice to the Owner. On all Certificate forms, the words "endeavor to" and the remaining words beginning with "but failure to" shall be stricken from the cancellation notice provision.

§ 11.3.13 All insurance policies shall be underwritten with responsible insurance carriers with Best's Rating of not less than A and X and otherwise satisfactory to the Owner and licensed to provide insurance in the state in which the project is located. Non-admitted carriers may be considered on an individual basis.

§ 11.4 PERFORMANCE BOND AND PAYMENT BOND

§ 11.4.1 The Contractor shall furnish bond or bonds as described below, covering the faithful performance of the Contract and the payments of all obligations arising thereunder. The Contract will not be signed until the Owner has received the proper bond specified under this Article, issued by a bonding company licensed to do business in the State where the construction will take place, and on the current list of Company's Holding Certificates of Authority as acceptable Sureties on Federal Bonds and as acceptable reinsuring companies as

published in Circular 570 (Amended) by the Audit Staff Bureau of Accounts, U.S. Treasury Department. All bonds signed by an agent must be accompanied by a certified copy of the authority to act.

§ 11.4.1.1 Furnish both AIA A312 Performance Bond and AIA A312 Payment Bond in the amount of 100% of the Contract Price.

§ 11.4.1.2 The Performance Bond and Payment Bond shall be submitted in the exact form specified in Section 11.4.1.1, above, and with the certificates specified in Section 11.4.1.3, below, and no other modifications or addendum whatsoever shall be allowed.

§ 11.4.1.3 Duly executed, notarized and updated Acknowledgements of both the Principal and Surety and the Surety's Power of Attorney must be attached to each of the two required bonds.

§ 11.4.1.4 Bond amounts shall not exceed the single bond limit for the Contractor's bonding company as set forth in the Federal Register current as of the bid date.

§ 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.

§ 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 or Architect to do so unless the Owner or Architect has previously given the Contractor a written acceptance of such condition. The Owner or Architect shall give such notice promptly after discovery of the condition. During the one-year period for correction of Work, if the Owner or Architect 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 and to make a claim for breach of warranty. 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 incomplete or defective Work noted on the Certificate of Substantial Completion shall commence at final payment.

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§ 12.2.2.3 The one-year period for correction of Work shall not be extended by corrective Work performed by the Contractor pursuant to this Section 12.2.

§ 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, 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 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

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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

Accrual dates for Statutes of Limitations are controlled by Michigan Law.

§ 13.8 EQUAL OPPORTUNITY

§ 13.8.1 The Contractor shall maintain policies of employment as follows:

§ 13.8.1.1 The Contractor and the Contractor's Subcontractors shall not discriminate against any employee or applicant for employment because of race, religion, color, sex or national origin. The Contractor shall take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, religion, color, sex or national origin. Such action shall include, but not be limited to, the following: employment, upgrading, demotion or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices setting forth the policies of non-discrimination.

§ 13.8.1.2 The Contractor and the Contractor's Subcontractors shall, in all solicitations or advertisements for employees placed by them or on their behalf, state that all qualified applicants will receive consideration for employment without regard to race, religion, color, sex or national origin.

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

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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;
- .2 An act of government, such as a declaration of national emergency that requires all Work to be stopped;
- .3 Because the Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Section 9.4.1, or because the Owner has not made payment on a Certificate for Payment within the time stated in the Contract Documents; or
- .4 The Owner has failed to furnish to the Contractor promptly, upon the Contractor's request, reasonable evidence as required by Section 2.2.1.

§ 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 Architect/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 Architect/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 In case of such termination for the Owner's convenience, the Contractor shall be entitled to receive payment for Work executed, and costs incurred by reason of such termination, along with reasonable overhead and profit on the Work not executed.

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 Architect/Initial Decision Maker. 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 Architect/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.

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§ 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 Architect/Initial Decision Maker for initial decision. Except for those Claims excluded by this Section 15.2.1, an initial decision shall be required as a condition precedent to arbitration 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 Architect/Initial Decision Maker with no decision having been rendered. Unless the Architect/Initial Decision Maker and all affected parties agree, the Architect/Initial Decision Maker will not decide disputes between the Contractor and persons or entities other than the Owner.

§ 15.2.2 The Architect/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 Architect/Initial Decision Maker is unable to resolve the Claim if the Architect/Initial Decision Maker lacks sufficient information to evaluate the merits of the Claim or if the Architect/Initial Decision Maker concludes that, in the Architect/Initial Decision Maker's sole discretion, it would be inappropriate for the Architect/Initial Decision Maker to resolve the Claim.

§ 15.2.3 In evaluating Claims, the Architect/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 Architect/Initial Decision Maker in rendering a decision. The Architect/Initial Decision Maker may request the Owner to authorize retention of such persons at the Owner's expense.

§ 15.2.4 If the Architect/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 Architect/Initial Decision Maker when the response or supporting data will be furnished or (3) advise the Architect/Initial Decision Maker that no supporting data will be furnished. Upon receipt of the response or supporting data, if any, the Architect/Initial Decision Maker will either reject or approve the Claim in whole or in part.

§ 15.2.5 The Architect/Initial Decision Maker will render an initial decision approving or rejecting the Claim, or indicating that the Architect/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, 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 arbitration.

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

§ 15.2.6.1 When a written decision of the Architect/Initial Decision Maker states that (1) the decision is final but subject to arbitration, **as provided for herein**, and (2) a demand for arbitration of a Claim covered by such decision must be made within 30 days after the date on which the party making the demand receives the final written decision, then failure to demand arbitration within said 30 days' period shall result in the Architect's decision becoming final and binding upon the Owner and Contractor. If the Architect/Initial Decision Maker renders a decision after arbitration proceedings have been initiated, such decision may be entered as evidence, but shall not supersede arbitration proceedings unless the decision is acceptable to all parties concerned.

§ 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.

(Paragraphs deleted)

§ 15.4 ARBITRATION

NOTE: All references to "Arbitration" in Section 15.4 shall be considered permissive and not mandatory. The Owner shall, in its sole discretion, have the right and option to enforce any claim it may have against the Contractor, or against any of the Subcontractors, Sub-subcontractors, Suppliers or Vendors of Contractor, through litigation. The Owner shall, in its sole discretion, also have the right and option to refuse to arbitrate any claim brought against Owner by the Contractor, either on Contractor's own behalf, or on behalf of any of the Subcontractors, Sub-subcontractors, Suppliers or Vendors of Contractor, and demand that such claim be pursued through litigation. In the event the Owner exercises its right and option to refuse to arbitrate a claim brought against the Owner, written notice of such refusal shall be given by Owner to the party making the claim and to any tribunal administering the claim at any time up to and including the date when Owner is required by any applicable statute, rule or order to respond to such claim.

§ 15.4.1 If the parties have selected arbitration as the method for binding dispute resolution in the Agreement, any Claim shall be subject to arbitration unless the Owner decides to pursue the claim through litigation which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Arbitration 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. The party filing a notice of demand for arbitration must assert in the demand all Claims then known to that party on which arbitration is permitted to be demanded.

§ 15.4.1.1 A demand for arbitration 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 Limitation on Consolidation or Joinder. No arbitration arising out of or relating to the Contract shall include, by consolidation or joinder or in any other manner, the Architect, the Architect's employees or consultants, except by written consent containing specific reference to the Agreement and signed by the Architect, Owner, Contractor and any other person or entity sought to be joined. No arbitration shall include, by consolidation or joinder or in any other manner, parties other than the Owner, Contractor, a separate contractor as described in Article 6 and other persons substantially involved in a common question of fact or law whose presence is required if complete relief is to be accorded in arbitration. No person or entity other than the Owner, Contractor or a separate contractor as described in Article 6 shall be included as an original third party or additional third party to an arbitration whose interest or responsibility is insubstantial. Consent to arbitration involving an additional person or entity shall not

constitute consent to arbitration of a Claim not described therein or with a person or entity not named or described therein. 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.

(Paragraphs deleted)

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User Notes:

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SECTION 01 11 00

SUMMARY OF THE WORK

PART 1: GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings, Details of Construction and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Sections, apply to work specified in this section.

1.02 SUMMARY

- A. This Section includes the following:
1. Work covered by the Contract Documents.
 2. Work phases.
 3. Work under other contracts.
 4. Use of premises.
 5. Owner's occupancy requirements.
 6. Punchlist Completion.
 7. Work restrictions.
 8. Specification formats and conventions.
- B. Related Sections include the following:
1. Division 1 Section "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

1.03 PROJECT IDENTIFICATION

- A. Project Name: Madonna University Toilet Renovation, Livonia, Michigan.
- B. Owner: Madonna University
36600 School Craft Road
Livonia, Michigan 48150
- C. Architect: Wold Architects and Engineers
710 North Crooks Road
Clawson, Michigan 48017
- D. Mechanical Engineer: MacMillan and Associates
714 East Midland Street
Bay City, Michigan 48706
- E. Electrical Engineer: MacMillan and Associates
714 East Midland Street
Bay City, Michigan 48706

1.04 SUMMARY OF THE WORK

Briefly and without force and effect upon the Contract Documents, the Work of this single prime Contract can be summarized as follows:

A. Work under this Contract includes:

1. Interior Finishes
 - a. Insulated gypsum board/metal stud partitions.
 - b. Floor finishes of porcelain tile and quarry tile.
 - c. Wall finishes of paint and porcelain tile.
 - d. Ceiling finishes of acoustical lay-in tile, gypsum board, gypsum board soffits.
 - e. Plastic laminate casework, HM doors and frames, wood doors, access panels, hardware, toilet partitions, toilet accessories.
2. Mechanical Systems
 - a. Plumbing including, supply and waste piping systems, piping insulation, plumbing fixtures.
 - b. Heating including piping, piping insulation, terminal heating devices.
 - c. Ventilation to include exhaust fan modifications.
 - d. Temperature control system.
3. Electrical Systems
 - a. Electrical service, switchgear, distribution panels, conduit and wiring.
 - b. Interior and exterior lighting. Parking lot lighting.
 - c. Communications including telephone, intercom, public address system.
 - d. Fire alarm and security systems.
4. Keep Architect fully informed about progress of the work, performance of the work and potential problems.
5. The Owner will hold a ground breaking at the start of construction. The Contractor is responsible to supply 20 new hard hats and 20 new shovels for the participants.

1.05 WORK PHASES

- A. Start submittal process immediately upon contract award by the University. Actual work on site shall not commence until May 11, 2015 for Phase 1 and May 16, 2016 for Phase 2.

B. The Work shall be conducted in phases as follows:

1. Phase 1 Wing 'C' and Wing 'B' Restroom/Shower Areas. The work of this phase will include demolition of existing restroom/shower room finishes and plumbing fixtures. New finishes and fixtures to be furnished. Upgrades to the mechanical and electrical systems.
 - a. Substantial Completion of this phase shall be on July 31, 2015.
2. Phase 2 Wing 'A' Restroom and Shower Room. The work of this phase will include demolition of existing restroom/shower room finishes and plumbing fixtures. New finishes and fixtures to be furnished. Upgrades to the mechanical and electrical systems.
 - a. Substantial Completion of this phase shall be on July 29, 2016.

1.06 WORK UNDER OTHER CONTRACTS

- A. General: Cooperate fully with separate contractors so work on those contracts may be carried out smoothly, without interfering with or delaying work under this Contract. Coordinate the Work of this Contract with work performed under separate contracts.
- B. Preceding Work: Owner has awarded or will award separate contract(s) for the following construction operations at Project site. Those operations are scheduled to be substantially complete before work under this Contract begins.
 1. Asbestos Abatement: A separate will be awarded for abatement of the following:
 - a. VAT
 - b. Asbestos pipe insulation
 - c. Asbestos fireproofing

1.07 USE OF PREMISES

- A. General: Contractor shall have limited use of premises for construction operations as indicated on Drawings by the Contract limits.
 1. Contractor is to visit site and be familiar with existing conditions. Contractor will be required to accept existing conditions on site prior to mobilizing.
- B. Use of Site: Limit use of premises to work in areas indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
 1. Allow for Owner occupancy of Project site and use by the public.
 2. Driveways and Entrances: Keep driveways, loading areas, and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.
 - a. Schedule deliveries to minimize use of driveways and entrances.
 - b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.
 3. Public Streets: Maintain clear of automobile parking, equipment or material storage unless arrangements have been made with the appropriate jurisdiction.

4. Lock automotive type vehicles, such as passenger cars and trucks and other mechanized or motorized construction equipment, when parked and unattended, so as to prevent unauthorized use. Do not leave such vehicles or equipment unattended with the motor running or the ignition key in place.
- C. Do not allow construction waste and debris to accumulate; remove debris as it accumulates and, unless specified otherwise, dispose of legally off-site.
- D. Conform to City's noise control regulations, including limited hours of construction operations.
- E. Use of Existing Building: Maintain existing building in a weathertight condition throughout construction period. Repair damage caused by construction operations. Protect building and its occupants during construction period.

1.08 LAYING OUT WORK

- A. Locate all general reference points. Where dimensions or observed scope of work differ substantially from Drawings, notify Architect for decision.
- B. Lay out Work from the reference points furnished and be responsible for all lines, elevations, and measurements inside workspace. Exercise proper precaution to verify figures shown on Drawings before laying out work and will be held responsible for any error resulting from his failure to exercise such precaution.
- C. Hire the services of a locator company to locate all privately owned utilities that may be disturbed by construction operations.
- D. Coordinate utility connections with municipality/utility company in which project is being constructed.

1.09 OWNER'S OCCUPANCY REQUIREMENTS

- A. Partial Owner Occupancy: Owner will occupy the premises during entire construction period, with the exception of areas under construction. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's operations. Maintain existing exits, unless otherwise indicated.
 1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and authorities having jurisdiction.
 2. Provide not less than 72 hour's notice to Owner of activities that will affect Owner's operations.
- B. Owner Occupancy of Completed Areas of Construction: Owner reserves the right to place and install equipment in completed areas of building, before Substantial Completion, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and partial occupancy shall not constitute acceptance of the total Work.
 1. Architect will prepare a punchlist for each specific portion of the Work to be occupied before Owner move in.
 2. Obtain a temporary Certificate of Occupancy if required from authorities having jurisdiction before Owner occupancy to install furnishings and equipment.

1.10 WORK RESTRICTIONS

- A. The Contractor shall limit access to grounds as indicated on Drawings.

- B. The Contractor's access to and use of the site/facility for completion of work shall be subject to the following:
1. Should the Contractor have additional work to complete after July 31, 2015 including punchlist work within the existing building, continuous use of facilities is required by the Owner during regular business hours of 8:00 a.m. to 5:00 p.m. Work in those areas shall occur during evenings and weekends and shall be cleaned and available for use the following school or business day.
 2. The building is open between the hours of 8:00 a.m. and 7:00 p.m. Hours of operation are 8:00 a.m. to 7:00 p.m. and no work shall be performed in occupied areas during these times.
 - a. Coordinate schedule with Owner's designated building representative.
 3. Should the Contractor choose to perform work after normal business hours when the building is occupied, the Contractor shall:
 - a. Maintain access, building utilities, and services to allow full and free use of the facility during this time. All temporary conditions, re-routing of services, utilities and/or power are the Contractor's responsibility.
 - b. Coordinate access and storage of materials and equipment with the Owner's designated building representative. To the fullest extent possible provide for normal building operation, and the safety of the building's occupants. Work in areas that occur during evenings and weekends shall be cleaned and available for use the following business day.
 - c. Coordinate schedule with the Owner's designated building representative.
- C. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
1. Notify Architect not less than seven (7) days in advance of proposed utility interruptions.
 2. Do not proceed with utility interruptions without Architect's or Owner's permission.

1.11 SPECIFICATION FORMATS AND CONVENTIONS

- A. Specification Format: The Specifications are organized into Division and Sections using the 49-division format and CSI/CSC's "Master Format" numbering system.
1. Division 1: Sections in Division 1 govern the execution of the Work of all Sections in the Specifications.
- B. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural, and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.
 2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.
 - a. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

END OF SECTION 01 11 00

SECTION 01 23 00

ALTERNATES

PART 1: GENERAL

1.01 DESCRIPTION

- A. This Section describes the limits of the requested alternates to the Contract work. Refer to the Product/Execution Articles of the appropriate Specifications and the Drawings for information pertaining to the work of each alternate.
- B. Each proposal under an alternate shall include all incidental work and all adjustments necessary to accommodate the changes. All work shall meet the requirements of the Drawings, Specifications and appropriate details.
- C. Submit each alternate proposal as an individual cost for the particular alternate and shall be proposed under the premise that no other alternates have been accepted. Should the work of an alternate called for by the Bid Form not affect the cost of the work, state "No Change" in the space provided. If an alternate is left blank, the Owner reserves the right to throw out the entire bid or interpret the alternate as "No Change".
- D. Include taxes which are applicable to work involved in alternates as well as costs, if any, for increased coverage of bonds and insurance.
- E. Any of the alternates may be accepted by Owner and will be used in determining the low bidder.
- F. Owner may, at his option, vary the scope of the work by authorizing alternates which will add to the work, deduct from the work or substitute materials, equipment or methods.
- G. Each Bidder shall examine the Drawings and Specifications to determine the extent to which his work is affected by bid alternates. Include in the space provided on the bid form the cost of any added or deducted work resulting from each alternate.
- H. Contractor is responsible for providing work if applicable to each alternate, whether or not an added or deducted cost is included on his bid form.

PART 2: EXECUTION

2.01 IMPLEMENTATION

- A. If the Owner elects to proceed on the basis of one or more of the alternates, make all modifications to the Work required in the furnishing and installation of the selected alternate or alternates subject to the approval of the Architect at no additional cost to the Owner except as proposed in the Bid.
- B. Coordinate pertinent related work and modify surrounding work as required to properly integrate the work under each alternate, and to provide the complete construction required by Contract Documents.
- C. If so stated in the Agreement, or modifications thereto, provide alternate materials, equipment and/or construction as specified.

2.02 ALTERNATES

A. Alternate No. 1 Toilet Rooms COO3A-W, COO3B-W, A108, and A110.

1. Provide the cost for all material and labor associated with the renovations/upgrades and toilet rooms COO3A-W, COO3B-W, A108, and A109.

END OF SECTION 01 23 00

SECTION 01 25 00

SUBSTITUTIONS AND PRODUCT OPTIONS

PART 1: GENERAL

1.01 DESCRIPTION

- A. This Section defines procedures to be followed to gain acceptance of products in the Work which are not listed in the individual specification sections. A two step process is required.
- B. Requests for acceptance for bidding purposes of alternative manufacturers is encouraged except where specifically prohibited by this Project Manual.
- C. Submit Prior Approval request via email to mail@woldae.com with the following information in the subject line: Prior Approval [COMM] XX XX XX (Specification Section).

1.02 PRODUCT OPTIONS NOT REQUIRING PRE-BID SUBMITTAL

- A. Where a single manufacture is specified and acceptable manufacturer are also listed, acceptable manufacturers must provide an identical product or accept responsibility for all design implications when providing a product other than the specified product.
- B. Where products are specified by reference standards, any product established by a material testing agency to meet these standards is acceptable.
- C. Where multiple manufacturers and associated models are specified, select any one named.
- D. Where manufacturer(s) alone are specified, select any manufacturer and the product recommended in writing by the manufacturer as most suited to the application shown on the Drawings and Specifications.
- E. Where the phrase "or equal" follows the name of a manufacturer, any product which meets the performance and appearance standards established by the specified manufacturer may be selected, subject to the Architect's acceptance.
- F. Where a manufacturer is listed in both a technical specification section and the Material Finish/Color Schedule, on Architectural Drawings and a color is provided.

1.03 PRODUCT SUBSTITUTIONS REQUIRING PRE-BID SUBMITTALS

- A. Step One - Manufacturers Acceptance
 - 1. Individual specification sections may be amended by the Architect during the bid period to include additional names of manufacturers determined to be capable of providing acceptable materials.
 - 2. The Material Finish/Color Schedule, on Architectural Drawings or Specifications may be amended by the Architect during the bid period to include colors by manufacturers listed in technical sections, but not noted on the Material Finish/Color Schedule, on Architectural Drawings or Specifications.
 - 3. To propose the names of specific manufacturers, submit, or arrange for suppliers to submit, written requests to Architect or appropriate Architect's Consultant. Requests received ten (10) calendar days prior to bid date will be considered.
 - a. Provide sufficient review data. Include specified manufacturer's model numbers and proposed manufacturer's product literature, noting product numbers for proposed substitutions, and where appropriate, samples and data relating to construction details. If the product is not identical to specified product, submit letter stating proposed manufacturer will custom make products to meet specified product.

- b. Architect's acceptance is based upon his determination that a manufacturer is capable of supplying acceptable materials. Approval is not assured or implied for a specific material, item of equipment, color or finish.
- c. Official notification will be by addendum to the Contract Documents. However, in addition, if letters of request are delivered in duplicate with accompanying stamped self addressed envelopes, copies may be returned with Architect's decision in advance.

B. Step Two - Product Acceptance

- 1. Upon award of a construction contract, accepted manufacturers may submit for review to the Architect through the General Contractor or Construction Manager, specific products, materials or equipment items as substitutes for those specified. Contractor to provide letter stating they will reimburse Architect to review substitutions.
- 2. Architect will review substitute products for performance, appearance, color, finish, size and suitability for inclusion in the work. If a substitute product is not accepted, submit another product by the same or other accepted manufacturer or provide the specified product.
- 3. Match specified colors and dimensions exactly, whether or not they are standard with the substitute product, unless a minor variation is accepted by the Architect.
- 4. If a substitute product is accepted, coordinate any necessary changes in other related work and pay for these changes. Pay cost of architectural or engineering services, if any, required to incorporate substitute products in the Work.

1.04 SUBSTITUTIONS BY CHANGE ORDER

- A. A substitution for a specified product may be permitted by "change order" at no additional cost to the Owner if product proposed is determined to be equivalent in performance and suitability, and if at least one of the following conditions apply:
 - 1. Owner is given a credit for the work.
 - 2. Product is of superior quality than product specified.
 - 3. Product color or finish selection is preferable.
 - 4. Products specified and upon which building is designed have been discontinued by manufacturer.
- B. Provide Architect, through Owner, reasonable compensation for product evaluation.

END OF SECTION 01 25 00

SECTION 01 26 63

CHANGE ORDERS

1.01 CHANGE ORDER PROCEDURES

- A. Changes in the Project scope of work affecting the project cost can be made only through AIA Document G701 - Change Order.
- B. The procedures for processing changes in the scope of Work are listed as follows:
 - 1. The Architect prepares one of the following documents to modify the scope of work. Documents and attachments revising the drawings and specifications will be distributed electronically and the Contractor will be responsible for printing.
 - a. Supplemental Instructions (SI) which are used for no cost changes.
 - b. Proposal Request (PR) to be used for proposed changes that need written approval on cost prior to proceeding.
 - c. Construction Change Directive AIA Document G714 (CCD) which is used when the work must proceed immediately and time and material cost submitted as soon as possible for review by the Architect.
 - 2. The Contractor reviews and responds as follows:
 - a. Supplemental Instructions (SI): This no cost change is to be carried out in accordance with the following modifications to the contract documents described herein. If this change effects cost, do not proceed with this change. Notify the Architect in writing within 10 days of receipt that an itemized (labor and material) quotation will be submitted within 21 days of initial receipt of this Supplemental Instruction. If a cost is not submitted within 21 days, this Supplemental Instruction will be accepted at no additional cost.
 - b. Proposal Request (PR): Submit an itemized (labor and material) quotation for the proposed modifications to the contract documents as described herein within 21 days of receipt. If a cost is not submitted within 21 days, this Proposal Request can be accepted at no additional cost. Written approval is required prior to proceeding with this change.
 - c. Construction Change Directive AIA Document G714 (CCD): Proceed immediately to carry out this change in the contract documents as described herein. If this revision effects cost, submit an itemized (labor and material) quotation within 21 days of receipt. If a cost is not submitted within 21 days this Change Directive will be accepted at no additional cost.
 - 3. The Architect will review the Contractor's labor and material itemized quotation and respond in writing whether it is acceptable or needs revision. When all pricing is accepted by the Architect and Owner, a Change Order will be processed. Change Orders will be processed at increments determined by the Architect throughout the construction schedule.
- C. See General Conditions and Supplementary Conditions of the Work for methods of determining cost or credit, mark-up and schedule on submitting claims.

END OF SECTION 01 26 63

SECTION 01 31 19
PROJECT MEETINGS

PART 1: GENERAL

1.01 DESCRIPTION

- A. Schedule and administer pre-construction meeting, periodic progress meetings, and specially called meetings throughout the progress of the work.
 - 1. Notify Architect in advance.
 - 2. Prepare agenda for meetings.
 - 3. Make physical arrangements for meetings.
 - 4. Preside at meetings.
- B. Representatives of contractors, subcontractors and suppliers attending the meetings shall be qualified and authorized to act on behalf of the entity each represents.
- C. Architect may attend meetings to ascertain that Work is expedited consistent with Contract Documents and the construction schedules.

1.02 PRE-CONSTRUCTION MEETING

- A. Schedule within 15 days after date of Notice to Proceed.
- B. Location: A central site, convenient for all parties, designated by Contractor.
- C. Attendance:
 - 1. Owner's representative
 - 2. Architect and his professional consultants
 - 3. Resident Project representative
 - 4. Contractor's superintendent
 - 5. Major subcontractors
 - 6. Major suppliers
 - 7. Others as appropriate
- D. Suggested Agenda:
 - 1. Distribution and discussion of:
 - a. List of major subcontractors and suppliers
 - b. Projected construction schedules Refer to Section 01 32 00

- Critical Path Method. Schedule for entire construction period.
 - Submittal Schedule
 - Schedule pre-scheduling conf.
- 2. Critical work sequencing.
- 3. Major equipment deliveries and priorities.
- 4. Project coordination and scheduling:
 - a. Designation of responsible personnel.
 - b. Pre-installation conference.
 - Waterproofing
 - Weather barrier
 - Flashing
 - Tile
 - Floor finishes (carpet, tile, etc.)
 - Dust control
 - c. Mock-up panels.
- 5. Procedures and processing of:
 - a. Field decisions
 - b. Proposal Requests/Supplemental Instructions
 - c. Submittals
 - 1) Mechanical Electrical Coordination drawings
 - d. 21 day time limit on claims
 - e. Change orders
 - f. Applications for payment
- 6. Adequacy of distribution of Contract Documents.
- 7. Procedures for maintaining Record Documents.
- 8. Use of premises:
 - a. Office, work and storage areas
 - b. Owner's requirements
- 9. Steel fabrication certification. Refer to 05 12 00 – 1.06 B, C.
- 10. Construction facilities, controls and construction aids.
 - a. Construction Dust Control. Refer to Spec 01 56 00
 - Submit work area and procedures schedule
 - Dust proof enclosures
 - HEPA filters vacuums.
 - Maintain negative air flow

- Dust control by spraying surfaces with watermist
 - Enforcement per spec. Written warning, if not corrected in 8 hours, Owner will stop work. Cost will be borne by Contractor.
11. Temporary utilities.
 12. Safety and first-aid procedures
 13. Security procedures
 14. Housekeeping procedures Refer 01 50 00
 - Debris removed weekly
 - Daily clean requirements
 - Failure to maintain clean site will result in Owner cleaning and back charging Contractor.
 15. Final Cleaning Refer to Spec 01 74 00
 - Schedule in time for Owner to complete furniture installation, required clean (i.e. floors)
 - Any cleaning done by Owner due to unacceptable cleaning by Contractor, or to and contractor in completing cleaning on schedule will be back charged to Contractor.

1.03 PROGRESS MEETINGS

- A. Schedule regular periodic meetings, as required.
- B. Hold called meetings as required by progress of the work.
- C. Location of the meetings: The project field office of the Contractor.
- D. Attendance:
 1. Architect and his professional consultants may attend as needed.
 2. Subcontractors as appropriate to the agenda.
 3. Suppliers as appropriate to the agenda.
 4. Others
- E. Suggested Agenda:
 1. Review, approval of minutes of previous meeting.
 2. Review of work progress since previous meeting.
 3. Field observations, problems, conflicts.
 4. Problems which impede Construction Schedule.
 5. Review of off-site fabrication, delivery schedules.
 6. Corrective measures and procedures to regain projected schedule.
 7. Revisions to Construction Schedule.
 8. Plan progress, schedule, during succeeding work period.
 9. Coordination of schedules.

10. Review submittal schedules; expedite as required.
11. Maintenance of quality standards.
12. Review proposed changes for:
 - a. Effect on Construction Schedule and on completion date.
 - b. Effect on other contracts of the Project.
13. Other business

END OF SECTION 01 31 19

SECTION 01 32 00

CONSTRUCTION SCHEDULING

PART 1: GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings, Details of Construction and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Sections, apply to work specified in this section.

1.02 SUMMARY

- A. This Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
 - 1. Contractor's Construction (CPM) Schedule.
 - 2. Shop Drawing Submittals Schedule
 - 3. CPM Reports

1.03 DEFINITIONS

- A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.
 - 1. Critical activities are activities on the critical path. They must start and finish on the planned early start and finish times.
 - 2. Predecessor activity is an activity that must be completed before a given activity can be started.
- B. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.
- C. Critical Path: The longest continuous chain of activities through the network schedule that establishes the minimum overall Project duration and contains no float.
- D. Event: The starting or ending point of an activity.
- E. Float: The measure of leeway in starting and completing an activity.
 - 1. Float time is for the exclusive use or benefit of the Contractor to meet schedule milestones and Contract completion date.
 - 2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the following activity.
 - 3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.
- F. Fragnet: A partial or fragmentary network that breaks down activities into smaller activities for greater detail.
- G. Major Area: A story of construction, a separate building, or a similar significant construction element.
- H. Milestone: A key or critical point in time for reference or measurement.
- I. Network Diagram: A graphic diagram of a network schedule, showing activities and activity relationships.

1.04 SUBMITTALS

- A. Submittals Schedule: Submit six 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. (Assume 15 working day turnaround.)
 - 7. Identify submittals that effect critical path.
- B. Contractor's Construction (CPM) Schedule: Submit two printed copies of initial schedule large enough to show entire schedule for entire construction period.
- C. CPM Reports: Concurrent with CPM schedule, submit three printed copies of the following computer-generated reports. Format for each activity in reports shall contain activity number, activity description, original duration, early start date, early finish date, late start date, late finish date, and total float.
 - 1. Activity Report: List of all activities sorted by activity number and then early start date, or actual start date if known.

1.05 QUALITY ASSURANCE

- A. Prescheduling Conference: Conduct conference at Project site to review methods and procedures related to the Contractor's Construction (CPM) Schedule, including, but not limited to, the following:
 - 1. Discuss constraints, including phasing, work stages, area separations, interim milestones and partial Owner occupancy.
 - 2. Review delivery dates for Owner-furnished products.
 - 3. Review schedule for work of Owner's separate contracts.
 - 4. Review time required for review of submittals and resubmittals.
 - 5. Review requirements for tests and inspections by independent testing and inspecting agencies.
 - 6. Review time required for completion and startup procedures.
 - 7. Review and finalize list of construction activities to be included in schedule.
 - 8. Review submittal requirements and procedures.
 - 9. Review procedures for updating schedule.

1.06 COORDINATION

- A. Coordinate requirements in this Article with "Submittals Schedule" Article in Part 2. If a submittal review sequence policy governs, revise this Article to comply with requirements. See Evaluations for discussion on submittal review sequence policies.

PART 2: PRODUCTS

2.01 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. Identify items that affect critical path.

2.02 CONTRACTOR'S CONSTRUCTION SCHEDULE (CPM SCHEDULE)

- A. General: Prepare network diagrams using CPM (critical path method) format.
- B. Preliminary Network Diagram: Submit diagram within 14 days from the Notice to Proceed. Outline significant construction activities for the first 90 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.
- C. CPM Schedule: Prepare Contractor's Construction Schedule using a CPM network analysis diagram.
 - 1. Develop network diagram in sufficient time to submit CPM schedule so it can be accepted prior to first pay request.
 - 2. Establish procedures for monitoring monthly and updating CPM schedule if work is not on schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.
 - 3. Use "one workday" as the unit of time. Activities should not be shorter than 2 work days or longer than 10 work days for projects with a construction period over 6 months and/or longer than 5 work days for projects with a construction period under 6 months.
- D. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the preliminary network diagram, prepare a skeleton network to identify probable critical paths.
 - 1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:
 - a. Preparation and processing of submittals.
 - b. Purchase of materials.
 - c. Delivery.
 - d. Fabrication.
 - e. Installation.
 - 2. Processing: Process data to produce output data or a computer-drawn, logic network diagram. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.

PART 3: EXECUTION

3.01 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Contractor's Construction Schedule Updating:
 - 1. 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, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
 - 1. Post copies in Project meeting rooms and temporary field offices.
 - 2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

END OF SECTION 01 32 00

SECTION 01 33 00

SUBMITTALS

PART 1: GENERAL

1.01 DESCRIPTION

- A. This Section defines procedures for the following submittals required by the Contract Documents.
- B. Provide submittals as noted in each Section.
- C. Allow for two weeks review of submittals to avoid delay of Work.
- D. Include with submittal preparation, field verifications of measurements, field construction criteria, verification of catalog numbers and similar data, and coordination of Work requirements and Contract Documents.
- E. Submit all color samples within 45 days of contract award for Architect's use in color selections. The Architect will not start the color schedule until all samples are received.

PART 2: REQUIRED SUBMITTALS

2.01 SHOP DRAWINGS AND SAMPLES

- A. Submit shop drawings in accordance with Article 3 of the General Conditions and the following.
- B. Prepare clearly identified shop drawings or schedules to this specific project, containing only data applicable. Include with the shop drawings or schedules a letter of transmittal listing and dating the submitted drawings in sets.
- C. Contractor to review all submittals prior to submittal to Architect, and indicate such review with a stamp and signature. Review submittals for conformance to Drawings, Specifications, coordination with other trades and adjacent construction and verification of field dimensions. Failure of Contractor to adequately review submittals shall be cause for rejection.
- D. Prepare and submit electronically (with exception for color charts and samples) to Architect for review, all shop drawings and manufacturers catalog sheets showing illustrated cuts of items to be furnished, scale details, sizes, dimensions, performance characteristics, capacities, wiring diagrams, weights and arrangements. Each submittal to include a transmittal on contractor letterhead. Submittal to be in the form of one combined PDF, professionally assembled so all documents are facing the same way.

- 1. The Contractor will provide submittals labeled as follows:

- a. 144012, _____[PROJECT NAME ABBREVIATION],
XX-XX-XX-X [SPECIFICATION # AND CONSECUTIVELY NUMBERED SUBMITTAL]
_____[SPECIFICATION NAME] _____[SUBMITTAL NAME].

[Example: 142118, JHS, 04 20 00-1, Non-Bearing Masonry – Masonry Accessories]

- E. The Architect will take one of the following actions on submittals:
 - 1. “Reviewed”: Contractor shall proceed with ordering and/or fabrication.
 - 2. “Review Comments”: Contractor shall proceed with ordering and/or fabrication after taking into account noted comments.

3. "Rejected": Contractor shall provide a submittal that meets the intent of the specifications.
 4. "Revise and Resubmit": Contractor shall modify submittal to address comments and resubmit.
- F. If equipment other than that used in the design of this project is proposed to be used, the Contractor and/or supplier shall verify electrical differences, dimension variations and weight increases. The Contractor shall be responsible for any extra costs incurred as a result of equipment substitutions.
 - G. Information submittals and submittals that are not required shall be for Architects' and Engineers' use and be available for the design team's review at the jobsite. Quantity of submittals will be the same for Architect as noted under shop drawings. These submittals will not be reviewed, stamped or returned to the Contractor.
 - H. Unless otherwise specified, submit to the Architect's office samples of size, and nature representing typical qualities. Where required, submit a sufficient number of samples to demonstrate the complete range of variations of the material or quality. Written acceptance of the Architect is required prior to ordering any item for which samples are required.
 - I. Submit samples to Architect's office, securely packaged, with the name of the Project clearly indicated on the package exterior. Each physical sample shall have a label or tag, firmly attached to the sample, bearing the following information: (a) Name of Project, (b) Name of Supplier, (c) Name of Contractor, and (d) Product information such as manufacturer's designation, finish, type, class, grade, etc. as is appropriate. The Architect will retain one copy of each sample.

2.02 LIST OF MATERIALS

- A. Within 7 days after the award of the Contract (notice to proceed or letter of intent), submit 4 copies of a complete list of all material, products, and equipment proposed to be used in construction to the Architect for acceptance. Do not order materials until the proposed listed materials, products and equipment to be used in construction are accepted by the Architect.
- B. Where two or more makes or kinds of items are named in the specifications (or additional names are called for in addenda), the Contractor shall state which particular make or kind of each item he proposes to provide. If the Contractor fails to state a preference, the Owner shall have the right to select any of the makes or kinds named without change in price.
- C. This list shall be arranged generally in order of specification sections. The items listed shall fully conform to project requirements and specifications. All materials are subject to the Architect's acceptance. After acceptance, changes or substitutions will not be permitted.
- D. Clearly identify or list the material, product or equipment by manufacturer and brand by listing the names for all items, including those where only one material or product is specified. Each and every material, product and equipment shall be specifically named, not listed "as specified".

2.03 LIST OF SUBCONTRACTORS

- A. Refer to the General Conditions of the Contract for Construction.

- B. Propose use of subcontractors or sub-subcontractors who are established, reputable firms of recognized standing with a record of successful and satisfactory past performance. Include the following information: specification section, item of work, subcontractor or supplier, material/manufacturer (as specified will not be allowed), project manager, phone and facsimile numbers. List major sub-subcontractors for mechanical and electrical work. Use only those subcontractors (and sub-sub-contractors, when appropriate) who are acceptable to the Architect and Owner on the Work.
- C. Once subcontractor selection is complete, submit electronically a signed and notarized MN Responsible Contractor Compliance Affidavit for each subcontractor as outlined in General Conditions of the Contract for Construction.

2.04 SCHEDULE OF VALUES

- A. Requirements
 - 1. Submit separate Schedule of Values for each building or phase to Architect ten (10) days prior to first Application For Payment (AIA Form G702, G702a).
 - 2. Use Schedule of Values only as basis for Contractor's Application For Payment.
- B. Form of Submittal
 - 1. Base format on Sections listed in Section 00 01 10 Table of Contents, as well as, the Mechanical and Electrical Table of Contents. Break down labor and material separately.
 - 2. Provide a separate line item on the schedule of values for coordination drawings as defined in Division 23 Specification Section 23 05 00 "Common Work Results for HVAC".
 - 3. Round off amounts to nearest ten dollars.

2.05 PROGRESS SCHEDULE

- A. Refer to the General Conditions of the Contract for Construction and Section 01 32 00 Construction Scheduling for submittal requirements.

2.06 COORDINATION DRAWINGS

- A. Refer to Common Work Results in Mechanical and Electrical Specifications.
- B. Prior to construction occurring above grade plane, submit Mechanical/Electrical Coordination Drawings for design team review.

2.07 SUBMITTAL LIST

- A. The following submittal list is a guide for submittals required for specification divisions 2-14 on the project. Inconsistencies or omissions from the list does not relieve the contractor from required submittals delineated in each specification section.

Section	Pre-Installation Conference	Product Data, Install Instruction, Wiring Diagrams	Shop Drawing	Samples	Mock-Up Panel	Design Data, Mix Design	Reports/Sched. Calculations	Qualification/ Certification	Source Quality Control Tests/Reports	Reference Specs	Warranty	Maint. & Operation Manual
03 30 13		X				X						
06 65 10		X	X	X				X				
07 62 13			X	X							X	X
07 92 00		X		X								
08 14 00		X	X	X			X				X	X
08 31 00			X									
08 71 00		X	X	X					X			
09 21 16		X		X								
09 30 00				X				X				
09 51 00			X	X								
09 91 00		X		X	X		X					X
10 21 13		X	X	X							X	X
10 28 13		X		X								

END OF SECTION 01 33 00

SECTION 01 45 16

QUALITY CONTROL

PART 1: GENERAL

1.01 SELECTION AND PAYMENT

- A. The Contractor shall select, hire and pay for the services of an independent testing laboratory(s) acceptable to the Owner and Architect to perform specified Source Quality Control and other tests and inspections called for in the Specifications.
- B. The Owner will select, hire, pay for services of an independent testing laboratory, to perform specified Field Quality Control and other inspections, test of materials and construction called for in the Specifications.
- C. The Owner will select, hire and pay for services of a special inspector to perform Special Inspections and Testing defined in Specification Section 01 45 33.

1.02 RESPONSIBILITY OF CONTRACTOR

- A. Be responsible for furnishing materials and construction in full conformance with Plans and Specifications.
- B. Pay for all tests, conducted by the testing laboratory that fail and also pay for all scheduled tests for which the pours are cancelled and a test field crew is on site before that particular pour is cancelled.

1.03 COOPERATION OF CONTRACTOR

- A. Contractor: Cooperate with the Laboratory, and:
 - 1. Make available, without cost, samples of all materials to be tested in accordance with applicable standard specifications.
 - 2. Furnish such nominal labor and working space as is necessary to obtain samples at the Project.
 - 3. Advise Laboratory of the identity of material sources and instruct the suppliers to allow test or inspections by the Laboratory.
 - 4. Notify Laboratory sufficiently in advance of operations to allow completion of initial tests or inspections by the Laboratory.

1.04 REJECTION OF MATERIALS/INSTALLATION

- A. Laboratory: Notify the Owner, Architect Engineer and Contractor or his authorized representative of any materials or installation which are not in full conformance with the specifications.

1.05 FILING OF REPORTS

- A. Laboratory: File a copy of the inspection report with the Architect, appropriate Architect's Consultant, Owner and Building Official.

PART 2: PRODUCTS – Not Applicable.

PART 3: EXECUTION

3.01 GENERAL SCOPE OF TESTING, INSPECTION

- A. Require laboratory to conduct tests and inspections as directed by the Owner, Architect or Engineer.
- B. Refer to individual specification sections for test requirements.

3.02 QUALIFICATION TESTING

- A. In addition to tests specified, if a product, material, or method of assembly that is of unknown or questionable quality to Architect, the Architect may require and order suitable tests to establish a basis for acceptance or rejection. Pay for these tests. "Standard" test reports or reports on "similar" material will not be accepted.

3.03 MISCELLANEOUS (REGULATORY) INSPECTIONS

- A. Should specifications, Architect's instructions, laws, ordinances or any public authority require any work to be inspected or approved, Contractor shall give timely notice of its readiness for inspection and a reasonable date fixed for such inspection. If any work should be covered up without approval or consent of approving agency, or Architect, it must be uncovered for examination at Contractor's expense.

END OF SECTION 01 45 16

SECTION 01 50 00

TEMPORARY FACILITIES AND CONTROLS

PART 1: GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings, Details of Construction and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Sections, apply to work specified in this section.

1.02 SUMMARY

- A. This Section includes requirements for temporary facilities and controls, including temporary utilities, support facilities, and security and protection facilities.
- B. Support facilities include, but are not limited to, the following:
 - 1. Housekeeping and waste disposal facilities.
 - 2. Field offices
 - 3. Temporary elevator usage.
 - 4. Temporary stairs.
 - 5. Construction aids and miscellaneous services and facilities.
 - 6. Temporary power and lighting.
- C. Security and protection facilities include, but are not limited to, the following:
 - 1. Environmental protection.
 - 2. Stormwater control.
 - 3. Tree and plant protection.
 - 4. Pest control.
 - 5. Site enclosure fence.
 - 6. Security enclosure and lockup.
 - 7. Barricades, warning signs, and lights.
 - 8. Temporary enclosures.
 - 9. Temporary partitions.
 - 10. Fire protection.
- D. Related Sections include the following:
 - 1. Division 1 Section "Submittal Procedures" for procedures for submitting copies of implementation and termination schedule and utility reports.
 - 2. Division 1 Section "Execution Requirements" for progress cleaning requirements.
 - 3. Division 1 Section "Construction Dust Control" for partitions and procedures for control of construction dust.
 - 4. Divisions 3 through 49 for temporary heat, ventilation, and humidity requirements for products in those Sections.

1.03 DEFINITIONS

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

1.04 USE CHARGES

- A. General: Cost or use charges for temporary facilities are not chargeable to Owner or Architect and shall be included in the Contract Sum. Allow other entities to use temporary services and facilities without cost, including, but not limited to, the following:
 - 1. Owner's construction forces.
 - 2. Occupants of Project.
 - 3. Architect.
 - 4. Testing agencies.
 - 5. Personnel of authorities having jurisdiction.
- B. Water Service: Use water from Owner's existing water system without metering and without payment of use charges.
 - 1. Pay for pumps, pipe, hoses, and backflow preventors as required to distribute water.
- C. Electric Power Service: Use electric power from Owner's existing system without metering and without payment of use charges.

PART 2: PRODUCTS

2.01 MATERIALS

- A. General: Provide new materials or undamaged, previously used materials in serviceable condition. Provide materials suitable for use intended.
- B. Lumber and Plywood: Comply with requirements in Division 6 Section "Carpentry."
- C. Gypsum Board: Minimum 1/2 inch thick by 48 inches wide by maximum available lengths; regular-type panels with tapered edges. Comply with ASTM C 36.
- D. Insulation: Unfaced mineral-fiber blanket, manufactured from glass, slag wool, or rock wool; with maximum flame-spread and smoke-developed indices of 25 and 50, respectively.
- E. Paint: Comply with requirements in Division 9 Section "Painting."
- F. Tarpaulins: Fire-resistive labeled with flame-spread rating of 15 or less.
- G. Water: Potable.
- H. Wood Walkways: 3/4" Plywood, framed with 2x__ joists (size as required to support span), with wood rails to contain occupants.
- I. Poly Film Guard: 3 mil. self adhering clear poly film utilizing tack water-based adhesive.

2.02 EQUIPMENT

- A. General: Provide equipment suitable for use intended.

- B. Field Offices: Prefabricated with lockable entrances, insulated, weather-tight; heated and air conditioned. Provide stairs with handrails as required for accessibility.
- C. Fire Extinguishers: Hand carried, portable, UL rated. Provide class and extinguishing agent as indicated or a combination of extinguishers of NFPA-recommended classes for exposures.
 - 1. Comply with NFPA 10 and NFPA 241 for classification, extinguishing agent, and size required by location and class of fire exposure.
- D. Self-Contained Toilet Units: Single-occupant units of chemical, aerated recirculation, or combustion type; vented; fully enclosed with a glass-fiber-reinforced polyester shell or similar nonabsorbent material.
- E. Drinking-Water Fixtures: Containerized, tap-dispenser, bottled-water drinking-water units, including paper cup supply.
- F. 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, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use for type of fuel being consumed.

PART 3: EXECUTION

3.01 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.
- B. Provide each facility ready for use when needed to avoid delay. Maintain and modify as required. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.02 TEMPORARY UTILITY INSTALLATION

- A. General: Engage appropriate local utility company to install temporary service or connect to existing service. Where utility company provides only part of the service, provide the remainder with matching, compatible materials and equipment. Comply with utility company recommendations.
 - 1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
 - 2. Provide adequate capacity at each stage of construction. Before temporary utility is available, provide trucked-in services.
 - 3. Obtain easements to bring temporary utilities to Project site where Owner's easements cannot be used for that purpose.
- B. 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.
 - 1. Provide rubber hoses as necessary to serve Project site.

2. Where installations below an outlet might be damaged by spillage or leakage, provide a drip pan of suitable size to minimize water damage. Drain accumulated water promptly from pans.
 3. Provide backflow prevention devices to protect Owner's water system.
- B. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking-water fixtures. Comply with regulations and health codes for type, number, location, operation, and maintenance of fixtures and facilities.
1. Disposable Supplies: Provide toilet tissue, paper towels, paper cups, and similar disposable materials for each facility. Maintain adequate supply. Provide covered waste containers for disposal of used material.
 2. Provide safety showers, eyewash fountains, and similar facilities for convenience, safety, and sanitation of personnel as required by government jurisdictions.
 3. Toilets: Use of Owner's existing toilet facilities (as designated by Owner's representative) 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.
- C. Heating and Cooling: Provide temporary heating and cooling 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 from that specified that will not have a harmful effect on completed installations or elements being installed.
1. Maintain a minimum temperature of 50 deg F (10 deg C) in permanently enclosed portions of building for normal construction activities, and 65 deg F (18.3 deg C) for finishing activities and areas where finished Work has been installed.
- D. 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 from that specified 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.
- F. Power is available on-site.
1. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations and to maintain schedule.
 2. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and to meet government regulations.
 - a. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.
- E. Telephone Service: Provide temporary telephone service throughout construction period for common-use facilities used by all personnel engaged in construction activities. Install separate telephone line for each field office and first-aid station.
1. Provide additional telephone lines for the following:
 - a. Provide a dedicated telephone line for each facsimile machine and computer with modem in each field office.
 2. Provide an answering machine or voice-mail service on superintendent's telephone.

3. Provide a portable cellular telephone for superintendent's use in making and receiving telephone calls when away from field office.

3.03 SUPPORT FACILITIES INSTALLATION

A. General: Comply with the following:

1. Locate field offices, storage sheds, sanitary facilities, and other temporary construction and support facilities for easy access.
2. Provide incombustible construction for offices, shops, and sheds located within construction area or within 30 feet of building lines. Comply with NFPA 241.
3. 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. Project Identification and Temporary Signs: Prepare Project identification and other signs in sizes indicated. Install signs where indicated to inform public and persons seeking entrance to Project. Do not permit installation of unauthorized signs.

1. Prepare temporary signs to provide directional information to construction personnel and visitors.
2. Construct signs of exterior-type Grade B-B high-density concrete form overlay plywood in sizes and thicknesses indicated. Support on posts or framing of preservative-treated wood or steel.

C. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Containerize and clearly label hazardous, dangerous, or unsanitary waste materials separately from other waste. Comply with Division 1 Section for progress cleaning requirements.

1. If required by authorities having jurisdiction, provide separate containers, clearly labeled, for each type of waste material to be deposited.
2. Develop a waste management plan for Work performed on Project. Indicate types of waste materials Project will produce and estimate quantities of each type. Provide detailed information for on-site waste storage and separation of recyclable materials. Provide information on destination of each type of waste material and means to be used to dispose of all waste materials.

D. Housekeeping

1. Do not allow debris to accumulate on-site or within the building work areas. The contractor shall implement and provide the following cleaning services:
 - a. Debris shall be removed from the construction site and police exterior project site area on a weekly basis at a minimum to clean-up any wind-blown or excess construction materials or debris and dispose of in construction dumpsters to maintain a clean project site.
 - b. Debris shall be removed from interior of the buildings on a daily basis and disposed of in construction dumpsters.
 - c. Lower waste materials in a controlled manner with as few handlings as possible; do not drop or throw materials from heights.
 - d. Schedule cleaning operations so that dust and other contaminants resulting from cleaning process will not fall on wet, newly painted surfaces.

- e. Once floor slabs are in place, walk-off mats shall be provided at all exterior entrances that are utilized by the workers. Mats shall be cleaned on a daily basis and change out mats on a monthly basis.
 - f. Areas without final floor finish in place shall be cleaned of debris and swept on a daily basis.
 - g. Areas that workers have access to with final floor finish in place shall be vacuumed on a daily basis. Carpeted major circulation paths shall be covered with poly film guard. Replace poly film guard when it develops holes or tears as they occur. Poly film guard to be replaced if left in place over 45 days. Horizontal and vertical surfaces shall be wiped down as construction dust has accumulated.
 - h. Where Contractor has periodic access to ancillary spaces occupied by Owner, thoroughly clean after each use, so as to not disrupt Owner's ongoing operations.
 - i. Failure to maintain a clean construction area may result in the Owner cleaning the site and back-charging the Contractor.
 - j. Remove waste materials, rubbish and debris from the site and legally dispose of at public or private dumping areas off the Owner's property.
- E. Common-Use Field Office: Provide an insulated, weather-tight, air-conditioned field office for use as a common facility by all personnel engaged in construction activities; of sufficient size to accommodate required office personnel and meetings of 12 persons at Project site. Keep office clean and orderly.
- 1. Furnish and equip offices as follows:
 - a. Desk and four chairs, file cabinets in quantities to file shop drawings, supplemental instructions, proposal requests, and change orders, a plan table, a plan rack, and bookcase to store project manuals, detail books, and addenda.
 - b. Provide a room of not less than 240 sq. ft. for Project meetings. Furnish room with conference table, 12 folding chairs, and 4-foot square markerboard.
- F. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment involved, including temporary utility services. Sheds may be open shelters or fully enclosed spaces within building or elsewhere on-site.
- G. Lifts and Hoists: Provide facilities for hoisting materials and personnel. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.
- H. Existing Elevator Usage: Use of Owner's existing or new elevators (as designated by Owner's representative) will be permitted, as long as elevators are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore elevators to condition existing before initial use, including replacing worn cables, guide shoes, and similar items of limited life. A limit of 400 lbs per load will be enforced for elevator usage.
- 1. Provide protective coverings, barriers, devices, signs, or other procedures to protect elevator car and entrance doors and frame. If, despite such protection, elevators become damaged, engage elevator Installer to restore damaged work so no evidence remains of correction work. Return items that cannot be refinished in field to the shop, make required repairs and refinish entire unit, or provide new units as required. Paint interior of elevator at time when construction materials will no longer be used.
- I. Existing Stair Usage: Use of Owner's existing stairs (as designated by Owner's representative) will be permitted, as long as stairs are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore stairs to condition existing before initial use.
- 1. Provide protective coverings, barriers, devices, signs, or other procedures to protect stairs and to maintain means of egress. If, despite such protection, stairs become damaged, restore damaged areas so no evidence remains of correction work.

3.04 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. Avoid using tools and equipment that produce harmful noise. Restrict use of noisemaking tools and equipment to hours that will minimize complaints from persons or firms near Project site.
- B. 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.
- C. Barricades, Warning Signs, and Lights: Comply with standards and code requirements for erecting structurally adequate barricades. Paint with appropriate colors, graphics, and warning signs to inform personnel and public of possible hazard. Where appropriate and needed, provide lighting, including flashing red or amber lights.
 - 1. For safety barriers, sidewalk bridges, and similar uses, provide minimum ¾-inch thick exterior plywood and appropriate 2x___ framing for support.
- D. Food Consumption: Limit food and soft drink consumption to within the Contractor's trailer or out of the building.
- E. 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 weather-tight enclosure for building exterior.
 - 1. Where heating or cooling is needed and permanent enclosure is not complete, provide insulated temporary enclosures. Coordinate enclosure with ventilating and material drying or curing requirements to avoid dangerous conditions and effects.
- F. Temporary Dust Control Partitions: Refer to Construction Dust Control Section 01 56 00.
- G. Temporary Fire Protection: Until fire-protection needs are supplied by permanent facilities, install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses as required by the local fire marshal.

3.05 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. Protect from damage caused by freezing temperatures and similar elements.
 - 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.
 - 2. Prevent water-filled piping from freezing. Maintain markers for underground lines. Protect from damage during excavation operations.
- C. Temporary Facility Changeover: Except for using permanent fire protection as soon as available, do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.

- D. 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.
1. Materials and facilities that constitute temporary facilities are the property of Contractor. Owner reserves right to take possession of Project identification signs.
 2. Remove temporary paving not intended for or acceptable for integration into permanent paving. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.
 3. At Substantial Completion, clean and renovate permanent facilities used during construction period. Comply with final cleaning requirements in Division 1 Section "Closeout Procedures."

END OF SECTION 01 50 00

SECTION 01 56 00

CONSTRUCTION DUST CONTROL

PART 1: GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings, Details of Construction and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Sections, apply to work specified in this section.

1.02 SUMMARY

- A. Section Includes:
 - 1. Airborne construction dust/containment control in:
 - a. Buildings occupied during remodeling.
- B. Related Sections:
 - 1. Section 01 73 29-Cutting, Drilling and Patching: Removal of debris.
 - 2. Section 01 33 00-Submittals: Work and procedures for containment of construction dust/airborne contaminants.
 - 3. Section 01 50 00-Temporary Facilities: Temporary barriers/chutes; cleaning.
 - 4. Section 02 41 19-Selective Demolition

1.03 POLICY

- A. Airborne contaminants control is critical in all areas noted in Paragraph 1.02A. Contractor shall limit dissemination of airborne contaminants produced by construction-related activities, including dust, chalk, powders, aerosols, fumes, fibers and other similar materials, in order to provide protection of persons and equipment.
 - 1. Construction activities causing disturbance of existing dust, or creating new dust, or other airborne contaminants, must be conducted in tight enclosures cutting off any flow of particles into occupied areas.
 - 2. Ceilings, walls in Project area must be secure at all times.

1.04 SUBMITTALS

- A. Progress Schedules: Submit work areas and procedure schedules for containment of construction dust/airborne contaminants.
- B. Work Plan: Drawings and details of extent of enclosures, construction of necessary temporary barriers and exhaust fans, and description of procedures to be used to achieve and maintain control of construction-related airborne contaminants.

1.05 GENERAL ACCESS PROCEDURES

- A. Contractor shall notify Architect each time that work requiring access to occupied areas within two weeks of when work is about to begin.

- B. Dust Control Preconstruction Meeting: Before any construction on site begins, Contractor and workers are required to attend a mandatory dust control preconstruction orientation session held by Owner's Representative/Architect for training and instruction on precautions to be taken.
 - 1. Conditions in construction area may be presumed to be in a condition similar to other existing surfaces or a survey of work area to record pre-existing damage may occur at this time.
- C. Notification: Contractor shall notify Architect a minimum of 48 hours prior to starting construction activity which might be expected to produce excessive construction dust and airborne contaminants in occupied areas so that additional precautions may be taken.

1.06 TESTING

- A. The Owner may provide the following tests and observations:
 - 1. Air Samples: Baseline particle counts and conduct periodic air sampling of Project Areas during construction to monitor effectiveness of containment procedures.
 - 2. Air Pressure: Using visual indicators, the maintenance of negative air pressure in Containment Area relative to Project Areas will be verified on a daily basis.

1.07 DEFINITIONS

- A. Containment producing activities include, but are not limited to:
 - 1. Demolition and removal of walls, floors, ceilings, and other finish materials.
 - 2. Demolition of plumbing, mechanical and electrical systems and equipment.
 - 3. Finish operations such as sawcutting, shotblasting/grinding, sanding, painting, and application of special surface coatings.
- B. Containment Areas: As determined by Architect and Owner's Representative and shown within entire construction limits of project area. Includes area of construction, adjacent staging and storage areas, and passage areas for workers, supplies, and waste; includes ceiling spaces above and adjacent to construction, if shown.
- C. Project Areas: As determined by Architect and Owner's Representative and shown within entire construction limits of project area. Includes occupied areas adjacent to Project Area, either occupied or used for passage, as well as areas connected to construction area by mechanical system air intake, exhaust and ductwork.

PART 2: PRODUCTS

2.01 MATERIALS

- A. Carpet or Mats: Provide carpets or mats at containment entrances, vacuumed or changed as often as necessary (minimum daily) to prevent accumulation of dust. All vacuuming outside areas not under negative pressure shall be with a certified HEPA-filtered vacuum.
- B. Dust Caps: Block off all existing ventilation ducts within the construction area. Method of capping ducts shall be dust tight, withstand airflow and potential damage from construction activities.
- C. Portable Enclosures: Whenever work is done outside existing barricaded work areas, provide 4 mil portable polyethylene enclosure capable of sealing off opening fitted tight to ceiling, or provide prefabricated unit.
- D. Polyethylene: Polyethylene shall be fire retardant type listed by Fire Underwriter's Laboratories, Griffolyn #T55R with Griffolyn fire retardant tape, or equal.

- E. Exhaust fans: Maintain continuous uninterrupted operation.

PART 3: EXECUTION

3.01 INSPECTION

- A. Before any demolition or construction begins, a complete field review of all Project Areas (airborne contaminant control areas) and policies will be conducted and work plan revised if required. Initial work plan shall be presented at dust control preconstruction meeting.

3.02 CONTAINMENT, ENCLOSURES AND BARRIERS

- A. Air Quality Contaminant Control: Fasten windows shut, ventilate barricaded construction areas by use of fans to the outside of building.
 - 1. Maintain a minimum negative airflow of 100 +/- 10 FPM with door fully open at barricade entrance openings and during window replacement by use of fans vented to outside of building.
 - 2. Secure operable exterior windows and doors/windows not required for construction access as required to maintain negative airflow.
 - 3. Provide additional local exhaust during welding.
- B. Contractor shall install dustproof enclosures for work as submitted on work plan and when required to protect areas occupied by the Owner from dust, debris and damage.
 - 1. Construction must be conducted in tight enclosures cutting off any flow of dust particles into occupied areas.
 - 2. The Contractor shall provide additional dustproof enclosures as requested by the Owner when enclosure locations are not adequately containing the dust.
 - 3. Provide all barricades, warning signs and warning lights to protect the public, the existing building, storage areas and materials or equipment.
- C. Enclosure Barricades: Full height, noncombustible construction, with minimum ½ inch gypsum board both sides with 3-1/2 inch R-11 insulation batts to reduce noise. Use 3-inch wide masking tape to tightly seal top, bottom, and all seams to prevent spread of dust to occupied areas, including above ceiling.
 - 1. Barricade Doors: 3'-0" minimum width (pair of 3'-0" wide doors as required by plans), solid core wood with metal frame and hardware, including closer, tightly weather-stripped to prevent flow of dust. Locate as directed and swing out of construction area (unless directed otherwise by fire marshal). Keep barriers locked outside of working hours. Provide signage at each door "Keep Door Closed." Three keys for emergency access shall be furnished to the Owner.
 - 2. Seal all ductwork, piping, conduit, structure and miscellaneous penetrations in enclosure barricades.
 - 3. Materials for barricade shall be precut in unoccupied areas.
- D. Enclosure outside of work area (including spaces above ceilings): Whenever work is necessary outside of the construction barricades the space where work is being done, including ladders, shall be contained within full height enclosure. Contractor may use prefabricated unit.
 - 1. All work performed outside the construction barricade shown on drawings including all work in corridors and lobbies shall be performed outside of normal working hours and shall be scheduled in advance with Owner except where specified otherwise.

2. At no time shall any construction equipment or material be stored outside the construction barricade.

E. Furniture and Equipment Protection:

1. Cover all furniture and equipment remaining in the space with polyethylene. Seal with tape to prevent dust/dirt from reaching the furniture and equipment.

3.03 PROCEDURES

- A. General: Contractor shall provide and maintain all barriers, filters, ventilation, walk-off mats and cleaning and removal procedures as detailed in work plan.
1. Traffic between barricaded areas and open areas shall be kept to a minimum. Instruct workers to refrain from tracking dust into adjacent occupied areas or opening windows or doors allowing construction dust/airborne contaminants into adjacent occupied or finished areas. Any dust tracked outside of construction area shall be cleaned up immediately. Contractor shall have the necessary manpower and equipment (HEPA vacuum cleaners, dust and wet mops, brooms, buckets and clean wiping rags) to keep adjacent occupied areas clean at all times. Keep door to such areas closed at all times. Transport materials and refuse into an area from an external site without violating occupied areas by transporting in covered containers.
 2. Provide negative pressure in construction area by use of fans to the outside of the building. Block supply and return ventilation as to not recirculate air from construction area to air handlers supplying occupied areas. Rebalance air handling equipment to maintain correct airflow to occupied areas.
 - a. Provide adequate forced ventilation of enclosed areas to cure installed materials, to prevent excessive humidity, and to prevent hazardous accumulations of dust, fumes, vapors, or gases in the building.
 - b. Direct exhaust from equipment away from building air intakes and operable windows; assure that filters on building air intakes are operational and protected from excessive amounts of airborne contaminants. Cover intakes of air handling equipment not in operation in proximity to exhaust locations.
- B. Sealing of Openings: Use tape or other impenetrable sealant to seal barrier wall seams, cracks around window and door frames, exhaust system ductwork, pipes, floor penetrations, joints and ducts. Seal or filter all open return and exhaust ductwork.
- C. Dust Control: The Contractor shall take appropriate steps throughout the term of the Project to prevent airborne dust due to work under this contract. Water shall be applied wherever practical to settle and hold dust to a minimum, particularly during demolition and moving of materials. No chemical palliatives shall be used without permission of the Owner's Representative.
1. Spray surfaces with water mist during dust-producing interior demolition activities. Hard surface floors in work area, adjacent hallways and passage areas require vacuuming with HEPA-filtered vacuum cleaners and frequent wet-mopping during demolition and construction; protect adjacent carpeted areas with plastic and plywood and vacuum with HEPA-filtered vacuum cleaners.
 2. Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent airborne dust from dispersing into atmosphere.
- D. Whenever access panels are opened in occupied areas, for work above ceilings, provide portable enclosure ladder and sealing off opening, fitted tight to ceiling.
- E. Provide thorough cleaning of existing surfaces which become exposed to dust, before start of Owner's occupancy.

3.04 FINAL CLEANING

- A. Removal of construction barriers shall be done carefully, and when necessary, outside of normal work hours. Remove all tape residue from existing/new surfaces. HEPA vacuum and clean all surfaces free of dust after the removal prior to Owner's occupancy.
- B. Rebalance existing HVAC systems to restore modified systems back to the original design intent.

3.05 ENFORCEMENT

- A. Failure to maintain containment areas will result in issuance of written warning; if situation is not corrected within eight (8) hours of receipt of warning, Owner will have cause to stop the work as provided in Article 2.3 of A201 General Conditions of the Contract for Construction. All costs associated with Owner's written order to stop the Work and remobilization shall be borne by the Contractor.

END OF SECTION 01 56 00

SECTION 01 73 29
CUTTING AND PATCHING

PART 1: GENERAL

1.01 DESCRIPTION

- A. Execute cutting, fitting or patching of Work, required to:
 - 1. Make several parts fit properly.
 - 2. Uncover Work to provide for installation of ill-timed Work.
 - 3. Remove and replace defective Work.
 - 4. Remove and replace Work not conforming to requirements of Contract Documents.
 - 5. Install specified Work in existing construction.
 - 6. Provide finished surfaces (to match adjacent existing surfaces) to fill in voids caused by removal or replacement of materials.
- B. Pay for costs caused by ill-timed or defective Work, or Work not conforming to Contract Documents, including costs for additional services of Architect/Engineer.

PART 2: PRODUCTS

2.01 MATERIALS

- A. Replacement of Work Removed: Comply with specifications for type of Work to be done.
- B. Placement of Work to fill Voids caused by Removal: Comply with latest industry standards for type of Work to be done.

PART 3: EXECUTION

3.01 INSPECTION

- A. Inspect existing conditions of Work, including elements subject to movement or damage during:
 - 1. Cutting and patching.
- B. After uncovering Work, inspect conditions affecting installation of new products.

3.02 PREPARATION PRIOR TO CUTTING

- A. Provide shoring, bracing and support as required to maintain structural integrity of Project.
- B. Provide protection for other portions of Project.
- C. Provide protection from elements.

3.03 PERFORMANCE

- A. Neatly cut or demolish along straight, true, square lines.
- B. Execute cutting and demolition by methods which will prevent damage to other Work, and will provide proper surfaces to receive installation of repairs and new Work.
- C. Restore Work which has been cut or removed; install new products to provide complete Work in accordance with requirements of Contract Documents.
- D. Refinish entire surfaces as necessary to provide an even finish.
 - 1. Continuous Surfaces: To nearest intersections.
 - 2. Assembly: Entire refinishing.

END OF SECTION 01 73 29

SECTION 01 74 00

FINAL CLEANING

PART 1: GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

- A. Cleaning required for specified work is specified in sections pertaining to that work.
- B. Cleaning during construction and prior to substantial completion – Section 01 50 00 Temporary Facilities and Controls.

PART 2: PRODUCTS

2.01 CLEANING MATERIALS

- A. Use only cleaning materials recommended by manufacturer of surface to be cleaned.
- B. Use cleaning materials only on surfaces recommended by cleaning material manufacturer.

PART 3: EXECUTION

3.01 FINAL CLEANING

- A. Employ experienced workers or professional cleaners for final cleaning.
- B. At completion of construction and just prior to acceptance or occupancy, conduct a final inspection of exposed interior and exterior surfaces.
- C. Remove grease, dust, dirt, stains, labels, fingerprints, and other foreign materials from interior and exterior surfaces.
- D. Repair, patch and touch up marred surfaces to match adjacent finishes.
- E. Broom clean paved surfaces; rake clean other surfaces of grounds.
- F. Maintain cleaning until the Building or portion thereof, is occupied by the Owner.

END OF SECTION 01 74 00

SECTION 01 77 00

PROJECT CLOSEOUT

1.01 GENERAL

- A. Comply with requirements stated in Conditions of the Contract and in Specifications for administrative procedures in closing out the Work.
- B. Related requirements in other parts of the Project Manual
 - 1. Fiscal provisions, legal submittals and additional administrative requirements: Conditions of the Contract.
- C. Related requirements specified in other sections
 - 1. Closeout Submittals Required: The respective sections of specifications.

1.02 SUBSTANTIAL COMPLETION

- A. Refer to the General Conditions of the Contract for Construction.
- B. When the Project is determined by the Architect to be sufficiently complete to permit utilization for the intended use, the Architect will issue a Certificate of Substantial Completion.
- C. To receive the Certificate of Substantial Completion, perform the following:
 - 1. Submit to the Architect a notice declaring that work is believed to be substantially complete.
 - 2. Submit a list of work items that remain to be completed or corrected and the date this work will be accomplished.
 - 3. Obtain Occupancy certificate when required from governing municipality.
 - 4. Submit documentation of Functional Performance Test deficiency list and completion schedule from temperature control contractor.
- D. Architect will visit the project to evaluate the request for issuance of a Certificate of Substantial Completion.
 - 1. If the Architect concurs that the Project is substantially complete, the Architect will deliver a Certificate of Substantial Completion and a list of work items necessary for completion or correction prior to request for inspection for final completion.
 - 2. If the Architect determines that the work is not substantially complete, the Architect will deliver to the Contractor a written statement including reasons.
 - 3. Complete work on the items required by the Architect for achieving substantial completion and make additional written requests for issuance of a Certificate of Substantial Completion until the Architect determines that sufficient Work has been performed.

1.03 FINAL INSPECTION

- A. When the Work is considered complete, submit written certification that:
 - 1. Contract Documents have been reviewed.
 - 2. Work has been completed and inspected by the Contractor for compliance with Contract Documents and is ready for final inspection.
 - 3. Building Permit Final has been submitted.
- B. Architect will make an inspection to verify the status of completion with reasonable promptness after receipt of such certification.
- C. Should Architect consider that the Work is incomplete or defective:
 - 1. Architect will notify the Contractor in writing, listing the incomplete or defective work.
 - 2. Take immediate steps to remedy the stated deficiencies, and send a second written certification to Architect that the Work is complete.
 - 3. Architect will reinspect the Work.
- D. When the Architect finds that the Work is acceptable under the Contract Documents, he will request preparation of closeout submittals.

1.04 REINSPECTION FEES

- A. Should Architect perform reinspections due to failure of the Work to comply with the claims of status of completion made by the Contractor:
 - 1. Owner will compensate Architect for such additional services.
 - 2. Owner will deduct the amount of such compensation from the final payment.

1.05 CLOSEOUT SUBMITTALS TO ARCHITECT

- A. When the Architect has determined that the Construction Work is acceptable under the Contract Documents and the Contract fully performed, prepare and submit final Application for Payment to the Architect together with one original and one copy of the following:
 - 1. A letter recommending acceptance of the Project and indicating all punch list items are complete.
 - 2. Contractor's Affidavit of Payment of Debts and Claims, AIA Document G706, with bonds for any exceptions.

1.06 FINAL ADJUSTMENT OF ACCOUNTS

- A. Submit a final statement of accounting to Architect.
- B. Statement shall reflect all adjustments to the Contract Sum:
 - 1. The original Contract Sum.
 - 2. Additions and deductions resulting from:
 - a. Previous Change Orders

- b. Allowances
 - c. Unit Prices
 - d. Deductions for uncorrected Work
 - e. Penalties and Bonuses
 - f. Deductions for liquidated damages
 - g. Deductions for reinspection payments and costs incurred by Architect or Architect's Consultants if project is not closed out within sixty (60) days of Substantial Completion.
 - h. Other adjustments
- 3. Total Contract Sum, as adjusted.
 - 4. Previous payments.
 - 5. Sum remaining due.
- C. Architect will prepare a final Change Order, reflecting approved adjustments to the Contract Sums which were not previously made by Change Orders.

1.07 FINAL APPLICATION FOR PAYMENT

- A. Submit the final Application for Payment in accordance with procedures and requirements stated in the Conditions of the Contract.

END OF SECTION 01 77 00

SECTION 01 78 23

OPERATING, MAINTENANCE AND WARRANTY DATA

1.01 GENERAL

- A. Compile product data and related information appropriate for Owner's maintenance and operation of products furnished under the Contract.
- B. Prepare operating, maintenance and warranty data as specified in this Section and as referenced in other pertinent section of Project Manual.
- C. Instruct Owner's personnel in the maintenance of products and in the operation of equipment and systems.
- D. Related requirements specified in other sections:
 - 1. Shop drawings, product data and samples: Section 01 33 00.
 - 2. Project Closeout: Section 01 77 00.
 - 3. Project Record Documents: Section 01 78 39.

1.02 QUALITY ASSURANCE

- A. Preparation of data shall be done by personnel with the following qualifications:
 - 1. Trained and experienced in maintenance and operation of the described products.
 - 2. Completely familiar with requirements of this Section.
 - 3. Skilled as a technical writer to the extent required to communicate essential data.
 - 4. Skilled as a draftsman competent to prepare required drawings.

1.03 FORM OF SUBMITTALS

- A. Prepare data in the form of an instructional manual for use by the Owner's personnel.
- B. Format shall conform to the following:
 - 1. Size: 8½" x 11".
 - 2. Paper: 20 pound minimum, white, for typed pages.
 - 3. Text: Manufacturer's printed data, or neatly typewritten.
 - 4. Drawings
 - a. Provide reinforced punched binder tab, bind in with text.
 - b. Fold larger drawings to the size of the text pages.

5. Provide fly-leaf for each separate product, or each piece of operating equipment.
 - a. Provide typed description of product, and major component parts of equipment.
 - b. Provide indexed tabs.
6. Cover: Identify each volume with typed or printed title "OPERATING, MAINTENANCE AND WARRANTY INSTRUCTIONS". List:
 - a. Title of Project
 - b. Identity of separate structure as applicable.
 - c. Identity of general subject matter covered in the manual.

C. Binders

1. Commercial quality three-ring binders with durable and cleanable plastic cover.
2. Maximum ring size: 2 inch.
3. When multiple binders are used, correlate the data into related consistent groupings.

D. Digital Format: Submit one PDF copy of the O&M Manual on a DVD Disk.

1.04 CONTENT OF MANUAL

A. Arrange neatly typewritten table of contents for each volume, in the following systematic order.

1. Contractor, name of responsible principal, address and telephone number.
2. A list of each product required to be included, indexed to the content of volume.
3. List, with each product, the name, address and telephone number of:
 - a. Contractor or installer.
 - b. Maintenance contractor, as appropriate.
 - c. Identify the area of responsibility of each.
 - d. Local source of supply for parts and replacement.
 - e. Include warranty information as specified.
4. Identify each product by product name and other identifying symbols such as set in Contract Documents.

B. Product Data

1. Include only those sheets which are pertinent to the specific product.
2. Annotate each sheet to:
 - a. Clearly identify the specific product or part installed.

- C. Content, for moisture-protection and weather-exposed products:
 - 1. Manufacturer's data, giving full information on products.
 - a. Applicable standards
 - b. Chemical composition
 - c. Details of installation
 - 2. Instructions for inspection, maintenance and repair.
- D. Additional requirements for maintenance data: The respective section of the Project Manual.

1.05 SUBMITTAL SCHEDULE

- A. Submit one copy of completed data in final form within thirty days of substantial completion. Copy will be returned with comments.
- B. Submit two copies of approved data in final form ten (10) days after comments are received.

END OF SECTION 01 78 23

SECTION 01 78 39

PROJECT RECORD DOCUMENTS

1.01 GENERAL

- A. Fully cooperate with the Architect to accomplish the following.
- B. These requirements supplement the requirements set forth in the General Conditions.
- C. Maintain at each site one record copy, as applicable, of:
 - 1. Drawings and Details with addenda marked in.
 - 2. Specifications with addenda marked in.
 - 3. Addenda.
 - 4. Change Orders and other modifications to the Contract.
 - 5. Architect/Engineer Supplemental Instructions, Proposal Requests or written instructions.
 - 6. Approved shop drawings, product data and samples.
 - 7. Field test records.

1.02 MAINTENANCE OF RECORD DOCUMENTS AND SAMPLES

- A. Store record documents and samples in Contractor's field office in files and racks. Provide locked cabinet or secure storage space for storage of samples.
- B. File documents and samples in accordance with the Construction Specifications Institute MASTERFORMAT.
- C. Maintain record documents in a clean, dry, legible condition and in good order. Do not use record documents for construction purposes.
- D. Make record documents and samples available at all times for inspection by Architect or Owner.

1.03 RECORDING

- A. Label each document "PROJECT RECORD" in neat large printed letters.
- B. Continuously record information and changes.
- C. Drawings: Legibly mark to record actual construction.
 - 1. Depths of various elements of foundation in relation to finish first floor datum.
 - 2. Horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
 - 3. Location of internal utilities and appurtenances concealed in the construction, referenced to visible and accessible features of the structure.
 - 4. Field changes of dimension and detail.

5. Changes made by Field Order or by Change Order.
 6. Details not on original contract drawings.
- D. Specifications and Addenda - Legibly mark each Section to record:
1. Manufacturer, trade name, catalog number, and Supplier of each Product and item of equipment actually installed.
 2. Changes made by Field Order or by Change Order.
- E. Shop Drawings – Label each set by corresponding specification section. At the completion of the project, provide the Owner with one complete set, reviewed and stamped by architect, organized by specification section in the following formats:
1. Paper (various sizes) folded to 8 1/2" x 11" and boxed with project name and completion date clearly labeled on exterior.
 2. Scanned PDF copy on a compact disk, ordered by specification section.

1.04 SUBMITTAL

- A. Deliver Record Documents to the Owner at contract close-out.
- B. Accompany submittal with transmittal letter in duplicate, containing:
1. Date
 2. Project title
 3. Title and number of each Record Document

END OF SECTION 01 78 39

SECTION 01 79 00

DEMONSTRATION AND TRAINING

PART 1: GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings, Details of Construction and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Sections, apply to work specified in this section.

1.02 SUMMARY

- A. This Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:
 - 1. Demonstration of operation of systems, subsystems, and equipment.
 - 2. Training in operation and maintenance of systems, subsystems, and equipment.
 - 3. Recording of training sessions.
- B. Related Sections:
 - 1. Division 1-14 – Individual sections with training requirements.
 - 2. Divisions 21-25 – Mechanical sections with training requirements.
 - 3. Divisions 26-28 – Electrical sections with training requirements.

1.03 SUBMITTALS

- A. Instruction Program: Submit two copies of outline of instructional program for demonstration and training, including a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.
 - 1. At completion of training, submit one complete training manual for Owner's use.
- B. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- C. Attendance Record: For each training module, submit list of participants and length of instruction time.
- D. Evaluations: For each participant and for each training module, submit results and documentation of performance-based test.
- E. Demonstration and Training DVD: Submit one copy at end of each training module.

1.04 QUALITY ASSURANCE

- A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.
- B. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Division 1 Section "Quality Requirements," experienced in operation and maintenance procedures and training.

1.05 COORDINATION

- A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations.
- B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.
- C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Architect.

PART 2 – PRODUCTS

2.01 INSTRUCTION PROGRAM

- A. Program Structure: Develop an instruction program that includes individual training modules for each system and equipment not part of a system, as required by individual Specification Sections.
- B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable:
 - 1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
 - a. System, subsystem, and equipment descriptions.
 - b. Performance and design criteria if Contractor is delegated design responsibility.
 - c. Operating standards.
 - d. Regulatory requirements.
 - e. Equipment function.
 - f. Operating characteristics.
 - g. Limiting conditions.
 - h. Performance curves.
 - 2. Documentation: Review the following items in detail:
 - a. Emergency manuals.
 - b. Operations manuals.
 - c. Maintenance manuals.
 - d. Project Record Documents.
 - e. Identification systems.
 - f. Warranties and bonds.
 - g. Maintenance service agreements and similar continuing commitments.
 - 3. Emergencies: Include the following, as applicable:
 - a. Instructions on meaning of warnings, trouble indications, and error messages.
 - b. Instructions on stopping.
 - c. Shutdown instructions for each type of emergency.
 - d. Operating instructions for conditions outside of normal operating limits.
 - e. Sequences for electric or electronic systems.
 - f. Special operating instructions and procedures.

4. Operations: Include the following, as applicable:
 - a. Startup procedures.
 - b. Equipment or system break-in procedures.
 - c. Routine and normal operating instructions.
 - d. Regulation and control procedures.
 - e. Control sequences.
 - f. Safety procedures.
 - g. Instructions on stopping.
 - h. Normal shutdown instructions.
 - i. Operating procedures for emergencies.
 - j. Operating procedures for system, subsystem, or equipment failure.
 - k. Seasonal and weekend operating instructions.
 - l. Required sequences for electric or electronic systems.
 - m. Special operating instructions and procedures.
5. Adjustments: Include the following:
 - a. Alignments.
 - b. Checking adjustments.
 - c. Noise and vibration adjustments.
 - d. Economy and efficiency adjustments.
6. Troubleshooting: Include the following:
 - a. Diagnostic instructions.
 - b. Test and inspection procedures.
7. Maintenance: Include the following:
 - a. Inspection procedures.
 - b. Types of cleaning agents to be used and methods of cleaning.
 - c. List of cleaning agents and methods of cleaning detrimental to product.
 - d. Procedures for routine cleaning
 - e. Procedures for preventive maintenance.
 - f. Procedures for routine maintenance.
 - g. Instruction on use of special tools.
8. Repairs: Include the following:
 - a. Diagnosis instructions.
 - b. Repair instructions.
 - c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
 - d. Instructions for identifying parts and components.
 - e. Review of spare parts needed for operation and maintenance.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a combined training manual.
- B. Set up instructional equipment at instruction location.

3.02 INSTRUCTION

- A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Owner for number of participants, instruction times, and location.
- B. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
 - 1. Owner will furnish Contractor with names and positions of participants.
- C. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.
 - 1. Schedule training through Architect with at least seven days' advance notice.
- D. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of a demonstration performance-based test.
- E. Demonstration and Training Recording: Record each training module separately on digital, window's compatible DVD media.. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice.
 - 1. At beginning of each training module, record each chart containing learning objective and lesson outline.
- F. Cleanup: Collect used and leftover educational materials and give to Owner. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

3.03 REQUIRED DEMONSTRATION AND TRAINING

- A. The following is a list of demonstration and training requirements listed in individual specification sections. Inconsistencies or omissions from the list does not relieve the Contractor from providing required demonstration and training delineated in each specification section.

Specification Section	Item	Minimum Time*
01 45 43	Testing, Adjusting and Balancing	8 hours
05 50 00	Miscellaneous Metals (Stainless steel)	As required
06 65 00	Solid Surface Fabrications	As required
08 71 00	Finish Hardware	As specified
10 21 13	Solid Plastic Toilet Partitions	As required
22 11 16	Domestic Water Piping	As required
23 82 33	Heating Terminals	4 hours
26 51 00	Interior Lighting	8 hours

3.04 DEMONSTRATION

- A. Manufacturer's onsite field technician shall demonstrate the operation of the doors to the Owner. A video outlining the operation of the item or system, scheduled maintenance, basic troubleshooting and care of the item or system shall be provided to the Owner by the door manufacturer. Refer to Section 01 79 00 Demonstration and Training.

END OF SECTION 01 79 00

SECTION 02 41 19

SELECTIVE DEMOLITION

PART 1: GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings, Details of Construction and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Sections, apply to work specified in this section.

1.02 SUMMARY

- A. This Section requires the selective removal of the following:
 - 1. Portions of existing building indicated on drawings and as required, to be removed and disposed of off site, to accommodate new construction.
 - 2. Removal and protection of existing fixtures, materials, and equipment items indicated "salvage."
- B. Related work specified elsewhere:
 - 1. Remodeling construction work and patching are included within the respective sections of specifications.
 - 2. Construction Dust Control: Section 01 56 00.
 - 3. Removal of roofing, roof insulation and flashing is specified in Division 7.
 - 4. Removal of mechanical and electrical systems and equipment is specified in Divisions 23 and 26.
- C. Related work by others:
 - 1. Removal of movable furnishings and equipment is by Owner.
 - 2. Removal of asbestos containing materials is by Owner.

1.03 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
- B. Schedule indicating proposed sequence of operations for selective demolition work to Owner's Representative/Construction Manager for review prior to start of work. Include coordination for shutoff, capping, and continuation of utility services as required, together with details for dust and noise control.
 - 1. Provide detailed sequence of demolition and removal work to ensure uninterrupted progress of Owner's on-site operations.
 - 2. Coordinate with Owner's continuing occupation of portions of existing building and with Owner's partial occupancy of completed new construction areas.
- C. Photographs of existing conditions of structure surfaces, equipment, and adjacent improvements that might be misconstrued as damage related to removal operations. File with Owner's Representative/Construction Manager prior to start of work.
- D. Product data and Material Safety Data Sheets for any hazardous, highly odoriferous, or high volatile materials to be used, along with procedure and safeguards to be followed during the use of each.

1.04 JOB CONDITIONS

- A. Occupancy: Owner will occupy portions of the building immediately adjacent to areas of selective demolition. Conduct selective demolition work in manner that will minimize need for disruption of Owner's normal operations. Provide minimum of 72 hours advance notice to Owner's Representative of demolition activities that will affect Owner's normal operations.
- B. Condition of Structures: Owner assumes no responsibility for actual condition of items or structures to be demolished.
 - 1. Conditions existing at time of inspection for bidding purposes will be maintained by Owner insofar as practicable. However, minor variations within structure may occur by Owner's removal and salvage operations prior to start of selective demolition work.
- C. Partial Demolition and Removal: Items indicated to be removed but of salvageable value to Contractor may be removed from structure as work progresses. Transport salvaged items from site as they are removed.
 - 1. Storage or sale of removed items on site will not be permitted.
- D. Protection: Provide temporary barricades and other forms of protection to protect Owner's personnel, students and general public from injury due to selective demolition work.
 - 1. Coordinate protective measures with those to be performed or constructed for asbestos abatement work. Avoid duplication of work where practical.
 - 2. Provide protective measures as required to provide free and safe passage of Owner's personnel and general public to occupied portions of building.
 - 3. Erect temporary covered passageways as required by authorities having jurisdiction.
 - 4. Provide interior and exterior shoring, bracing, or support to prevent movement, settlement, or collapse of structure or element to be demolished and adjacent facilities or work to remain.
 - 5. Protect from damage existing finish work that is to remain in place and which becomes exposed during demolition operations.
 - 6. Protect floors with suitable coverings when necessary.
 - 7. Construct temporary insulated dustproof partitions where required to separate areas where noisy, dirty or dusty operations are performed. Construct partitions out of metal stud, poly and gypsum board and provide dustproof doors and security locks.
 - 8. Provide temporary weather protection during interval between demolition and removal of existing construction on exterior surfaces and installation of new construction to ensure that no water leakage or damage occurs to structure or interior areas of existing building.
- E. Damages: Promptly repair damages caused to adjacent facilities by demolition work.

- F. Traffic: Conduct selective demolition operations and debris removal to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities.
 - 1. Do not close, block, or otherwise obstruct streets, walks, or other occupied or used facilities without written permission from authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.
- G. Flame Cutting: Do not use cutting torches for removal until work area is cleared of flammable materials. At concealed spaces, flame cutting will not be allowed. Maintain portable fire suppression devices during flame-cutting operations.
- H. Utility Services: Maintain existing utilities indicated to remain in service and protect them against damage during demolition operations.
 - 1. Do not interrupt utilities serving occupied or used facilities or spaces, except when authorized in writing by authorities having jurisdiction. Provide temporary services during interruptions to existing utilities, as acceptable to Owner.
 - 2. Maintain fire protection services during selective demolition operations.
 - 3. Maintain HVAC functions in occupied spaces, in so far as possible. Provide temporary heating and ventilation as required to maintain acceptable working conditions. Do not interrupt functions to occupied spaces, except as shown on the demolition plans or when authorized in writing by the Owner.
- I. Environmental Controls: Use temporary enclosures, and other methods to limit dust and dirt migration. Comply with governing regulations pertaining to environmental protection.
 - 1. Do not use water when it may create hazardous or objectionable conditions such as ice, flooding, and pollution, or damage to finishes or occupied spaces.
- J. Do not use highly odoriferous, hazardous or highly volatile chemicals during demolition without the approval of the Owner. Provide appropriate safeguards during the use of such approved materials.
- K. Lead Containing Materials: The existing building may contain lead-containing materials, including lead paint. It is the Contractor's responsibility to meet all governmental regulations when dealing with and disposing of lead containing materials.

PART 2: PRODUCTS (Not Applicable)

PART 3: EXECUTION

3.01 PREPARATION

- A. General: Provide interior and exterior shoring, bracing, or support to prevent movement, settlement, or collapse of areas to be demolished and adjacent facilities to remain.
 - 1. Cease operations and notify Architect immediately if safety of structure appears to be endangered. Take precautions to support structure until determination is made for continuing operations.
 - 2. Cover and protect furniture, equipment, and fixtures from soilage or damage when demolition work is performed in areas where such items have not been removed.

3. Erect and maintain dust-proof partitions and closures as required to prevent spread of dust or fumes to occupied portions of the building.
 - a. Where selective demolition occurs immediately adjacent to occupied portions of the building, construct dust-proof partitions of minimum 3-5/8" metal studs, 5/8-inch drywall (joints taped) on occupied side, 1/2-inch fire-retardant plywood on demolition side. Fill partition cavity with insulation. Provide lockable dustproof doors.
 - b. Provide similar weatherproof closures for exterior openings resulting from or immediately adjacent to demolition work.
4. Locate, identify, stub off, and disconnect utility services that are not indicated to remain.
 - a. Provide bypass connections as necessary to maintain continuity of service to occupied areas of building. Provide minimum of 72 hours advance notice to Owner if shutdown of service is necessary during changeover.
5. Asbestos containing materials shall be removed only by a licensed asbestos abatement contractor. In the event that asbestos containing materials are encountered during the demolition process, implement the following procedures:
 - a. If the materials are not disturbed, stop work in the immediate area and notify the Owner/Construction Manager who will arrange for abatement of the material.
 - b. If the material has been disturbed by demolition operation, or is otherwise loose or damaged, evacuate the immediate area and restrict access to all personnel. Shut off or isolate HVAC to the area. Notify the Owner/Construction Manager and do not re-enter space until abatement is complete and permission has been received.
 - c. Rearrange selective demolition schedule as necessary to continue overall job progress without undue delay.

3.02 DEMOLITION

- A. General: Perform selective demolition work in a systematic manner. Use such methods as required to complete work indicated on Drawings in accordance with demolition schedule and governing regulations.
 1. Demolish concrete and masonry in small sections. Cut concrete and masonry at junctures with construction to remain using power-driven masonry saw or hand tools.
 2. For interior slabs on grade, use removal methods that will not crack or structurally disturb adjacent slabs or partitions. Use power saw where possible.
 3. Completely fill below-grade areas and voids resulting from demolition work. Use compacted backfill as specified in Section 31 00 00.
 4. Provide for effective air and water pollution controls as required by local authorities having jurisdiction.
- B. If unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure both nature and extend of the conflict. Submit report to Architect in written, accurate detail. Pending receipt of directive from Architect, rearrange selective demolition schedule as necessary to continue overall job progress without undue delay.
- C. If carpet to be removed is glue applied over vinyl asbestos tile. Use power carpet stripper or other device known to remove carpet with minimal damage to or loosening of, underlying tile.

- D. Leave all surfaces and work ready and acceptable to the next trade. Use only materials and techniques that are acceptable to subsequent trades to remove materials from surfaces to remain.
 - 1. Remove adhesive and other materials where wall and floor coverings are removed.
 - 2. Patch or repair demolition in excess of that shown on drawings.

3.03 SALVAGED MATERIALS

- A. Salvaged Items: Where indicated on Drawings as “Salvage”, carefully remove indicated items, clean and store.
 - 1. Furniture/building contents, not scheduled for reuse, remain property of Owner. Notify Architect if such items are encountered and obtain approval regarding method of removal and salvage for the Owner.
 - 2. Store salvaged items to be reused off the ground in a clean, dry location, away from uncured concrete or masonry. Cover with waterproof material in a manner that permits air circulation within covering.
 - 3. For items to be reused, inventory, label with previous location and new location.

3.04 DISPOSAL OF DEMOLISHED MATERIALS

- A. Remove from building site debris, rubbish, and other materials resulting from demolition operations. Transport and legally dispose of off site.
 - 1. If hazardous materials are encountered during demolition operations, comply with applicable regulations, laws, and ordinances concerning removal, handling, and protection against exposure or environmental pollution.
 - 2. Burning of removed materials is not permitted on project site.

3.05 CLEANUP AND REPAIR

- A. General: Upon completion of demolition work, remove tools, equipment, and demolished materials from site. Leave interior areas broom clean.
 - 1. Repair demolition performed in excess of that required. Return elements of construction and surfaces to remain to condition existing prior to start operations. Repair adjacent construction or surfaces soiled or damaged by selective demolition work.
 - 2. Remove protection when no longer required by demolition and remodeling work.

END OF SECTION 02 41 19

SECTION 03 3000

CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings, Details of Construction, and General Provisions of the Contract, including General and Supplementary Conditions and Division - 1 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

- A. Section Includes: Providing all items, articles and materials listed, mentioned, or scheduled on the Drawings or herein, including all labor, materials, equipment, and incidentals necessary and required for the installation of all cast-in-place concrete indicated on the Drawings or specified herein.
- B. Concrete footings
- C. Concrete building frame members.
- D. Concrete for composite floor construction.
- E. Elevated concrete slabs.
- F. Floors and slabs on grade.
 - 1. Including vapor barrier.
- G. Concrete shear walls, elevator shaft walls, foundation walls, and _____.
- H. Concrete fill for masonry lintels, bond beams and cores.
- I. Concrete fill for steel pan stairs.
- J. Concrete topping.
- K. Joint devices associated with concrete work.
- L. Miscellaneous concrete elements, including equipment pads, light pole bases, flagpole bases, thrust blocks, and manholes.
- M. Concrete curing.
- N. Perimeter insulation over non-waterproofed concrete foundation walls as shown on drawings.

1.03 RELATED REQUIREMENTS

- A. Section 01 4533 - Structural Testing and Special Inspection
- B. Section 32 1313 - Concrete Paving: Sidewalks, curbs and gutters.
- C. Section 03 1000 - Concrete Forming and Accessories: Forms and accessories for formwork.
- D. Section 03 2000 - Concrete Reinforcing.
- E. Section 03 3800- Post-Tensioned Structural Concrete
- F. Section 03 4110- Structural Precast, Prestressed Concrete
- G. Section 03 4113- Precast Concrete Hollow Core Planks
- H. Section 05 1200 - Embedded Structural Steel, Anchor Bolts
- I. Section 07 2100 - Insulation: Perimeter insulation and vapor barrier.

1.04 REFERENCE STANDARDS

- A. ACI 117 - Standard Specifications for Tolerances for Concrete Construction and Materials; American Concrete Institute International; 2006.

- B. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete; American Concrete Institute International; 1991 (Reapproved 2002).
- C. ACI 301 - Specifications for Structural Concrete for Buildings; American Concrete Institute International; 2005.
- D. ACI 302.1R - Guide for Concrete Floor and Slab Construction; American Concrete Institute International; 2004 (errata 2007).
- E. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete; American Concrete Institute International; 2000.
- F. ACI 305R - Hot Weather Concreting; American Concrete Institute International; 1999.
- G. ACI 306R - Cold Weather Concreting; American Concrete Institute International; 1988 (Reapproved 2002).
- H. ACI 306.1 - Standard Specification for Cold Weather Concreting, American Concrete Institute; 1990
- I. ACI 308R - Guide to Curing Concrete; American Concrete Institute International; 2001 (Reapproved 2008).
- J. ACI 308.1 - Standard Specification for Curing Concrete, American Concrete Institute; 1998
- K. ACI 309R - Guide for Consolidation of Concrete, American Concrete Institute; 1996
- L. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; American Concrete Institute International; 2005.
- M. ASTM A 615/A 615M - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement; 2007.
- N. ASTM A 820/A 820M - Standard Specification for Steel Fibers for Fiber-Reinforced Concrete; 2006.
- O. ASTM C 31 - Standard Practice for Making and Curing Concrete Test Specimens in the Field; 2003
- P. ASTM C 33 - Standard Specification for Concrete Aggregates; 2007.
- Q. ASTM C 39/C 39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2005.
- R. ASTM C 94/C 94M - Standard Specification for Ready-Mixed Concrete; 2007.
- S. ASTM C 136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregate; 2001
- T. ASTM C 143/C 143M - Standard Test Method for Slump of Hydraulic-Cement Concrete; 2008.
- U. ASTM C 150 - Standard Specification for Portland Cement; 2007.
- V. ASTM C 157 - Standard Test Method for Length Change of Hardened Hydraulic-Cement Mortar and Concrete; 2006.
- W. ASTM C 171 - Standard Specification for Sheet Materials for Curing Concrete; 2007.
- X. ASTM C 231 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method; 1997
- Y. ASTM C 260 - Standard Specification for Air-Entraining Admixtures for Concrete; 2006.
- Z. ASTM C 309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete; 2007.
- AA. ASTM C 494/C 494M - Standard Specification for Chemical Admixtures for Concrete; 2008a.
- AB. ASTM C 618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete; 2008a.
- AC. ASTM C 1107/C 1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink); 2008.
- AD. ASTM C 1116 - Standard Specification for Fiber-Reinforced Concrete; 2006.
- AE. ASTM C 1260 - Standard Test Method for Potential Alkali Reactivity of Aggregates (Mortar-Bar Method); 2007.
- AF. ASTM C 1315 - Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete; 2007.

- AG. ASTM C 1399 - Standard Test Method for Obtaining Average Residual Strength of Fiber-Reinforced Concrete; 1998.
- AH. ASTM C 1609 - Standard Test Method for Flexural Performance of Fiber-Reinforced Concrete (Using Beam With Third-Point Loading); 2005.
- AI. ASTM D 1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types); 2004 (Reapproved 2008).
- AJ. ICC Evaluation Service AC32 - Acceptance Criteria for Concrete with Synthetic Fibers; 2003
- AK. ICC Evaluation Service AC208 - Acceptance Criteria for Steel Fibers in Concrete; 2005
- AL. National Ready Mixed Concrete Association (NRMCA) - Quality Control Manual.

1.05 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Concrete mix designs for each mix used. On request, include field test data used to determine required average strength (if that method was used) and field test or trial mix data used to document required average compressive strength.
- C. Product data for admixtures, curing materials and compounds, joint fillers, fiber reinforcing, vapor retarders, non-shrink grout, and slab construction joint devices
- D. Aggregate tests.
- E. Batch plant inspection records.
- F. Cold weather concreting procedures.
- G. Drawings showing construction and control joint locations and details for interior supported floor slabs and slabs on grade.
- H. Certification of admixture conformance to chloride ion requirements.
- I. Field quality control test results.

1.06 LEED SUBMITTALS

- A. This project will be certified under the US Green Building Council's Leadership in Energy and Environmental Design Program Credits (USGBC LEED 2009 for New Construction).
- B. Submit documentation accordant with Section 01 3329 Sustainable Design Reporting for:
 - 1. **RECYCLED CONTENT** (MR Credits 4.1 & 4.2): Use materials with recycled content such that the sum of post-consumer recycled content plus one-half of the pre-consumer content constitutes at least 10% (based on cost) of the total value of the material in the project.
 - a. Include statement indicating costs for each product having recycled content.
 - 2. **REGIONAL MATERIALS** (MR Credits 5.1 & 5.2): Use building material or products that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of the project site for a minimum of 10% (based on cost) of the total material value.
 - a. Include statement indicating costs for each product that is regionally manufactured.
 - 3. **INNOVATION IN DESIGN** (ID Credit 1.1): Achieve a net 40% reduction in portland cement content, over conventional all portland cement mixes, for all concrete used on the project. Provide the following documentation:
 - a. Total cubic yards of cast in place concrete for the project.

- b. Standard 28-day strength concrete mix designs from the concrete producer, in accordance with ACI 301, for each concrete mix required for the project, to include the quantity of portland cement for each mix in pounds per cubic yard.
- c. Quantity of portland cement reduced and/or replaced for each mix in pounds per cubic yard.
- d. Temperature on day of pour if cold weather mix is used.
- e. Calculation demonstrating that a minimum 40% average reduction in the amount of portland cement has been achieved over the standard mix designs for the total of all cast-in-place concrete.

1.07 QUALITY ASSURANCE

- A. Perform work of this section in accordance with ACI 301 and ACI 318.
- B. Follow recommendations of ACI 305R when concreting during hot weather.
- C. Follow recommendations of ACI 306R when concreting during cold weather.
- D. Fiber reinforcing supplier shall have no less than five (5) years of satisfactory product performance experience with the approved product.

1.08 MATERIAL DELIVERY, HANDLING, AND STORAGE

- A. Materials shall be delivered in the Manufacturer's undamaged, unopened containers. Each container shall be clearly marked with the product name, manufacturer's name, batch number, component designation, and ratio of component mixtures.
- B. Provide equipment and personnel to handle the materials by methods that prevent damage.
- C. Promptly inspect shipments to assure that materials comply with requirements, quantities are correct, and materials are undamaged.
- D. Store materials in accordance with the Manufacturer's instructions, with seals and label intact and legible. Maintain temperatures within the Manufacturer's recommended ranges.
- E. Furnish delivery tickets with each load of concrete delivered to the Project. Information on each ticket shall be as required by ASTM C94 and shall also include: type of concrete (mix number), weights of all ingredients, maximum aggregate size, type, brand, and amount of admixture, total water in the batch, maximum amount of water that can be added at the site without exceeding design mix proportions, and amount of water added at site and initials of person adding water. Retain tickets until substantial completion unless directed otherwise.

1.09 PROJECT CONDITIONS

- A. Perform work only when existing and forecasted weather conditions are within the limits established by the manufacturer of the materials and products used.

1.10 NATIONAL VOLATILE ORGANIC COMPOUND (VOC) EMISSION STANDARDS

- A. All products shall comply with the E.P.A. rulings establishing national v.o.c. emission standards for architectural coatings as listed in the Federal Register: September 11, 1998 (Volume 63, Number 176), [Rules and Regulations] [Page 48848-48887].
- B. All products shall not exceed the VOC content limits established in South Coast Air Quality Management District (SCAQMD) Rule 1113, Architectural Coatings, as in effect on January 1, 2004.

PART 2 PRODUCTS

2.01 FORMWORK

- A. Comply with requirements of Section 03 1000.

2.02 REINFORCEMENT

- A. Comply with requirements of Section 03 2000.

2.03 CONCRETE MATERIALS

- A. Cement: ASTM C 150, Type I - Normal portland type.
- B. Fine and Coarse Aggregates: ASTM C 33.
 - 1. Provide maximum size specified in mix design schedule.
 - 2. Alkali Silicate Reactivity: Expansion of fine aggregate tested per ASTM C1260 shall not exceed 0.15%. If fly ash or other pozzolans are used to reduce shrinkage to meet this requirement, expansion of fine aggregate tested per ASTM C1260 without fly ash or other pozzolans shall not exceed 0.25%.
- C. Fly Ash: ASTM C 618, Class C or F.
- D. Ground Granulated Blast-Furnace Slag: ASTM C989, Grade 100 or 120.
- E. Water: Clean and not detrimental to concrete.
- F. Synthetic Micro Fiber Reinforcing: 100% virgin polyolefin (polypropylene or polyethylene), fibrillated, graded or minimum ¾" uniform length, ICC approved, ASTM C1116, Type III. Fibermesh 300: Propex Concrete Systems, Grace Fibers: W.R. Grace, and approved equal.
- G. Synthetic Macro Fiber Reinforcing: 100% virgin polyolefin (polypropylene or polyethylene), monofilament, non-fibrillated, 1.5-2" long, L/D aspect ratio 50-100, ASTM C1116, Type III. Enduro 600: Propex Concrete Systems, Strux 90/40: W.R. Grace, and approved equal.
 - 1. Blended synthetic macro fiber and micro fiber reinforcing with macro fibers meeting the above may be used. Novomesh 950: Propex Concrete Systems.
 - 2. Tested in concrete to meet requirements of ICC AC32. Tests for concrete over steel deck and fire-resistance only required for concrete used over steel deck.
 - 3. UL approved for use in rated systems over steel deck.
- H. Steel Fiber Reinforcing: Cold drawn steel wire, ASTM A820, Type I, 1.5-2" long.
 - 1. Blended steel fiber and synthetic micro fiber reinforcing with steel fibers meeting the above may be used. Novomesh 850: Propex Concrete Systems.
 - 2. Tested in concrete to meet requirements of ICC AC208. Tests for concrete over steel deck and fire-resistance only required for concrete used over steel deck.
 - 3. UL approved for use in rated systems over steel deck.

2.04 CHEMICAL ADMIXTURES

- A. Do not use chemicals that will result in soluble chloride ions in excess of 0.1 percent by weight of cement.
- B. Air Entrainment Admixture: ASTM C 260.
- C. High Range Water Reducing Admixture: ASTM C 494/C 494M Type F.
- D. Accelerating Admixture: ASTM C 494/C 494M Type C.
- E. Water Reducing Admixture: ASTM C 494/C 494M Type A.
- F. Prohibited Admixtures: Calcium chloride, thiocyanates or admixtures containing more than .05% chloride ions.
- G. Do not use accelerating or retarding admixtures without written approval of the Architect.

2.05 ACCESSORY MATERIALS

- A. Underslab Vapor Barrier: See Section 07 2100 – Insulation

- B. Non-Shrink Grout: ASTM C 1107 Grade B; Premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents.
 - 1. Conformance to ASTM C1107 shall occur with a minimum temperature range of 45 degrees F to 90 degrees F, a fluid consistency, and a minimum 30 minute working time.
- C. Curing Materials
 - 1. All curing agents and sealers shall have no adverse affect on finishes, traffic topping, or other sealers. Coordinate with the appropriate finish manufacturer and receive written confirmation before applying.
 - 2. Moisture-Retaining Cover: ASTM C 171; regular curing paper, white curing paper, white polyethylene film at temperatures above 60 degrees F., black polyethylene film at temperatures below 80 degrees F., clear polyethylene, or white burlap-polyethylene sheet at temperatures above 60 degrees F.
 - 3. Liquid Curing Compound (Strippable, dissipating): ASTM C 309, Type 1, clear or translucent. VOC compliant, 350 g/l.
 - 4. Curing and Sealing Compound: ASTM C1315, Type 1, Class A, VOC compliant, 25% minimum solids.
 - 5. Exterior Concrete Curing Compound: Wax base, membrane forming curing compound, ASTM C309, Type II, white pigmented.
 - 6. Evaporation Retarder: BASF Confilm or approved equal.
- D. Non-Slip Abrasive: Sintered aluminum oxide, graded to pass a No. 12 sieve but retained on a No. 24 sieve, 75% minimum aluminum oxide content.
- E. Self-leveling Cement based Underlayment: Sonneborn: Sonoflow; Thoro: Underlayment – self-leveling; Ardex: K-15; L&M Construction Chemicals: Levelex Euclid Chemical Company: Flo-Top or Super Flo-Top.
- F. Floor and/or Traffic Deck Insulation: See Section 07 2100 - Insulation.
- G. Waterstop Mastic: 30 oz. caulking cartridge of bentonite/chemical mixture. Waterstop Plus: Intercontinental Construction Equipment (763-784-8406), distributed by Brock White (www.brockwhite.com).
- H. Perimeter Insulation: See Section 07 2100 - Insulation.

2.06 BONDING AND JOINTING PRODUCTS

- A. Expansion and Isolation Joint Filler: Nonextruding, resilient asphalt impregnated fiberboard or felt, complying with ASTM D 1751, 1/4 inch thick and 4 inches deep; tongue and groove profile.
- B. Slab Construction Joint Devices: Diamond shaped plate dowels, 1/4", ASTM A36; Diamond Dowel System: PNA Construction Technologies (www.pna-inc.com) or approved equal; Flat plate dowels, 1/4", ASTM A36; Speed Plate: Greenstreak Group Inc. (www.greenstreak.com) or approved equal. Do not shear plates. Remove burrs at plate edges.
- C. Slab Contraction (Control) Joint Devices: Smooth steel plate bars ASTM A36. Load Plate Basket or PD3 Basket: PNA Construction Technologies (www.pna-inc.com) or Speed Basket: Greenstreak Group Inc. (www.greenstreak.com) or approved equal. Do not shear plates. Remove burrs at plate edges.

2.07 CONCRETE MIX DESIGN REQUIREMENTS

- A. Submit concrete mix design for each type of concrete at least 30 days prior to the proposed start of placement. Mix designs must be reviewed prior to pouring concrete. Review is for conformance with specification requirements only. Contractor is responsible for performance.
- B. Concrete shall conform to the requirements of ASTM C94 (Option A) unless other requirements of this project specification are more stringent.
- C. Fiber Reinforcement: Conform to ASTM C1116, Option B. Previous tests on similar concrete mixes may be used to establish residual strength.

- D. Provide concrete with workability such that it will fill the forms, without voids or honeycombs, when properly vibrated, without permitting materials to separate or excess water to collect on the surface.
- E. Self-consolidating concrete may be used at Contractor's option where desired and shall be used where required for architectural finish or where necessary to achieve proper consolidation in locations or reinforcing congestion. Modify standard mixes as appropriate to achieve self-consolidating properties.
- F. Slump at point of discharge: 5" max. for concrete without superplasticizer and 9" max. for concrete with superplasticizer.
- G. Flow for self-consolidating concrete: 20"-30"
- H. Proportioning Normal Weight Concrete: ACI 301. Establish proportions based on the standard practices contained in ACI 211.1.
- I. Determine required average strength as required by ACI 301.
- J. Concrete Strength: Document that mixes produce required average strength for each type of concrete on the basis of field experience or trial mixtures, as specified in ACI 301.
 - 1. For trial mixtures method, employ independent testing agency acceptable to Architect for preparing and reporting proposed mix designs.
- K. Admixtures: Add acceptable admixtures as recommended in ACI 211.1 and at rates recommended by manufacturer.

2.08 CONCRETE MIX DESIGN SCHEDULE

- A. Normal Weight Concrete: Footings
 - 1. Minimum Compressive Strength, when tested in accordance with ASTM C 39/C 39M at 28 days: 3,000 psi.
 - 2. Fly Ash Content: Maximum 30 percent of cementitious materials by weight.
 - 3. Water-Cement Ratio: Maximum 0.62 by weight.
 - 4. Maximum Aggregate Size: 1-1/2" Class 1S.
 - 5. Maximum Chloride Ion Content: 0.30 percent by weight of cement.
- B. Normal Weight Concrete: Walls not exposed to view and columns integral with those walls
 - 1. Fly Ash Content: Maximum 25 percent of cementitious materials by weight.
 - 2. Water-Cement Ratio: Maximum 0.52 by weight.
 - 3. Maximum Aggregate Size: 3/4" Class 1S.
 - 4. Maximum Chloride Ion Content: 0.30 percent by weight of cement.
- C. Normal Weight Concrete: Walls exposed to view and columns integral with those walls
 - 1. Fly Ash Content: Maximum 25 percent of cementitious materials by weight.
 - 2. Maximum Aggregate Size: 3/4" Class 1S, well graded to achieve shrinkage limits specified.
 - 3. Maximum 28-day shrinkage per ASTM C157: 0.05%
 - 4. Maximum Chloride Ion Content: 0.30 percent by weight of cement.
- D. Normal Weight Concrete: Concrete walls in insulated concrete forms (ICF) and columns integral with those walls
 - 1. Minimum Compressive Strength, when tested in accordance with ASTM C 39/C 39M at 28 days: 4,000 psi.
 - 2. Fly Ash Content: Maximum 50 percent of cementitious materials by weight.
 - 3. Water-Cement Ratio: Maximum 0.52 by weight.
 - 4. Maximum Aggregate Size: 3/4" Class 1S.

5. Maximum Chloride Ion Content: 0.30 percent by weight of cement.
- E. Normal Weight Concrete: Freestanding columns
1. Minimum Compressive Strength, when tested in accordance with ASTM C 39/C 39M at 28 days: 5,000 psi.
 2. Fly Ash Content: Maximum 25 percent of cementitious materials by weight.
 3. Water-Cement Ratio: Maximum 0.50 by weight.
 4. Maximum Aggregate Size: 3/4" Class 1S.
 5. Maximum Chloride Ion Content: 1.00 percent.
- F. Normal Weight Concrete: Exterior Concrete, Garage Floors, and Parking Ramps
1. Exterior concrete includes: exterior aprons and stoop slabs, exterior sidewalks, slabs at overhead doors and loading docks, exterior walls, piers, and columns, and other similar conditions.
 2. Minimum Compressive Strength, when tested in accordance with ASTM C 39/C 39M at 28 days: 4,500 psi.
 3. Fly Ash Content: Maximum 25 percent of cementitious materials by weight.
 4. Synthetic Micro Fiber Reinforcement: Add to mix as recommended by manufacturer for specific project conditions. Minimum rate of 1.5 pounds per cubic yard. Minimum residual strength per ASTM C1399 or C1609: 45 psi. Required at slabs only.
 5. Water-Cement Ratio: Maximum 0.40 by weight.
 6. Total Air Content: 4-1/2% to 7-1/2% percent, determined in accordance with ASTM C231.
 7. Maximum Aggregate Size: 3/4" Class 4S.
 8. Maximum Chloride Ion Content: 0.10 percent by weight of cement.
- G. Normal Weight Concrete: Slabs on grade
1. Minimum Compressive Strength, when tested in accordance with ASTM C 39/C 39M at 28 days: 4,000 psi.
 2. Fly Ash Content: Maximum 25 percent of cementitious materials by weight.
 3. Synthetic Micro Fiber Reinforcement: Add to mix as recommended by manufacturer for specific project conditions. Minimum rate of 1.5 pounds per cubic yard. Minimum residual strength per ASTM C1399 or C1609: 45 psi.
 4. Water-Cement Ratio: Maximum 0.45 by weight.
 5. Maximum Aggregate Size: 3/4" Class 2S, well graded to achieve shrinkage limits specified.
 6. Maximum 28-day shrinkage per ASTM C157: 0.05%
 7. Maximum Chloride Ion Content: .30 percent by weight of cement.
- H. Normal Weight Concrete: Slabs on grade without joints
1. Minimum Compressive Strength, when tested in accordance with ASTM C 39/C 39M at 28 days: 4,000 psi.
 2. Fly Ash Content: Maximum 25 percent of cementitious materials by weight.
 3. Synthetic Macro Fiber Reinforcement: Add to mix as recommended by manufacturer for specific project conditions. Minimum rate of 5 pounds per cubic yard. Minimum residual strength per ASTM C1399 or C1609: 80 psi.
 4. Water-Cement Ratio: Maximum 0.45 by weight.
 5. Maximum Aggregate Size: 1 1/2" Class 2S, well graded to achieve shrinkage limits specified.
 6. Maximum 28-day shrinkage per ASTM C157: 0.04%
 7. Maximum Chloride Ion Content: .30 percent by weight of cement.

- I. Normal Weight Concrete: Concrete slab on steel deck
1. Minimum Compressive Strength, when tested in accordance with ASTM C 39/C 39M at 28 days: 3,500 psi.
 2. Fly Ash Content: Maximum 25 percent of cementitious materials by weight.
 3. Fiber Reinforcing: Reinforce with one of the below.
 - a. Synthetic Macro Fiber Reinforcement: Add to mix as recommended by manufacturer for specific project conditions. Minimum rate of 4 pounds per cubic yard. Minimum residual strength per ASTM C1399 or C1609: 80 psi.
 - b. Steel Fiber Reinforcement: Add to mix as recommended by manufacturer for specific project conditions. Minimum rate of 25 pounds per cubic yard. Minimum residual strength per ASTM C1399 or C1609: 80 psi.
 4. Water-Cement Ratio: Maximum 0.45 by weight.
 5. Maximum Aggregate Size: 3/4" Class 4S, well graded to achieve shrinkage limits specified.
 6. Maximum 28-day shrinkage per ASTM C157: 0.05%
 7. Maximum Chloride Ion Content: .15 percent by weight of cement.
- J. Normal Weight Concrete: Topping and Fill for Steel Pan Stairs
1. Minimum Compressive Strength, when tested in accordance with ASTM C 39/C 39M at 28 days: 3,000 psi.
 2. Fly Ash Content: Maximum 25 percent of cementitious materials by weight.
 3. Synthetic Macro Fiber Reinforcement: Add to mix as recommended by manufacturer for specific project conditions. Minimum rate of 4 pounds per cubic yard. Minimum residual strength per ASTM C1399 or C1609: 80 psi.
 4. Water-Cement Ratio: Maximum 0.57 by weight.
 5. Maximum Aggregate Size: 3/4" Class 2S, well graded to achieve shrinkage limits specified, not to exceed 75% of the minimum actual topping thickness.
 6. Maximum 28-day shrinkage per ASTM C157: 0.05%, topping slabs only.
 7. Maximum Chloride Ion Content: .15 percent by weight of cement.
- K. Normal Weight Concrete: Floor Slabs, floor beams, and grade beams
1. Minimum Compressive Strength, when tested in accordance with ASTM C 39/C 39M at 28 days: 4,000 psi.
 2. Post-tensioned concrete: Minimum compressive strength, when tested in accordance with ASTM C 39/C 39M at 3 days: 3,000 psi.
 3. Fly Ash Content: Maximum 25 percent of cementitious materials by weight.
 4. Water-Cement Ratio: Maximum 0.50 by weight.
 5. Maximum Aggregate Size: 3/4" Class 2S, well graded to achieve shrinkage limits specified.
 6. Maximum 28-day shrinkage per ASTM C157: 0.05%.
 7. Maximum Chloride Ion Content: 0.15 percent.
- L. Normal Weight Concrete: Masonry Core Fill, Bond Beams, Lintels, and Pilasters
1. Minimum Compressive Strength, when tested in accordance with ASTM C 39/C 39M at 28 days: 3,000 psi.
 2. Fly Ash Content: Maximum 25 percent of cementitious materials by weight.
 3. Water-Cement Ratio: Maximum 0.60 by weight.

4. Maximum Aggregate Size: 3/8" Class 1S.
5. Maximum Chloride Ion Content: .15 percent by weight of cement.

2.09 SOURCE QUALITY CONTROL

- A. Provide an independent testing laboratory to perform the following:
 1. At the beginning of the concrete operations for the project and for each 1,000 yards of concrete delivered to the project, test the fine and coarse aggregate gradation in accordance with ASTM C136 for conformance with this specification.
 2. Submit test results to the Architect.
- B. Submit records showing that, within the previous year, the batch plant has been certified as meeting the requirements of the National Concrete Ready Mix Association or the inspection checklist in ACI 311.4R and conforms to:
 1. Control, handling, and material storage requirements of Chapter 2 of ACI 304.
 2. Measurement requirements of Chapter 3 of ACI 304 and that batching equipment is in good condition.
 3. Batching tolerance requirements of Table 3.1.2 of ACI 304.
 4. Inspection performed by a qualified independent inspector.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify lines, levels, and dimensions before proceeding with work of this section.

3.02 PREPARATION

- A. Verify that anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely, and will not interfere with concrete placement.
- B. Do not embed pipes other than non-aluminum electrical conduit or snow melting pipes in any structural concrete.
 1. Any pipes embedded in concrete, even those meeting the guidelines given herein, are subject to acceptance by Architect. Remove any unacceptable pipes.
 2. Outside diameter of pipes placed in slabs and walls shall not exceed 25% of the thickness of the slab or wall and shall be placed in groups of not more than 3. Space pipes within a group at not less than 4 diameters clear. Space groups of pipes at not less than 48 diameters clear.
 3. Maximum total dimension or area of pipes and their fittings embedded in concrete beams and columns shall not exceed, at any location, 15% of least section dimension or 4% of the gross cross sectional area.
- C. Where new concrete is to be bonded to existing or previously placed concrete, clean existing surface to remove dust, dirt, grease, oil, curing compounds and other items that would be detrimental to bonding. Saturate existing surface with clean water (8 hours minimum), remove excess water, and slush with a neat cement grout immediately before placing new concrete.
- D. Protect existing concrete work to be exposed to view and other finished materials from damage and staining resulting from concreting operations. Cover sills, ledges and other surfaces with protective coverings as necessary to protect the work.
- E. Slabs on Grade:
 1. Verify subgrade compaction tests have been performed and are accepted.
 2. Verify subgrade is level and within acceptable tolerances.
 3. Verify subgrade is substantially dry with no freestanding water, muddy spots, or soft spots and is free from snow or ice.

4. Verify completion of all underfloor mechanical and electrical work.
 5. Provide 3 inch minimum cover bottom and 3 inch minimum cover sides at electrical conduits and other embedded items.
- F. Vapor Barrier Placement
1. Install in accordance with ASTM E1643 and manufacturer's written instructions.
 - a. Place with longest dimension parallel with the direction of the concrete pour.
 - b. Lap over footings and seal to foundation walls with vapor-proofing mastic.
 - c. Overlap joints 6 inches minimum and seal with manufacturer's tape.
 - d. Seal all penetrations including, but not limited to, pipes, conduits, columns, and piers with pipe boots in accordance with manufacturer's written instructions. No unsealed penetrations will be permitted.
 - e. Repair damaged areas by applying patches of vapor barrier, overlapping damaged area 6" and sealing on all four sides with tape.

3.03 JOINTS

- A. Locate slab on grade construction and control joints as given on Drawings and submit drawings showing proposed locations. Cut joints as soon as concrete has hardened sufficiently to prevent aggregate dislodgement. Use a "Soff Cut" saw to cut to a depth of 1 1/4" immediately after final finishing. Use a conventional saw to cut to a depth of one-fourth the slab thickness or as shown on the drawings. Complete sawing within 12 hours of placement.
- B. Vertical construction joints in walls shall be a maximum of 80 feet on center and shall be located as shown on structural drawings. Vertical control joints in wall shall be a maximum of 20 feet on center between construction joints and shall be located as shown on the structural drawings. If locations are not shown, locate joints at edges of piers integral with wall and near corners and in concealed locations where possible.
- C. Locate construction joints for beams, slabs, joists and girders in the middle 1/3 of the span. Place so they do not compromise the strength of the structure. Offset joints in a girder at least twice the beam width from a beam-girder intersection.
- D. Horizontal joints in walls and columns shall be at underside of slabs, beams and girders and at top of footings. At least 24 hours shall elapse between placing concrete in a wall or column and placing concrete in an area supported by the wall or column.
- E. Reinforcing shall be continuous across construction joints. Provide dowels where detailed or requested. Joints in walls shall be keyed with longitudinal keys at least 1-1/2 inches deep unless detailed otherwise.

3.04 CONCRETE MIXING

- A. Transit Mixers: Comply with ASTM C 94/C 94M.
- B. Use cooled or heated water in accordance with ACI 306 and 305.
- C. Air-entraining and chemical admixtures, if approved, shall be charged into mixer as a solution and dispensed by an automatic dispenser or similar metering device. Powdered admixtures shall be weighted or measured by volume as recommended by the manufacturer. Superplasticizer may be added at the job site to maintain slump.
- D. Two or more admixtures may be used in same concrete, provided such admixtures are added separately during batching sequence. Admixtures used in combination shall retain full efficiency and have no deleterious effect on concrete or on properties of each other.
- E. For fiber reinforced concrete, introduce fibers to mix when recommended by fiber supplier to maximize disbursement through the mix and to minimize balling of fibers.
- F. Ready mixed concrete shall be transported to the site in watertight agitator or mixer trucks loaded not in excess of rated capacities. Schedule and dispatch trucks from the batching point so that they shall arrive at the site of the work just before the concrete is required to avoid excessive mixing of concrete while waiting.

- G. Discharge at the site shall begin within one (1) hour after charging. Concrete may be used as long as it is of such slump that it can be placed and properly consolidated without the addition of water to the batch (other than water added prior to the start of discharge as given below). If elapsed time since batching exceeds 90 minutes, or if drum has revolved more than 300 revolutions since batching, test air content, slump, and temperature for conformance to this specification prior to placing. In no case shall the time between batching and complete discharge exceed 120 minutes. Do not permit retempering of concrete. Discard concrete that has obtained its initial set.
- H. Do not add water after the initial introduction of the mixing water for the batch, except at the start of discharge, subject to the conditions below. In this case, the producer may add water in an amount not exceeding that allowed to achieve the design water/cement ratio. The drum blades shall then be turned an additional 30 revolutions minimum at mixing speed. Water shall not be added to the batch at any later time. Reject concrete if water is added and these conditions are not met.
 - 1. The measured slump of the concrete is less than that specified in the mix design.
 - 2. No more than 60 minutes have elapsed from the time of batching.
 - 3. The ready-mix plant is notified and approves.
 - 4. Truck tickets indicate maximum amount of water to be added.
 - 5. Water is added in a manner to control volume.
 - 6. Special Inspector is notified, if concrete placement requires inspection.
- I. Maximum concrete temperature delivered to Project site shall be 85 degrees F.
- J. To use materials other than those accepted originally, or if the materials from the source originally accepted change in characteristics, make additional tests with proposed new materials that will verify production of concrete meeting with the stated requirements without causing objectionable change in the color or appearance of the structure. Pay the testing agency for these additional tests. Do not use concrete made from such different materials until the Architect has given his approval.
- K. If, during the progress of the work, it is impossible to secure concrete of the required workability and strength with the materials being furnished by the Vendor, the Architect may order such changes in the proportions or materials, or both, as may be necessary to secure the desired properties, subject to the stated requirements. Make any changes so ordered without extra compensation.

3.05 PLACING CONCRETE

- A. Place concrete in accordance with ACI 301. Follow recommended practice of ACI 304R.
- B. Place concrete for floor slabs following recommended practices of ACI 302.1R.
- C. Do not place in rain, sleet or snow unless exposed concrete surface is protected from moisture.
- D. Ensure reinforcement, inserts, and embedded parts will not be disturbed during concrete placement.
- E. Repair underslab vapor retarder damaged during placement of concrete reinforcing. Repair with vapor retarder material; lap over damaged areas minimum 6 inches and seal watertight.
- F. Separate slabs on grade from vertical surfaces with joint filler.
- G. Install joint devices in accordance with manufacturer's instructions.
- H. Install construction joint devices in coordination with floor slab pattern placement sequence. Set top to required elevations. Secure to resist movement by wet concrete.
- I. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.
- J. Place concrete continuously between predetermined expansion, control, and construction joints.
- K. Do not interrupt successive placement; do not permit cold joints to occur.

- L. If, for any reason, the concrete pour is delayed for more than 45 minutes, bulkhead pour at last acceptable construction joint. Immediately remove excess concrete and clean all forms and in situ concrete surfaces.
- M. Do not permit concrete to drop more than 4 feet from its point of release to mixers, hoppers, or conveyances. Use tremmies, chutes, or pumps as necessary to place columns and walls.
- N. Deposit concrete in wall forms in layers not greater than 24 inches in depth. Consolidate each layer before the succeeding layer is placed.
- O. Place concrete as near as possible to its final position to prevent segregation. Do not use vibrators to transport concrete.
- P. Immediately remove concrete spilled on existing surfaces.
- Q. Exercise care in placing concrete over waterproof membranes to avoid damaging the membrane. Report damage immediately, and do not proceed until the damage is repaired.
- R. Place slabs on grade according to submitted, approved joint location plan.
- S. Concrete at tops of forms: Strike concrete at top of wall, footing, and pier forms. Smooth and float to texture comparable to adjacent formed surfaces.

3.06 CONSOLIDATION

- A. Consolidation of concrete shall conform to ACI 301, unless modified herein.
- B. Follow recommended practices of ACI 309, unless modified herein.
- C. Consolidate concrete using internal vibrators.
- D. Maintain a spare vibrator at the Project Site during all placing operations.

3.07 SELF-LEVELING CEMENT BASED UNDERLAYMENT

- A. Clean surface of oil, grease, dirt, dust, curing compounds and laitance to sound concrete and according to manufacturers written instructions. Apply primer as recommended by manufacturer.
- B. Mix in accordance with manufacturers instructions. Add aggregate if required due to underlayment thickness.
- C. Pour over substrate and spread per manufacturers instructions.
- D. Protect from foot traffic until underlayment is fully cured.

3.08 CONCRETE FINISHING

- A. Concrete Finish Schedule
 - 1. Concealed walls, columns, beams, and slabs: As-cast rough form finish.
 - 2. Concealed walls to receive waterproofing: Smooth form finish
 - 3. Exposed interior concrete floors and floors to receive carpeting: Troweled finish.
 - 4. Floors to receive sand bed terrazzo: Floated finish.
 - 5. Floors to receive topping or mortar setting beds for tile or pavers: Scratched finish.
 - 6. Exterior platforms, aprons, ramps, loading docks, and garage slabs: Broom finish.
 - 7. Exposed concrete stair treads: Non-slip finish.
 - 8. Floors to receive thin-set ceramic tile, resilient flooring, and vinyl tile: Flat troweled finish.
- B. Formed Surfaces
 - 1. Repair surface defects, immediately after removing formwork.

2. Provide finishes per ACI 301 as scheduled and to the following tolerances.
3. Rough Form Finish: Rub down or chip off fins or other raised areas 1/2 inch or more in height. Rough form finish per ACI 301. Class C surface per ACI 117.
4. Smooth Form Finish: Rub down or chip off and smooth fins or other raised areas 1/8 inch or more in height. Smooth form finish per ACI 301. Class B surface per ACI 117.

C. Unformed Surfaces

1. Provide finishes per ACI 301 as scheduled herein or noted on Drawings and to the following tolerances.
 - a. Troweled Finish: Moderately flat tolerance per ACI 117. Slope slab to floor drains.
 - b. Flat Troweled Finish: Flat tolerance per ACI 117
 - c. Scratched Finish: Conventional tolerance per ACI 117.
 - d. Broom Finish: Moderately flat tolerance per ACI 117.
 - e. Floated Finish: Conventional tolerance per ACI 117.
 - f. Non-Slip Finish: Broom finish or a troweled finish with a "dry shake" abrasive application, wet abrasive prior to installation, and apply at a rate not less than 25 pounds per 100 square feet. Moderately flat tolerance.
2. Provide finishes per ACI 301 as scheduled and to the following tolerances (F Numbers) per ACI 117 and measured according to ASTM E1155.
 - a. Troweled Finish: Moderately flat tolerance.
 - 1) F(F): Specified Overall Value of 25; Minimum Localized Value of 15.
 - 2) F(L): Specified Overall Value of 20; Minimum Localized Value of 12.
 - b. Flat Troweled Finish: Flat tolerance
 - 1) F(F): Specified Overall Value of 35; Minimum Localized Value of 21.
 - 2) F(L): Specified Overall Value of 25; Minimum Localized Value of 15.
 - c. Scratched Finish: Conventional tolerance.
 - 1) F(F): Specified Overall Value of 20; Minimum Localized Value of 12.
 - 2) F(L): Specified Overall Value of 15; Minimum Localized Value of 10.
 - d. Broom Finish: Moderately flat tolerance.
 - 1) F(F): Specified Overall Value of 25; Minimum Localized Value of 15.
 - 2) F(L): Specified Overall Value of 20; Minimum Localized Value of 12.
 - e. Floated Finish: Conventional tolerance.
 - 1) F(F): Specified Overall Value of 20; Minimum Localized Value of 12.
 - 2) F(L): Specified Overall Value of 15; Minimum Localized Value of 10.
 - f. Non-Slip Finish: Broom finish or a troweled finish with a "dry shake" abrasive application, wet abrasive prior to installation, and apply at a rate not less than 25 pounds per 100 square feet. Moderately flat tolerance.
 - 1) F(F): Specified Overall Value of 25; Minimum Localized Value of 15.
 - 2) F(L): Specified Overall Value of 20; Minimum Localized Value of 12.
3. Clean exposed concrete to remove laitance, efflorescence and stains.

3.09 CURING AND PROTECTION

- A. Comply with requirements of ACI 308.1 as amended by this section. 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 above 55° F for the period necessary for hydration of cement and hardening of concrete as follows:
 1. Normal concrete: Not less than 7 days.

- C. Curing may be terminated earlier than the minimum time above if at least one of the following conditions is met:
 - 1. At least 4 field cylinders for each pour, prepared and cured according to ASTM C31 alongside the concrete they represent, reach 70% of the specified 28-day strength.
 - 2. The concrete temperature is maintained above 50°F and laboratory cylinders reach 85% of the specified 28-day strength.
- D. Formed Surfaces: Cure by moist curing with forms in place for full curing period. If forms are removed during the curing period, by one of the methods specified for unformed surfaces.
 - 1. Keep steel forms heated by the sun and all wood forms wet during the curing period.
- E. Unformed Surfaces: Apply curing materials as soon as finishing operations are complete and the concrete's sufficiently hard to be undamaged by the curing process.
 - 1. Waterproof paper or polyethylene film: Use appropriate color of film based on ambient temperature. Sprinkle concrete with water as necessary during application of covering. Lap edges and ends at least 6 inches, and seal laps. Weight down covering to prevent movement. Patch holes and tears that occur during the curing period.
 - 2. Curing Compounds: Apply strictly according to the manufacturer's instructions using low pressure spray equipment.
 - a. Maximum 300 square feet per gallon for curing and sealing compound.
 - b. Maximum 200 square feet per gallon for strippable curing compound.
 - 3. Use the following methods:
 - a. Interior floors and stairs exposed in the finished work, or receiving mastic applied adhesives: Cure using a curing and sealing compound.
 - 1) For surfaces exposed in the finished work, provide a second coat of acrylic curing and sealing compound immediately prior to substantial completion. Clean floors, and apply sealer strictly according to manufacturer's instructions.
 - b. Interior surfaces receiving adhesive applied finishes: Cure using wet curing methods or by covering with waterproof paper or polyethylene film.
 - 1) Curing and sealing compound may be used upon receipt of a letter from the adhesive manufacturer that this compound is compatible with the adhesive.
 - 2) Strippable curing compound may be used provided it is completely removed prior to installation of adhesive.
 - c. Exterior concrete: Cure using exterior concrete curing compound.
 - d. Composite (bonded) topping: Cure with moisture cover curing material. Maintain curing for full seven days. Early termination is not permitted.
 - e. All other unformed surfaces: Cure using a strippable curing compound, by wet curing methods, or by covering with waterproof paper or polyethylene film.
 - 1) Remove strippable curing compound prior to installation of cementitious or adhered finishes.
 - 4. Protect concrete from excessive changes in temperature during the curing period and at the termination of the curing process. Changes in the temperature of the concrete shall be as uniform as possible and shall not exceed 5° F in any one hour or 50° F in any 24 hour period.

3.10 HOT WEATHER CONCRETING

- A. Apply recommended practices of ACI 305R when temperature and humidity will affect placing and finishing or may cause plastic shrinkage cracking.
- B. Wet or fog forms and reinforcing immediately prior to placement to bring temperature to ambient conditions.

- C. The following additional requirements apply when the temperature exceeds 70° F.
 - 1. Provide concrete meeting the following temperature requirements:
 - a. Wind Speed 0-10 mph: Maximum Concrete Temperature 80° F.
 - b. Wind Speed 10-15 mph: Maximum Concrete Temperature 75° F.
 - c. Wind Speed 15-20 mph: Maximum Concrete Temperature 70° F.
 - d. Wind Speed 20-25 mph: Maximum Concrete Temperature 65° F.
 - 2. Do not place concrete if the relative humidity is less than 30%
 - 3. Do not place concrete without windbreaks if the wind speed at the slab elevation is greater than 25 mph.
 - 4. Maintain surface moisture during the period between placement and final finishing by using fog sprayers, evaporation reducing materials, or shade (individually or in combination).

3.11 COLD WEATHER CONCRETING

- A. Concrete placed during cold weather shall conform to the requirements of ACI 306.1.
- B. Cold weather is defined as 3 or more successive days when the average daily outdoor temperature is less than 40 degrees F.
- C. All surfaces, including subgrade and reinforcing shall be above 35 degrees F. prior to placing concrete. Surfaces shall not be more than 10 degrees warmer than the minimum concrete temperatures required by ACI 306.1.
- D. Maintain cold weather protection for the following duration but not less than the duration specified in "Curing and Protection" above:
 - 1. Maintain protection for a minimum of 48 hours after placement of concrete.
 - 2. Maintain protection for columns and supported slabs until at least 4 field cylinders, prepared and cured in accordance with ASTM C31, reach 85 percent of the specified 28-day strength, or, laboratory cured cylinders reach the specified 28-day strength.
- E. Submit detailed procedures for cold weather concreting for engineer's information only.
- F. Follow recommended practices of ACI 306R. Subject to other requirements of this section, a non-chloride accelerator may be used to normalize initial set and for early strength gain.

3.12 PERIMETER INSULATION

- A. Install over non-waterproofed foundation wall.
- B. Place on face of wall to a minimum depth of four feet below grade unless shown deeper on drawings.
- C. Secure to substrate with manufacturer-recommended adhesive until backfill is placed.
- D. If insulation is to remain uncovered for more than 30 days, protect from UV exposure with opaque covering.

3.13 FIELD QUALITY CONTROL

- A. Provide free access to concrete operations at project site and cooperate with appointed firm.
- B. Structural Testing and Special Inspection
 - 1. Structural Testing and Special Inspection shall be performed by qualified parties as specified herein, and in accordance with the provisions of Section 01 4533.

2. Personnel Qualifications

- a. Testing Technician: Technical I - ACI Certified Concrete Field Testing Technician, Grade I, employed by a testing laboratory with C.C.R.L. certification at the National Bureau of Standards, under the direct supervision of a licensed civil/structural engineer. The licensed engineer shall review and approve all reports.
- b. Special Inspector – Structural I: ICBO Certified Concrete Inspector, ACI Concrete Construction Inspector, or a graduate civil/structural engineer, or other personnel acceptable to the Structural Engineer of Record (SER), with experience in the design of structural systems of this type. Inspections shall be performed under the direct supervision of a licensed structural engineer, as defined in Section 01 4533. The licensed engineer shall review and approve all inspection reports.

3. The Owner will provide the following tests and inspections:

- a. Tests for cast in place concrete. Qualifications: Technical I.
 - 1) Compression test specimens: ASTM C31. One set of four standard cylinders of concrete for each compressive strength test. Mold and store cylinders for laboratory cured specimens.
 - 2) Compressive strength tests: ASTM C39. One set of four cylinders for each day's pour between one and 25 cubic yards. If a day's pour exceeds 25 cubic yards, one set of four cylinders for each additional 50 cubic yards, or fraction thereof. One specimen tested at 7 days for information, two at 28 days for acceptance, and one specimen retained in reserve for later testing if required. (When frequency of testing will provide less than five strength tests for a given class of concrete, conduct at least five strength tests from randomly selected batches. If fewer than five batches are used, conduct one test from each batch.)
 - 3) For post tensioned concrete, make and test an additional cylinder at three days to verify strength prior to stressing.
 - 4) Slump: ASTM C143. One test at point of discharge for each set of compression test specimens; additional tests when concrete consistency appears to have changed.
 - 5) Air entrainment: ASTM C231. Test the first batch of air entrained concrete and one additional test for each set of compression test specimens.
 - 6) Concrete temperature: Test hourly when air temperature is below 40°F or above 80°F and each time a set of compression test specimens is made.
- b. Concrete mix verification. Qualifications: Technical I. Verify the following:
 - 1) Mixer truck trip ticket conforms to approved mix design.
 - 2) Total water added to mix on site does not exceed that allowed by concrete mix design.
 - 3) Concrete quality is indicative of adequate mixing time, consistency, and relevant time limits.
- c. Observe preparation for and placement of all concrete, excluding slabs on grade, strip footings without transverse reinforcement, and unbonded topping slabs. Additional exclusions may be noted on the structural drawings. Special Inspector must be present during entire concrete pour. Qualifications: Structural I. Verify the following:
 - 1) Acceptable general condition of concrete base prior to placement.
 - 2) Concrete conveyance and depositing avoids segregation and contamination.
 - 3) Concrete is properly consolidated.
 - 4) Reinforcement remains at proper location.
- d. Observe protection and curing methods for all concrete, excluding slabs on grade, strip footings without transverse reinforcement, and unbonded topping slabs. Additional exclusions may be noted on the structural drawings. Observations to be made periodically during the curing period. Qualifications: Structural I. Verify the following:
 - 1) Specified curing procedures are followed.
 - 2) Specified hot and cold weather procedures are followed.
- e. Observe all bolts installed in concrete. Qualifications: Structural I. Verify the following:
 - 1) Specified size, type, spacing, configuration, embedment, and quantity.
 - 2) Proper concrete placement and consolidation around all bolts.

C. Contractor Requirements:

1. Provide services of an independent laboratory to perform the following:
 - a. Make and test additional cylinders to determine time for form removal.
 - b. Make and test additional cylinders to determine termination of curing procedures.
 - c. Make and test additional cylinders to determine termination of cold weather practices.
2. Provide the services of a qualified technical representative to instruct the construction team in proper batching, mixing, placement, and finishing of fiber reinforced concrete.

3.14 DEFECTIVE CONCRETE

- A. Test Results: The testing agency shall report test results in writing to Architect and Contractor within 24 hours of test.
- B. Defective Concrete: Concrete not conforming to required lines, details, dimensions, tolerances or specified requirements.
- C. Acceptance criteria for concrete strength tests shall be as outlined in section 5.6 of ACI 318. If concrete does not meet acceptance criteria, investigation generally following the provisions of section 5.6.5 of ACI 318 will be used at the discretion of the Structural Engineer of Record. Contractor shall reimburse Owner for all costs associated with this investigation. If, in the judgment of the Structural Engineer of Record, the structural adequacy cannot be shown by this investigation, the Contractor shall remove and replace the concrete in question.
- D. Repair or replacement of defective concrete will be determined by the Architect. The cost of additional testing shall be borne by Contractor when defective concrete is identified.
- E. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Architect for each individual area.

3.15 CLEAN-UP

- A. Perform concrete washout only in designated area as required by either Division 31 section Erosion Control or the project NPDES permit.

END OF SECTION

SECTION 03 30 13

CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 CONTRACT CONDITIONS

- A. Drawings, Details of Construction and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Sections, apply to work specified in this section.

1.02 SUMMARY

- A. Section Includes: Providing all items, articles and materials listed, mentioned, or scheduled on the Drawings or herein, including all labor, materials, equipment, and incidentals necessary and required for the installation of all cast-in-place concrete indicated on the Drawings or specified herein.
- B. In general, the Work involves the following:
1. Slabs on grade.
 2. Concrete fill for masonry lintels, bond beams and cores.
 3. Concrete pads and curbs for mechanical and other equipment.
- C. Products furnished under other Sections and installed by this Section:
1. Anchor bolts, setting plates and inserts.
 2. Pipe Sleeves
 3. Embedded steel and miscellaneous metal items.
- D. Related Sections:
1. Section 05 10 00 - Embedded Structural Steel, Anchor Bolts
 2. Section 05 50 00 - Embedded Miscellaneous Metal
 3. Divisions 21, 22, 23, 26, 27, and 28 - Mechanical and Electrical Equipment Pad Requirements

1.03 REFERENCES

- A. The following specifications and standards are incorporated by reference. Materials and operations shall comply with requirements of the specified issue of published reference. Where provisions of these Project Specifications are at variance with these reference specifications and recommended practices, the maximum criteria or requirements shall govern.
1. American Concrete Institute (ACI) 117-90, "Standard Specification for Tolerances for Concrete Construction and Materials"
 2. American Concrete Institute (ACI) 304R-00, "Guide for Measuring, Mixing, Transporting, and Placing Concrete"
 3. American Concrete Institute (ACI) 308.1-98, "Standard Specification for Curing Concrete"
 4. ASTM A185-02, "Steel Welded Wire Fabric, Plain, for Concrete Reinforcement"
 5. ASTM C33-03, "Concrete Aggregates"
 6. ASTM C94-03, "Ready-Mixed Concrete"
 7. ASTM C494-99a¹, "Chemical Admixtures for Concrete"
 8. ASTM E1643-98, "Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs"
 9. ASTM E1745-97, "Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs"

1.04 SUBMITTALS

- A. Make submittals in accordance with Section 01300.
- B. Cast in place concrete
 - 1. Concrete mix designs for each mix used. Include field test data to support mix proportions on request.
 - 2. Product data for admixtures, curing materials and compounds, joint fillers, vapor retarders and non-shrink grout.

1.05 QUALITY ASSURANCE

- A. Work shall conform to the following:
 - 1. ACI 315
 - 2. ACI 318
 - 3. ACI 301 except as modified by the requirements of this Section.
 - 4. ACI 347R.
- B. Maintain a copy of ACI 301 at project site.
- C. Contractor is responsible for dimensions that shall be confirmed and correlated at the job site.
- D. Contractor is responsible for the fabrication processes, techniques of construction, coordination of his work with that of all other trades, and the satisfactory performance of his work.

1.06 MATERIAL DELIVERY, HANDLING, AND STORAGE

- A. Concrete and Accessories
 - 1. Furnish delivery tickets with each load of concrete delivered to the Project. Information on each ticket shall be as required by ASTM C94 and shall also include: type of concrete (mix number); weights of all ingredients; maximum aggregate size; type, brand, an amount of admixtures; total water in the batch; maximum amount of water that can be added at the site without exceeding design mix proportions; amount of water added at site and initials of person adding water. Retain tickets until substantial completion unless directed otherwise.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Formwork
 - 1. Form Material: As given in Chapters 2 and 6 of ACI 301. Do not use aluminum materials in contact with the concrete.
 - 2. Form Release Agent shall be manufactured for the type of form material used; prevent adhesion of concrete to form material, staining of concrete or injury to exposed concrete surfaces; and be compatible with finish material applied to the concrete.
- B. Reinforcement:
 - 1. Welded Wire Fabric: ASTM A185.
- C. Cementitious materials

1. Cement: ASTM C150, Type I.
2. Fly Ash: ASTM C618, Class C or Class F.
3. Use only one type and brand of Portland cement for all exposed concrete. Architect's permission is required to change brands.

D. Concrete Aggregates:

1. Fine and coarse aggregates for normal weight structural and non-structural concrete: ASTM C33, well graded with not more than 18% and not less than 8% retained on an individual sieve, except:
 - a. Less than 8% may be retained on the coarsest sieve and the No. 50 sieve, and
 - b. Less than 8% shall be retained on sieves finer than No. 50.
 - c. The above gradation limits are required for walls and slabs on grade only.
2. Provide maximum size specified in mix design schedule.

E. Water: Clean and free from deleterious amounts of acids, alkalis or organic materials.

F. Admixtures:

1. Air Entraining Admixture: ASTM C260.
2. Water Reducing Admixtures: ASTM C494, Type A and free from chlorides and added lignin.
3. High-Range Water-Reducing Admixture (Superplasticizer): ASTM C494, Type F or G, free from chlorides and added lignin.
4. Prohibited Admixtures: Calcium chloride, thiocyanates or admixtures containing more than .05% chloride ions.
5. Do not use accelerating or retarding admixtures without written approval of the Architect.

2.02 ACCESSORIES

A. Curing Materials:

1. Interior Curing Compounds: ASTM C309, Type 1-D, compatible with other surface treatments.
2. Acrylic Curing and Sealing Compound: ASTM C309, Type 1, VOC compliant, 18% minimum solids.
3. Moisture-cover curing materials: ASTM C171, curing paper, white polyethylene film at temperatures above 60°F, black polyethylene film at temperatures below 80°F.
4. Curing compounds shall not have any adverse affect on finishes, traffic topping or sealers. Coordinate with the finish, traffic topping or sealer manufacturer and receive written confirmation before applying.

B. Vapor Barrier: Conform to the requirements of Section 07 21 00 Insulation.

C. Expansion Joint and Isolation Joint Filler: Preformed, resilient, non-extruding asphalt impregnated cane fiber, ASTM D1751.

D. Grout for bearing plates for steel beams and columns bearing on concrete and masonry: ASTM C1107, non-metallic, Grade B. Conformance to ASTM C1107 shall occur with a minimum temperature range of 45°F to 90°F, a fluid consistency, and a minimum 30 minute working time.

E. Self-leveling Cement based Underlayment: BASF/Sonneborn: Sonoflow; BASF/Thoro: Underlayment – self-leveling; BASF/Master Builders: Master Top 110 Plus Underlayment; Ardex: K-15; L&M Construction Chemicals: Levelex Euclid Chemical Company: FLo-Top or Super FLo-Top; ProSpec/Bonsal American Inc.: Level Set 300.

2.03 MIXES

- A. Submit concrete mix design for each type of concrete at least 14 days prior to the proposed start of placement. Mix designs must be reviewed prior to pouring concrete. Review is for conformance with specification requirements only. Contractor is responsible for performance.
- B. Concrete shall conform to the requirements of ASTM C94 (Option A) unless other requirements of this project specification are more stringent. Establish mix proportions according to the procedure in ACI 301.
- C. Provide concrete with workability such that it will fill the forms, without voids or honeycombs, when properly vibrated, without permitting materials to separate or excess water to collect on the surface.
- D. Provide mixes meeting the following minimum requirements:

Use	28-Day Compressive Strength (Min.)	Maximum Aggregate Size	Air Content (ASTM C231)	Maximum Water Cement Ratio	Maximum Chloride Ion Content %
Exterior Concrete, Garage Floors	5,000 psi	3/4" Class 4S	4½% - 7½%	0.40	0.15
Slabs on Grade	4,000 psi	3/4" Class 2S	----	0.45	1.00
Masonry Core Fill, Bond Beams, Lintels, Pilasters	3,000 psi	3/8" Class 1S	----	0.60	1.00

- E. Slump at point of discharge shall not exceed 6" for concrete without superplasticizer and 8" for concrete with superplasticizer.
- F. Substitution of fly ash for Portland cement shall not exceed 30% by weight of cement for footings and 25% by weight of cement for other concrete.
- G. Exterior concrete includes: exterior sidewalks, aprons and slabs; semi-exterior slabs at overhead doors, loading docks, etc.; exterior walls, etc.

PART 3 EXECUTION

3.01 PREPARATION

- A. Establish a bench mark in an accessible location and use as a reference point for various construction levels. Maintain in an undisturbed condition until final completion.
- B. Do not embed pipes other than non-aluminum electrical conduit or snow melting pipes in any structural concrete. Maximum total dimension of pipes embedded in concrete beams and columns shall not exceed 15% of least section dimension.
- C. Slabs on Grade:
 - 1. Verify subgrade compaction tests have been performed and are accepted.
 - 2. Verify subgrade is level and within acceptable tolerances.
 - 3. Vapor Barrier Placement:
 - a. Installation shall be in accordance with manufacturer's instructions and ASTM E 643-04.

- 1) Unroll vapor barrier with longest dimension parallel with the direction of the pour.
 - 2) Lap over footings and seal to foundation walls with vapor proofing mastic.
 - 3) Overlap joints 6 inches and seal with manufacturers tape.
 - 4) Seal all penetrations (including but not limited to pipes, conduits, steel columns) with pipe boots or per manufacturer's instructions. No unsealed penetrations will be allowed.
 - 5) Repair damaged areas by applying patches of vapor barrier, overlapping damaged area 6" inches and taping all four sides with tape.
 - 6) Secure to walls and seal multiple penetrations per details.
4. Verify subgrade is substantially dry with no freestanding water, muddy spots, or soft spots and is free from snow or ice.
 5. Verify completion of all underfloor mechanical and electrical work.
 6. Provide 3 inch minimum cover bottom and 3 inch minimum cover sides at electrical conduits and other embedded items.

3.02 FORMWORK ERECTION AND INSTALLATION

- A. Provide forms for all concrete work. Construct forms to slopes, lines and dimensions shown, plumb and straight and sufficiently tight to prevent leakage.
- B. Securely brace and shore forms to prevent displacement and to safely support construction loads.
- C. Lay out all work and check general building lines and levels established. Coordinate layout and measurements and if discrepancies arise, report them to the Architect.
- D. Keep wood forms wet as necessary to prevent shrinkage.
- E. Thoroughly clean all forms of debris immediately before concrete is placed.
- F. Inserts, Embedded Part And Openings
 1. Build in sleeves, thimbles and other items furnished or set in place by other trades. Accurately position and support these items. Fill voids with a readily removable material to prevent entry of concrete into voids.

3.03 INSTALLATION – REINFORCEMENT

- A. Lap wire mesh in slabs on grade so that full, uncut squares of mesh of both sheets lap each other at least 1-1/2 times or 6", whichever is greater.

3.04 JOINTS

- A. Locate slab on grade construction and control joints as given on Drawings and submit drawings showing proposed locations. Cut joints as soon as concrete has hardened sufficiently to prevent aggregate dislodgement. Cut to a depth of one-fourth the slab thickness or as shown on the drawings. Complete sawing within 12 hours of placement.
- B. Where new concrete is to be placed against concrete that has set, roughen and clean the existing surfaces. Thoroughly wet the existing surfaces and slush with a neat cement grout immediately before placing new concrete.

3.05 CONCRETE MIXING

- A. Use cooled or heated water in accordance with ACI 306 and 305.
- B. Air-entraining and chemical admixtures, if approved, shall be charged into mixer as a solution and dispensed by an automatic dispenser or similar metering device. Powdered admixtures shall be weighted or measured by volume as recommended by the manufacturer. Superplasticizer may be added at the job site to maintain the slump requirement.
- C. Two or more admixtures may be used in same concrete, provided such admixtures are added separately during batching sequence. Admixtures used in combination shall retain full efficiency and have no deleterious effect on concrete or on properties of each other.
- D. Ready mixed concrete shall be transported to the site in watertight agitator or mixer trucks loaded not in excess of rated capacities. Schedule and dispatch trucks from the batching point so that they shall arrive at the site of the work just before the concrete is required to avoid excessive mixing of concrete while waiting.
- E. Discharge at the site shall begin within one (1) hour after charging. Concrete may be used as long as it is of such slump that it can be placed and properly consolidated without the addition of water to the batch (other than water added prior to the start of discharge as given below). If elapsed time since batching exceeds 90 minutes, or if drum has revolved more than 300 revolutions since batching, test air content, slump, and temperature for conformance to this specification prior to placing. In no case shall the time between batching and complete discharge exceed 120 minutes. Do not permit retempering of concrete. Discard concrete that has obtained its initial set.
- F. Do not add water after the initial introduction of the mixing water for the batch, except at the start of discharge, subject to the conditions below. In this case, the producer may add water in an amount not exceeding that allowed to achieve the design water/cement ratio. The drum blades shall then be turned an additional 30 revolutions minimum at mixing speed. Water shall not be added to the batch at any later time. Reject concrete if water is added and these conditions are not met.
 - 1. The measured slump of the concrete is less than that specified in the mix design.
 - 2. No more than 60 minutes have elapsed from the time of batching.
 - 3. The ready-mix plant is notified and approves.
 - 4. Truck tickets indicate maximum amount of water to be added.
 - 5. Water is added in a manner to control volume.
 - 6. Special Inspector is notified, if concrete placement requires inspection.
- G. Maximum concrete temperature delivered to Project site shall be 85 degrees F.
- H. If, during the progress of the work, it is impossible to secure concrete of the required workability and strength with the materials being furnished by the Vendor, the Architect may order such changes in the proportions or materials, or both, as may be necessary to secure the desired properties, subject to the stated requirements. Make any changes so ordered without extra compensation.

3.06 PLACING

- A. Do not place concrete until all reinforcement is in place, forms have been cleaned, formwork and reinforcing inspections made, all discrepancies corrected, and Architect's permission has been given.
- B. Do not place in rain, sleet or snow unless exposed concrete surface is protected from moisture.
- C. Place concrete in accordance with ACI 301, unless modified herein.
- D. Follow recommended practices of ACI 304, unless modified herein.

- E. Protect existing concrete work to be exposed to view and other finished materials from damage and staining resulting from concreting operations. Handle concrete carefully to avoid dripping and spillage. Cover sills, ledges and other surfaces with protective coverings as necessary to protect the work.
- F. Place concrete as continuously as possible until pour is complete so that no concrete is placed against concrete that has attained its initial set, except at authorized joints. If, for any reason, the concrete pour is delayed for more than 45 minutes, bulkhead pour at last acceptable construction joint. Immediately remove excess concrete and clean all forms and insitu concrete surfaces.
- G. Place concrete as near as possible to its final position to prevent segregation. Do not use vibrators to transport concrete.
- H. Immediately remove concrete spilled on existing surfaces.

3.07 FINISHING

- A. Unformed Surfaces: Provide finishes per ACI 301 as scheduled and to the following tolerances. Conformance shall be determined by placing a freestanding straightedge on the surface. The gap beneath the straightedge shall not exceed that specified at more than 10% of the samples. Samples shall be evenly distributed over the surface and taken in an equal number of perpendicular directions with at least one sample per 100 square feet. No gap shall exceed that specified by more than 1/4".
 - 1. Troweled Finish: Conventional straightedged tolerance per ACI 117. Slope slab to floor drains.
 - 2. Scratched Finish: Bullfloated tolerance per ACI 117.
 - 3. Broom Finish: Conventional straightedged tolerance per ACI 117.
 - 4. Floated Finish: Conventional straightedged tolerance per ACI 117.
- B. Finish Schedule
 - 1. As-cast rough form finish: slabs.
 - 2. Troweled finish: Exposed interior concrete floors and floors to receive carpeting, resilient flooring, or thin set tile finishes.
 - 3. Floated finish: Floors to receive sand bed terrazzo.
 - 4. Scratched finish: Floors to receive topping, or mortar setting beds for ceramic tile, quarry tile, pavers, etc.
 - 5. Broom finish: Exterior platforms, aprons, ramps, loading docks, garage slabs.
 - 6. Non-slip finish: Exposed concrete stair treads.
- C. Clean exposed concrete to remove laitance, efflorescence and stains.

3.08 CONCRETE CURING AND PROTECTION

- A. Cure concrete according to ACI 308.1 as amended by the following requirements.
- B. Freshly deposited concrete shall be protected from premature drying and excessively hot or cold temperatures, and shall be maintained with a minimal moisture loss at a relatively constant temperature above 55°F for a total of 7 days for normal concrete or 3 days for high-early strength concrete.
- C. Curing may be terminated earlier under the following conditions:
 - 1. At least 4 field cylinders for each pour, prepared and cured according to ASTM C31 alongside the concrete they represent, reach 70% of the specified 28-day strength.
 - 2. The concrete temperature is maintained above 50°F and laboratory cylinders reach 85% of the specified 28-day strength.

- D. Protect concrete from excessive changes in temperature during the curing period and at the termination of the curing process. Changes in the temperature of the concrete shall be as uniform as possible and shall not exceed 5 degrees F in any one hour or 50°F in any 24-hour period.
- E. Unformed Surfaces:
1. Cure interior floors and stairs exposed in the finished work using an acrylic curing and sealing compound. Provide a second coat of acrylic curing and sealing compound immediately prior to substantial completion. Clean floors, and apply sealer strictly according to manufacturer's instructions.
 2. Cure exterior concrete using exterior concrete curing compound.
 3. Cure all other unformed surfaces using a curing compound or by covering with waterproof paper or polyethylene film.
- F. Apply waterproof paper or polyethylene film as soon as finishing operations are complete and the concrete is sufficiently hard to be undamaged by the covering. Use appropriate color of film based on ambient temperature. Sprinkle concrete with water as necessary during application of covering. Lap edges and ends at least 6 inches, and seal laps. Weight down covering to prevent movement. Patch holes and tears that occur during the curing period.
- G. Apply curing compounds strictly according to the manufacturer's instructions using low pressure spray equipment. Apply curing compounds as soon as finishing operations are complete, free water on the surface has disappeared and no water sheen can be seen. Apply two coats at right angles to each other where necessary to achieve proper coverage.

3.10 HOT WEATHER CONCRETING

- A. Apply recommended practices of ACI 305R when temperature and humidity will affect placing and finishing or may cause plastic shrinkage cracking.
- B. The following additional requirements apply when the temperature exceeds 70° F.
1. Provide concrete meeting the following temperature requirements:

Wind Speed (mph)	Min. Relative Humidity (%)	Maximum Concrete Temperature (° F)
0-10	30	80
10-15	30	75
15-20	30	70
20-25	30	65

2. Do not place concrete if the relative humidity is less than 30%
3. Do not place concrete without windbreaks if the wind speed at the slab elevation is greater than 25 mph.
4. Maintain surface moisture during the initial curing period between placement and final finishing by using fog sprayers, evaporation reducing materials, or shade (individually or in combination).

3.11 COLD WEATHER CONCRETING

- A. Concrete placed during cold weather shall conform to the requirements of ACI 306.1.
- B. Cold weather is defined as 3 or more successive days when the average daily outdoor temperature is less than 40 degrees F.
- C. Do not place concrete on frozen subgrades.
- D. Maintain protection for the entire curing period defined above and for a minimum of 48 hours after placement of concrete.

- E. Submit detailed procedures for cold weather concreting. Review shall be for information only.
- F. Follow recommended practices of ACI 306R.

3.12 FIELD QUALITY CONTROL

A. Testing

1. The Owner will provide the following tests and inspections:
 - a. Tests for cast in place concrete.
 - i. Compression test specimens: ASTM C31. One set of four standard cylinders of concrete for each compressive strength test. Mold and store cylinders for laboratory cured specimens.
 - ii. Compressive strength tests: ASTM C39. One set of four cylinders for each day's pour between one and 25 cubic yards. If a day's pour exceeds 25 cubic yards, one set of four cylinders for each additional 50 cubic yards, or fraction thereof. One specimen tested at seven days, two at 28 days, and one specimen retained in reserve for later testing if required. For post tensioned concrete, make and test an additional cylinder at three days to verify strength prior to stressing. (When frequency of testing will provide less than five strength tests for a given class of concrete, conduct at least five strength tests from randomly selected batches. If fewer than five batches are used, conduct one test from each batch.)
 - iii. Slump: ASTM C143. One test at point of discharge for each set of compression test specimens; additional tests when concrete consistency appears to have changed.
 - iv. Air entrainment: ASTM C231. Test the first batch of air entrained concrete and one additional test for each set of compression test specimens.
 - v. Concrete temperature: Test hourly when air temperature is below 40°F or above 80°F and each time a set of compression test specimens is made.

B. Contractor Requirements:

1. Provide services of an independent laboratory to perform the following:
 - a. Make and test additional cylinders to determine termination of curing procedures.
 - b. Make and test additional cylinders to determine termination of cold weather practices.

END OF SECTION 03 30 13

SECTION 04 20 00

NON-BEARING UNIT MASONRY

PART 1: GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings, Details of Construction and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Sections, apply to work specified in this section.

1.02 SUMMARY

- A. Section includes:

1. Furnish and install concrete masonry units where shown on the drawings.
 - a. Prior to applying cleaning agent to masonry or stone, apply to sample panel for Architect's review.

- B. Related work specified in other sections:

1. Flashings – Section 07 65 00/13.

1.03 REFERENCES

- A. The following specifications and standards are incorporated by reference. Where provisions of these Project Specifications are at variance with those reference specifications, the maximum criteria or requirements shall govern.
1. ACI 530.1/ASCE 6/TMS 602 – "Specifications for Masonry Structures"; American Concrete Institute International 2005.
 2. ASTM A82/A 82M, "Steel Wire, Plain, for Concrete Reinforcement"; 2005a.
 3. ASTM A153/A 153M, "Zinc Coating (Hot-Dip) on Iron and Steel Hardware"; 2005.
 4. ASTM A615/A 615M, "Deformed and Plain Billet-Steel Bars for Concrete Reinforcement"; 2007.
 5. ASTM C55 – "Concrete Building Brick"; 2006.
 6. ASTM C67 – "Sampling and Testing Brick and Structural Clay Tile"; 2007.
 7. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar; 2004.
 8. ASTM C150 - Standard Specification for Portland Cement; 2005.
 9. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes; 2006.
 10. ASTM C216 – "Facing Brick (Solid Masonry Units Made From Clay or Shale)"; 2007.
 11. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2007.
 12. ASTM C387, "Packaged, Dry, Combined Materials for Mortar and Concrete"; 2006.
 13. ASTM C780 - Standard Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry; 2006a.
 14. ASTM C1072 – "Measurement of Masonry Flexural Bond Strength"; 2006.
 15. ASTM C1314 – "Compressive Strength of Masonry Prisms"; 2003b. AN
 16. International Building Code (IBC) Edition enforced by local jurisdiction.

1.04 QUALITY ASSURANCE

- A. Employ and pay for the services of an independent testing laboratory acceptable to the Owner and Architect to perform the specified Source Quality Control.

1.05 SUBMITTALS

A. Submit in accordance with Section 01 33 00.

1. **Mix Design:** Submit mix designs for each mortar type at least seven days prior to preparation of job mortar and delivery to the site. Include copies of test reports for aggregate and mortar strength.
2. **Mortar Samples:** Submit samples of manufacturer's standard colors for preliminary selection. If requested, prepare and submit custom-mixed samples to match materials or colors as directed by the Architect. Prepare custom color samples using specified mix design; make 3/8" wide, tool concave smooth. Up to two different custom mortar colors may be selected for brick, in addition to standard gray mortar and colored pointing mortar.
3. **Mortar Mixes:** Test mortar for consistency, compressive strength and water retentively in accordance with ASTM C780 recommendations for preconstruction testing.
 - a. Preconstruction tests will be used to establish optimum mortar proportion and establish control values for construction testing. They are not required to meet the compressive strength requirements of ASTM C270.
4. **Test Reports**
 - a. Submit reports on manufacturer's normal quality control.
 - b. Provide report on modified ASTM C67 test for face brick as follows: Test to determine if the exterior face brick will meet the SW grade requirements of ASTM C216. Testing is recommended to document compressive strength, saturation coefficient, dimensions, distortion and potential for efflorescence. For this testing, a total of 15 bricks will be required. Make the samples representative of the whole lot of brick from which they are selected and include specimens representative of the complete range of colors and sizes of the brick in the shipment. Upon completion of testing, cut several of the brick samples and observe the cross section for the presence of stratification.
5. Submit samples of all specified masonry accessories for Architect's review.
6. Provide exterior elevation drawings showing all proposed brick expansion joints and floor plans with proposed block control joint location.

B. Masonry Samples

1. **Manufacturer's samples:** Preliminary selection of brick type and color has been based upon manufacturer's samples supplied to the Architect prior to bidding. Brick supplied to the site which, in the judgment of the Architect, varies significantly from these samples in color, color range or finish will be rejected.
2. **Preliminary sample panels:** At the site, erect a 2'-0" square panel of each brick type, incorporating the preliminary mortar selection(s) and the full range of brick color to be expected. After review by the Architect, construct additional sample panels to adjust brick range and mortar color. Do not begin final production and/or delivery of materials until acceptance of preliminary sample panel.
3. **Composite sample panel:** After acceptance of preliminary sample panel, construct a square panel as detailed incorporating all brick types, mortar colors and brick pattern shown on Drawings. Construct panel as a complete cavity wall system with weather barrier, insulation, flashing, rope wicks, cavity vents, ties and scored concrete block backup. Maintain panel as a quality control guide until completion of masonry work.

1.07 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Handle, transport and store at the job site in a manner that will avoid damage.
- B. Protect masonry units from water. Deliver the units to the job cubed on pallets.
- C. Deliver and store scored masonry units with cardboard separators to reduce chipping and other damage to block surface and edges.
- D. Store materials under cover in dry place; in manner to prevent damage, intrusion of foreign material. During freezing weather protect all masonry units with tarpaulins or other suitable material. Store concrete masonry under covers that will permit circulation of air, prevent excessive moisture absorption; protect against wetting prior to use.

PART 2: PRODUCTS

2.01 MORTAR MATERIALS

- A. Portland Cement: ASTM C150, Type I. Use of masonry cement is not permitted.
- B. Hydrated Lime: ASTM C207, Type S.
- C. Aggregates: ASTM C144.
- D. Water: Clean, potable, free of deleterious amounts of acids, alkalies or organic materials.
- E. Pre-Mixed Mortar: ASTM C387. Specific property and material requirements of this Section shall govern.
- F. Antifreeze Compounds: Not allowed in mortar to lower freezing point.
- G. Mortar Colorant: Inert, sunfast, weather resistant, alkali resistant, water insoluble, free of deleterious fillers and extenders. By Solomon Grind-Chem Service, Inc., Euclid, Twin City Concrete Co., Tamms Industries Co. or Prism Pigments.

2.02 MORTAR MEASURING AND MIXING

- A. Measure and mix mortar in accordance with ASTM C270 (Property Specifications) and as follows:

- 1. Component proportions by mortar type are as follows:

<u>Mortar Type</u>	<u>Portland Cement</u>	<u>Hydrated Lime</u>	<u>Aggregate</u>
M	1 part	1/4	See Below
S	1 part	1/4 to 1/2 part	See Below
N	1 part	1/2 to 1 1/4 parts	See Below

Volume of aggregate measured in a loose, damp condition shall be not less than 2 1/4 times and not more than 3 times the sum of the volumes of cement and lime used.

- 2. Accurately maintain and control the proportions of the mortar materials during the entire progress of the work.
- 3. Mix mortar as required for immediate use only and discard any mixed for a period exceeding 2 1/2 hours.
- 4. Thoroughly mix cementitious materials and aggregates with the amount of water to produce satisfactory workability. Machine mix all mortar.

2.03 MORTAR SOURCE QUALITY CONTROL

- A. Test proposed aggregate for conformance to ASTM C144 and these specifications.
- B. Test each mortar mix design for water retentivity and compressive strength in accordance with ASTM C270.
- C. Mix mortar in the laboratory from representative samples of materials to be used in the Work, including selected colorants. Average compressive strength at 28 days shall be as follows:

<u>Mortar Type</u>	<u>Compressive Strength Range</u>
M	2,500 psi - 3,000 psi
S	1,800 psi - 2,200 psi
N	750 psi - 1,100 psi

- D. Adjust mix design so as to achieve compatibility with brick to be supplied, considering initial rate of absorption of brick and water retentivity of mortar.
- E. Do not start masonry work until Architect has reviewed test reports and accepted mix design.
- F. Prepare and test new mix designs if mortar does not meet specifications or if, during the course of the Work, significant changes occur in aggregate or other materials.
- G. Use field measuring methods to accurately control mortar mix proportions.
- H. Testing of pointing mortar is not required.

2.04 MASONRY ACCESSORIES

- A. Reinforcing Steel: New billet stock, deformed bars, ASTM A615 Grade 60, free of mill scale, excessive rust or other coating that would prohibit proper bond with grout or mortar.
- B. Concrete block control joint: Hohmann & Barnard Control Joint, Rubber Compound, RS Series or equivalent product by Vinylex, Everlastic, or Vulcan Metal Products.
- C. Acoustic spray system: Conform to the requirements of section 07 21 00 Insulation.
- D. Detention Anchor Block as manufactured by Steel Block Co., Inc. (www.steelblock.com) or equal.
 - 1. Model SB0808 (8" x 8" x 8") constructed of 7 gauge face plates and 10 gauge web plates.
 - 2. Finishes:
 - a. At cells, toilet rooms and showers: Stainless Steel.
 - b. Other locations: Steel with 2-3 mil primer coat.

2.05 CONCRETE BLOCK

- A. Units
 - 1. Hollow load bearing units: ASTM C90, Grade N-1, normal weight. Type I.
 - 2. Concrete building brick: ASTM C55, Grade N, normal weight. Type I.
- B. Requirements
 - 1. Prism strength: As shown on drawings. If not shown, provide $f_m = 1,500$ psi.

2. Compressive strength of individual masonry units shall be as shown for the respective prism strength
 - a. $f_m = 1,500$ psi: required unit strength = 1,900 psi.
 3. Shapes: Provide plain shapes for non-reinforced walls excluding lintel, cap, and sill block units.
 4. Special Shapes: Provide non-standard blocks configured for corners, lintels, headers and control joint edges.
 5. Fire-Resistant Construction: Wherever a fire-resistant classification is indicated for unit masonry construction, provide concrete block units as tested and listed for the particular construction.
 6. Provide bullnose corners at all exposed outside corners in finished rooms and as detailed on drawings.
 7. Where exposed in interior spaces to receive paint. Provide single vertical "V" score in center of face.
- C. Fabrication: Use clean, smooth forms to eliminate voids, ridges and other blemishes visible in the finished work or which might be subject to damage during shipping and installation.

2.06 FACE BRICK

- A. Quality: ASTM C216, Grade SW. Type ###.

2.14 SOURCE QUALITY CONTROL

- A. Perform tests of each brick type in accordance with ASTM C67 to determine compliance with ASTM C216, Grade SW. Document compressive strength, saturation coefficient, initial rate of absorption, dimensional tolerance and potential for efflorescence.
- B. Perform tests of each brick/mortar combination to determine flexural bond strength in accordance with ASTM C1072.

PART 3: EXECUTION

3.01 LAYOUT

- A. Unless noted on Drawings as "clear", all dimensions on Drawings are modular, from center to center of vertical joints and from bottom to bottom of horizontal joints.
- B. Lay out exposed masonry to achieve joint pattern shown on Drawings. Where not shown, lay out exposed masonry to minimize cutting of units. Where possible, provide full 8" wide units at outside corners, jambs, and other openings.

3.02 MORTAR

- A. Mortar proportioning and mixing as specified.
- B. Tempering: The consistency of mortar may be adjusted to the satisfaction of the mason. Use mortar within two and one half (2-1/2) hours after mixing.
- C. Type: Lay masonry in mortar of the type specified below, as adjusted for compatibility with masonry units.

<u>Kind of Masonry</u>	<u>Mortar Type</u>
Exterior walls, non-load bearing at or below grade.	M
Exterior walls, non-load bearing, above grade; Brick veneer.	S
Interior non-load bearing partition walls.	N

3.03 PRECAUTIONS

- A. Protect facing material against staining; keep top of walls covered with non-staining waterproof coverings when work is not in progress.
- B. Where fresh masonry joins partially or totally set masonry, clean, roughen, lightly wet set masonry before new masonry is joined. Make necessary horizontal stop-offs by racking back masonry; do not tooth.
- C. Where units are specified to be wetted, uniformly wet units 3 to 4 hours before using.

3.04 LAYING MASONRY UNITS

- A. Lay masonry plumb, true to lines. Unless noted on drawings as "clear", all dimensions on drawings are modular, from center to center of vertical joints and from bottom to bottom of horizontal joints.
- B. Lay hollow masonry units 4 inches or less in thickness, all solid masonry units in full beds of mortar with full head joints.
- C. Lay hollow masonry units exceeding 4 inches in thickness with divided bed, head joints.
- D. Avoid over-plumbing, pounding of corner, jambs after setting masonry in position. Where an adjustment must be made after mortar has started to harden, remove mortar, replace with fresh mortar.
- E. Lay masonry within one minute of placing mortar.

3.05 BONDING AND ANCHORAGE

- A. Anchor abutting or intersecting non-load bearing walls, partitions at vertical intervals of 2 feet with corrugated ties.
- B. Where indicated anchor walls, partitions abutting or facing against steel columns, beams with flexible anchors. Unless indicated otherwise, maximum spacing; 16 inches vertically at columns, 16 inches horizontally at beams.
- C. Anchor exterior walls, veneer facing against concrete beams, columns, walls with dovetail anchors spaced 16 inches vertically, 16 inches horizontally.
- D. Anchor exterior walls parallel to open web joists with prefabricated anchoring and reinforcing assembly with adjustable rectangular ties welded to structural steel as indicated.
- E. Bond non-bearing walls, partitions of more than one wythe with wire ties; use at least one tie for each 3½ sq. ft. of wall surface; spaced maximum of 16 inches vertically, 36 inches horizontally, stagger alternate rows. Embed ties in horizontal joints.
- F. Anchor veneer to backup with ties spaced 16" horizontally and vertically.
- G. Bond bearing walls of more than one wythe as required for non-bearing walls. Fill all collar joints between all wythes with mortar.

3.07 CONCRETE MASONRY UNITS

- A. Concrete masonry erection, workmanship: Conform to requirements of ACI 530.1.
- B. Do not wet concrete masonry units.
- C. Make necessary cuts of concrete masonry with motor driven masonry saw.
- D. Units with open cells exposed in wall will not be permitted.

- E. Provide reinforced cast-in-place lintels over square head openings where indicated; formed in place with special shaped load bearing bond beam or lintel units; jointing, texture to match adjacent wall units. Fill lintels solid with grout; reinforce as indicated. Provide minimum of 8 inches bearing at ends. Provide temporary support under lintels as necessary.
- F. Provide continuous vertical control joints in concrete masonry walls where indicated; where joints are not indicated, locate maximum of 20 feet on center. Locate joints a minimum of 4'-0" beyond lintel bearing. Form joints as indicated. Bond beam reinforcing shall be continuous through control joints.
- G. In unexposed units or in block scheduled for tile or veneer plaster make joints uniform, approximately 3/8" wide, cut flush.

3.11 POINTING AND CLEANING

- A. Point up exposed masonry, fill holes, joints, remove loose mortar, cut out defective joints, repoint with mortar.
- B. Thoroughly clean exposed masonry. Before applying any cleaning agent to entire wall, apply to sample wall area or sample panel of approximately 20 sq. ft. in location approved by Architect. Do not proceed with cleaning work until sample area is approved. Use approved cleaning material, method on remaining wall area.
- C. If stiff brushes, water do not suffice clean the surface on which no green efflorescence appears with Sure-Klean Vana-Trol as manufactured by Pro So Co., Inc.
- D. Remove "problem" stains as follows with the as specified formulations of Pro So Co., Inc., or equal:
 - 1. Green Efflorescence - "Sure-Klean No. 800 Stain Remover".
 - 2. Tar, Asphalt - "Sure-Klean Asphalt & Tar Remover".
 - 3. Ferrous Stains - "Sure-Klean Ferrous Stain Remover".
- F. Do not use acid solutions for cleaning masonry units unless specifically approved by Architect.
- G. Clean off loose mortar, remove stains from concrete masonry units.
- H. Schedule, complete cleaning work as soon as possible; in any event, before Owner's signage work is commenced.

3.12 APPLICATION OF ACOUSTIC SPRAY SYSTEM

- A. Install mineral wool backing at depth required per manufacturer's details.
- B. Apply acoustic spray to required thickness and overlap onto adjacent surfaces as recommended by manufacturer to achieve specified sound transmission classification.

3.13 MORTAR FIELD QUALITY CONTROL

- A. The Owner will employ a testing agency to perform the following:
 - 1. Field test mortar for consistency, water content, mortar aggregate ratio, air content (only for those mixes with entrained air), and compressive strength in accordance with ASTM C780. Make one test for each 2,500 square feet of wall area.
 - 2. Test brick prisms for flexural bond strength in accordance with ASTM C1072. Make one test for each mortar/brick combination.
 - 3. Provide test results to Architect for comparison with laboratory results.

END OF SECTION 04 20 00

SECTION 06 65 10

SOLID SURFACE FABRICATIONS

PART 1: GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings, Details of Construction and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Sections, apply to work specified in this section.

1.02 SUMMARY

- A. Section includes: Labor, materials, equipment and accessories to provide the following:
 - 1. Solid surface window stools where noted.
 - 2. Solid surface countertops and vertical panels associated with architectural woodwork.
- B. Related work specified in other sections:
 - 1. Wood Blocking - Section 06 10 53.
 - 2. Architectural Woodwork – Division 6.
 - 3. Plastic Laminate Casework – Division 12.

1.03 SUBMITTALS

- A. Submit in accordance with Section 01 33 00.
 - 1. Shop Drawings: Drawings shall indicate sizes, color, details of fabrications, cutouts for mech/elec, furring and blocking required, and installation instructions.
 - 2. Product Data: Submit manufacturer's product data indicating compliance with specifications and maintenance, repair and cleaning recommendations.
 - a. Include maintenance kit for each color/finish.
 - 3. Samples: Submit 12" x 12" x 1/2" material samples for color selection.
 - 4. Manufacturer's qualification certification of installer.

1.05 QUALITY ASSURANCE

- A. Work of this section shall be by a certified fabricator/installer recommended by manufacturer and the distributor. Any project for food service applications or wall cladding shall be by a certified fabricator/installer recommended by manufacturer and the distributor and trained by the manufacturer and the distributor specifically for the application.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Delivery: Do not deliver product to site before product is to be installed. Product shall be delivered in protective wrapping. Wrapping shall remain in place until product is ready to be installed.

PART 2: PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable Manufacturers: DuPont Company, Wilmington, DE, CORIAN Building Products or other manufacturers who meet specification.

2.02 MATERIALS

- A. Solid polymer components
1. Cast, nonporous, filled polymer, not coated, laminated or of composite construction with through body colors meetings ANSI Z124.3 or ANSI Z124.6, having minimum physical and performance properties specified.
 2. Superficial damage to a depth or 0.010 inch shall be repairable by sanding and/or polishing.
- B. Thickness:
1. Horizontal surfaces and backsplashes: ½"
 2. Vertical surfaces: ¼"
- C. Edge treatment: As detailed.
- D. Back and side splash: Applied.
- E. Performance Characteristics:

<u>Property</u>	<u>Typical Result</u>	<u>Test</u>
1. Tensile Strength	6,000 psi	ASTM D 638
2. Tensile Modulus	1.5×10^{-6} psi	ASTM D 638
3. Tensile Elongation	0.4% min.	ASTM D 638
4. Flexural Strength	10,000 psi	ASTM D 790
5. Flexural Modulus	1.2×10^{-6} psi	ASTM D 790
6. Hardness	>85	Rockwell "M" Scale
	56	ASTM D 785
		Barcol Impressor
		ASTM D 2583
7. Thermal Expansion	1.80×10^{-5} in./in./°F	ASTM D 696
8. Gloss (60° Gardner)	5–75 (matte–highly polished)	ANSI Z124
9. Light Resistance	(Xenon Arc) No effect	NEMA LD 3-2000 Method 3.3
10. Wear and Cleanability	Passes	ANSI Z124.3 & Z124.6
11. Stain Resistance: Sheets	Passes	ANSI Z124.3 & Z124.6
12. Fungus and Bacteria Resistance	Does not support microbial growth	ASTM G21 & G22
13. Boiling Water Resistance	No visible change	NEMA LD 3-2000 Method 3.5
14. High Temperature Resistance	No change	NEMA LD 3-2000 Method 3.6
15. Izod Impact (Notched Specimen)	0.28 ft.-lbs./in. of notch	ASTM D 256 (Method A)
16. Ball Impact Resistance: Sheets	No fracture—½ lb. ball: ¼" slab—36" drop ½" slab—144" drop	NEMA LD 3-2000 Method 3.8
17. Weatherability	$\Delta E_{94} < 5$ in 1,000 hrs.	ASTM G 155

18.	Specific Gravity (Approximate weight per square foot: ¼” 2.2 lbs., ½” 4.4 lbs.)	1.7	
19.	Water Absorption	Long-term 0.4% (¾”) 0.6% (1/2”) 0.8% (1/4”)	ASTM D 570
20.	Toxicity	99 (solid colors) 66 (patterned colors)	Pittsburgh Protocol Test (“LC50” Test)
21.	Flammability	All colors (Class I and Class A)	ASTM E 84, NFPA 255 & UL 723
22.	Flame Spread Index	<25	
23.	Smoke Developed Index	<25	

F. Joint adhesive:

1. Manufacturer’s standard one- or two-part adhesive kit to create inconspicuous, nonporous joints.

G. Sealant:

1. Manufacturer’s standard mildew-resistant, FDA-compliant, NSF 51-compliant (food zone – any type), UL-listed silicone sealant in colors matching components.

2.03 FACTORY FABRICATION

A. Shop assembly:

1. Fabricate components to greatest extent practical to sizes and shapes indicated, in accordance with approved shop drawings and manufacturer’s printed instructions and technical bulletins.
2. Form joints between components using manufacturer’s standard joint adhesive without conspicuous joints.
3. Provide factory cutouts for plumbing fittings and bath accessories as indicated on the drawings.
4. Rout and finish component edges with clean, sharp returns.
 - a. Rout cutouts, radii and contours to template.
 - b. Smooth edges.
 - c. Repair or reject defective and inaccurate work.

2.04 FINISHES

- A. Colors: See Material Finish/Color Schedule, on Architectural Drawings.
- B. Finish: Provide surfaces with a uniform matte finish; gloss range of 5-20.

PART 3: EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Verify that surfaces and supports to receive cast plastic material as suitable for installation in accordance with Shop Drawings. Beginning of installation shall indicate acceptance of conditions.

3.02 INSTALLATION

- A. Install components plumb, level and rigid, scribed to adjacent finishes, in accordance with approved shop drawings and product data.
 - 1. Provide product in the largest pieces available.
 - 2. Form field joints using manufacturer's recommended adhesive, with joints inconspicuous in finished work.
 - a. Exposed joints/seams shall not be allowed.
 - 3. Reinforce field joints with solid surface strips extending a minimum of 1 inch on either side of the seam with the strip being the same thickness as the top.
 - 4. Cut and finish component edges with clean, sharp returns.
 - 5. Rout radii and contours to template.
 - 6. Anchor securely to base cabinets or other supports.
 - 7. Align adjacent countertops and form seams to comply with manufacturer's written recommendations using adhesive in color to match countertop.
 - 8. Carefully dress joints smooth, remove surface scratches and clean entire surface.
 - 9. Install countertops with no more than 1/8-inch sag, bow or other variation from a straight line.
- B. Applied backsplashes and sidesplashes:
 - 1. Install applied sidesplashes using manufacturer's standard color-matched silicone sealant.
 - 2. Adhere applied sidesplashes to countertops using manufacturer's standard color-matched silicone sealant.

3.03 REPAIR

- A. Repair or replace damaged work which cannot be repaired to architect's satisfaction.

3.04 CLEANING AND PROTECTION

- A. Keep components clean during installation.
- B. Remove adhesives, sealants and other stains.

3.05 DEMONSTRATION AND TRAINING

- A. Engage a factory-authorized representative to train Owner's maintenance personnel on using maintenance kit for repair of surfaces. Refer to Section 01 79 00 Demonstration and Training.

END OF SECTION 06 65 10

SECTION 07 13 00

MEMBRANE WATERPROOFING

PART 1: GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings, Details of Construction and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Sections, apply to work specified in this section.

1.02 SUMMARY

- A. Section includes:
 - 1. Rubberized asphalt sheet membrane waterproofing system for Shower room areas.
 - 2. Prior to installation of tile, all waterproofing shall be observed by the Architect. The Architect shall be given a minimum of 72 hours notice prior to the desired observation time. Any material covering the waterproofing that would impede observation by the Architect shall be removed and replaced at the Contractor's expense.
- B. Related work specified in other sections:
 - 1. Flexible Wall Flashing – Section 07 65 00.

1.03 REFERENCE STANDARDS

- A. The following standards and publications are applicable to the extent referenced in the text.
- B. American Society of Testing and Materials (ASTM):
 - 1. C 177 Test for Steady-State Thermal Transmission Properties by Means of the Guarded Hot Plate
 - 2. D 146 Sampling and Testing Felted and Woven Fabrics Saturated with Bituminous Substances for Use in Waterproofing and Roofing
 - 3. D 412 Tests for Rubber Properties in Tension
 - 4. D 570 Test Method for Water Absorption of Plastics
 - 5. D 3767 Practice for Rubber - Measurements of Dimensions
 - 6. E 96 Tests for Water Vapor Transmission of Materials in Sheet Form
 - 7. E 154 Testing Materials for Use as Vapor Barriers Under Concrete Slabs and as Ground Cover in Crawl Spaces
- C. Grace Test Methods
 - 1. B 134 Resistance to Hydrostatic Head
 - 2. B 135 Joint Cycling of Membranes
 - 3. B 136 Crack Cycling of Membranes
 - 4. B 138 90° Peel Adhesion for Bituthene Waterproofing Membrane to Concrete Substrate
- D. General Services Administration, Public Building Service
GSA-PBS-07115: Guide Specification for Elastomeric Waterproofing.

1.04 SUBMITTALS

- A. Submit in accordance with Section 01 33 00.
 - 1. Product Data: Submit manufacturer's product data, installation instructions, use limitations and recommendations. Include certification of data indicating Volatile Organic Compound (VOC) content of all components of waterproofing system.
 - 2. Samples: Submit representative samples of the following for approval:
 - a. Sheet membrane
 - b. Prefabricated drainage composite when specified.

1.06 QUALITY ASSURANCE

- A. Manufacturer: Sheet membrane waterproofing system shall be manufactured and marketed by a firm with a minimum of 10 years experience in the production and sales of self-adhesive sheet membrane waterproofing. Manufacturers proposed for use but not named in these specifications shall submit evidence of ability to meet all requirements specified, and include a list of projects of similar design and complexity completed within the past five years.
- B. Installer: A firm which has at least three years experience in work of the type required by this section.
- C. Materials: For each type of material required for the work of this section, provide primary material which are the products of one manufacturer.
- D. Pre-Installation Conference: A pre-installation conference shall be held prior to commencement of field operations to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work. Agenda for meeting shall include review of special details and flashing.
- E. Manufacturer's Representative: Make arrangements necessary to have a trained employee of the manufacturer on-site periodically during membrane waterproofing work to review installation procedures.

1.07 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials and products in labeled packages. Store and handle in strict-compliance with manufacturer's instructions, recommendations, and material safety data sheets. Protect from damage from sunlight, weather, excessive temperature and construction operations. Remove damaged material from the site and dispose of in accordance with applicable regulations.
 - 1. Do not double stack pallets of membrane on the job site. Provide cover on top and all sides, allowing for adequate ventilation.
 - 2. Protect mastic and adhesive from moisture and potential sources of ignition.
 - 3. Store drainage mat or protection board flat and off the ground. Provide cover on top and all sides.
 - 4. Protect surface condition from freezing.
- B. Sequence deliveries to avoid delays, but minimize on-site storage.

1.08 PROJECT CONDITIONS

- A. Perform work only when existing and forecasted weather conditions are within the limits established by the manufacturer of the materials and products used.

- B. Proceed with installation only when substrate construction and preparation work is complete and in condition to receive sheet membrane waterproofing.

1.09 WARRANTY

- A. Sheet Membrane Waterproofing: Provide within five-year material warranty issued by the membrane manufacturer upon completion of the work. Submit in accordance with Section 01 78 23.

PART 2: PRODUCTS

2.01 MANUFACTURER

- A. Waterproofing Systems by W.R. Grace Company are specified to establish the minimum level of quality. Equivalent systems by the following are acceptable subject to approval of submittals:
1. Karnak Corporation.
 2. Quaker Sealants and Coatings Company/Carlisle.
 3. Safseal 6660.
 4. Mirafi, Inc.
 5. W.R. Meadows

2.02 MATERIALS

- A. Sheet Membrane Waterproofing System: Bituthene System 3000 by W.R. Grace & Co.; a self-adhesive, cold-applied composite sheet consisting of a thickness of 56 mils of rubberized asphalt and 4 mils of cross-laminated, high density polyethylene film specially formulated for use with water-based surface conditioner. Provide rubberized asphalt membrane covered with release paper which is removed during installation. No special adhesive or heat shall be required to form laps.
- B. Sheet Membrane Waterproofing Physical Characteristics:

<u>Property</u>	<u>Typical Value</u>	<u>Test Method</u>
Color	Dark gray-black	
Thickness	60 mils	ASTM D 3767 Method A
Pliability, 180° bend over 1" mandrel at -45°F	Unaffected	ASTM D 146
Tensile Strength, membrane	250 psi (minimum)	ASTM D 412
Tensile Strength, film	5000 psi (minimum)	ASTM D 412
Elongation, ultimate failure of rubberized asphalt	300% (minimum)	ASTM D 412
Cycling Over ¼" Crack at -25°F, 100 cycles	No effect	Grace Method B 136
Cycling Over 1" Joint at -15°F, 1000 cycles	No effect	Grace Method B 135
Peel Adhesion (7 days dry (70°F) + 7 days dry (120°F) + 7 days dry (70°F))	5.0 lb./in. width	Grace Method B 138
Puncture Resistance, membrane	40 lb. (minimum)	ASTM E 154

Resistance to Hydrostatic Head	150 ft. of water	Grace Method B 134
Exposure to Fungi in Soil, 16 weeks	Unaffected	GSA-PBS-07115
Permeance	0.05 grains/sq. ft./hr./in. Hg	ASTM E 96 Method B
Water Absorption	0.1% maximum	ASTM D 570

- C. Miscellaneous Materials: Surface conditioner, mastic, liquid membrane, tape, and accessories specified or acceptable to manufacturer of sheet membrane waterproofing.

PART 3: EXECUTION

3.01 EXAMINATION

- A. Examine conditions of substrates and other conditions under which this work is to be performed and notify Architect in writing, of circumstances detrimental to the proper completion of the work. Do not proceed with work until unsatisfactory conditions are corrected.

3.02 PREPARATION OF SUBSTRATES

- A. Refer to manufacturer's literature for requirements for preparation of substrates. Surfaces shall be structurally sound and free of voids, spalled areas, loose aggregate and sharp protrusions. Remove contaminants such as grease, oil, and wax from exposed surfaces. Remove dust, dirt, loose stone, existing waterproofing and debris. Use repair materials and methods which are acceptable to manufacturer of sheet membrane waterproofing.
- B. Cast-in-Place Concrete Substrates:
1. Do not proceed with installation until concrete has properly cured and dried, minimum seven days for normal structural concrete and minimum 14 days lightweight structural concrete.
 2. Fill form tie rod holes with concrete and finish flush with surrounding surface.
 3. Repair bugholes over 1/2" in length and 1/4" deep and finish flush with surrounding surface.
 4. Remove scaling to sound, unaffected concrete and repair exposed area.
 5. Grind irregular construction joints to suitable flush surface.
- C. Masonry Substrates: Apply waterproofing over concrete block and brick with smooth trowel-cut mortar joints or parge coat.
- D. Related Materials: Treat joints and install flashings as recommended by waterproofing manufacturer.

3.03 INSTALLATION

- A. Refer to manufacturer's literature for recommendations on installation, including but not limited to, the following:
1. Apply primer/surface conditioner at dilution and rate recommended by manufacturer. Recoat areas not waterproofed if contaminated by dust. Mask and protect adjoining exposed finish surfaces to protect those surfaces from excessive application of surface conditioner.
 2. Delay application of membrane until primer/surface conditioner is completely dry. Dry time will vary with weather conditions.

3. Seal daily terminations with troweled bead of mastic.
 4. Apply membrane only in fair weather, when air and surface temperature are within limits established by manufacturer.
 5. Lap all seam 2½" minimum. Roll out all bubbles.
 6. Seal all terminations, penetrations with liquid membrane so as to make watertight.
 7. Install doubler layer of membrane over joints in precast concrete plank.
- B. Extend membrane continuous from wall flashing to bottom of footing.
 - C. Build into wall coursing and seal to flashing as shown.
 - D. Apply drainage mat or protection board and related materials in accordance with manufacturer's recommendations.

3.04 PERIMETER INSULATION

- A. Install over waterproofed basement or foundation wall as perimeter insulation.
- B. Install on face of wall to a minimum depth of 4 feet below finish grade, or as shown on Drawings.
- C. Secure to substrate with adhesive until backfill is placed.
- D. If insulation is to remain uncovered for more than 30 days, protect from UV exposure with opaque covering.

3.05 CLEANING AND PROTECTION

- A. Remove any masking materials after installation. Clean any stains on materials which would be exposed in the completed work.
- B. Protect completed membrane waterproofing from subsequent construction activities as recommended by manufacturer.

END OF SECTION 07 13 00

SECTION 07 51 15

ROOF PATCHING

PART 1: GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings, Details of Construction and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Sections, apply to work specified in this section.

1.02 SUMMARY

- A. Existing roof does not carry a warranty.
- B. Scope of work includes cutting in and patching curbs identified on Architectural, Mechanical or Electrical plans.
- C. Provide a ballasted EPDM roofing system including insulation.

1.04 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. Use experienced installers. Deliver, handle and store materials in accordance with manufacturer's instructions.
- B. FM Class I, UL Class A, Class 90 wind uplift.

PART 2: PRODUCTS

2.01 MATERIALS

- D. Ballasted EPDM
 - 1. Insulation (Based and Tapered): Polyisocyanurate insulation faced with a universal fiber glass reinforced facer as approved by roofing manufacturer.
 - 2. EPDM membrane: 60 mil at fully adhered, 45 mil at ballasted.
 - 3. Protection board: ½" high density wood fiberboard with non-asphaltic binders.
 - 4. Provide products for use with specified roofing system including, but not limited to taper primer/wash, bonding cement, lap cement, seam tape, peel and stick tape, flashing, lap caulk, sealing mastic, pourable sealer, prefabricated flashing, termination bar, fasteners / anchors, and pipe boots.
 - 5. Existing ballast may be moved and reused.

PART 3: EXECUTION

3.01 INSTALLATION

- A. Inspect substrate and report unsatisfactory conditions in writing. Beginning work means acceptance of substrate. Coordinate installation with other trades, including carpentry, flashing and penetrating work.
- B. Comply with NRCA Roofing and Waterproofing Manual and manufacturer's installation instructions.
- C. Clean, prime and prepare substrate.

- D. Install insulation in one layer with tightly butted joints and neatly fitted around penetrations.
- E. Install walkway protection membrane at locations indicated and where required to provide access to roof mounted equipment.
- F. Restore or replace damaged components. Protect work from damage.

END OF SECTION 07 51 15

SECTION 07 65 00

FLASHING

PART 1: GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings, Details of Construction and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Sections, apply to work specified in this section.

1.02 SUMMARY

- A. Section includes product specification of the following:
 - 1. Flexible and metal flashing used in masonry, exterior finish materials and exterior openings.
- B. Installation of flashings installed in other sections:
 - 1. Tile – Section 09 36 00

1.03 SUBMITTALS

- A. Submit in accordance with Section 01 33 00.
 - 1. Product data indicating proposed material conforms to specification.
 - 2. Submit samples of all specified materials for review.

PART 2: PRODUCTS

2.01 MATERIALS

- A. Products by WR Grace are specified unless noted otherwise. Equivalent products by Carlisle Coatings and Waterproofing, Miradri, Polyken, WR Meadows are acceptable.
- B. Flexible Flashing: Perm-A-Barrier Wall Flashing manufactured of 32 mils of self-adhesive rubberized asphalt integrally bonded to 8 mil of cross-laminated, high-density polyethylene film to provide a min. 40 mil thick membrane. Membrane shall be interleaved with disposable silicone-coated release paper until installed, conforming with the following:
 - 1. Water Vapor Transmission: ASTM E96, Method B: 2.9 ng/m²sPa (0.05 perms) max.
 - 2. Water Absorption: ASTM D570: max. 0.1% by weight
 - 3. Puncture Resistance: ASTM E154: 356 N (80 lbs.) min.
 - 4. Tear Resistance
 - a. Initiation ASTM D1004: min. 58 N (13.0 lbs.) M.D.
 - b. Propagation ASTM D1938: min. 40 N (9.0 lbs.) M.D.
 - 5. Lap Adhesion at -4°C (25°F): ASTM D1876: 880 N/m (5.0 lbs./in.) of width
 - 6. Low Temperature Flexibility ASTM D1970: Unaffected to -43°C (-45°F)
 - 7. Tensile Strength: ASTM D412, Die C Modified: min. 5.5 MPa (800 psi)
 - 8. Elongation, Ultimate Failure of Rubberized Asphalt: ASTM D412, Die C: min. 200%.

9. Wall Flashing Accessories:

a. Surface Conditioner:

- 1) Perm-A-Barrier Surface Conditioner: Water based latex liquid for substrate preparation conforming with the following:
 - (1.) Flash Point: No flash to boiling point
 - (2.) Solvent Type: Water
 - (3.) VOC Content: Not to exceed 125 g/L
 - (4.) Application Temperature: -4°C (25°F) and above
 - (5.) Freeze/Thaw Stability: 5 cycles min.
 - (6.) Freezing point (as packaged): -10°C (14°F)

b. Termination Mastic:

- 1) Bituthene® Mastic: Rubberized asphalt-based mastic with 20 g/L max. VOC Content.

c. Optional Primers:

- 1) Bituthene Primer WP-3000: Water-based latex primer with 110 g/L max. VOC Content.
- 2) Bituthene Primer B2: Rubber-based primer in solvent with 440 g/L max. VOC Content.

PART 3: EXECUTION

3.01 INSTALLATION OF ACCESSORIES

- A. See various technical sections listed in paragraph 1.02.B for installation of flashings.

END OF SECTION 07 65 00

SECTION 07 92 00

SEALANTS AND CAULKING

PART 1: GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings, Details of Construction and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Sections, apply to work specified in this section.

1.02 SUMMARY

- A. Exterior colored sealants:
 - 1. Joints around hollow metal.
 - 2. Miscellaneous joints where “sealant” or “caulk/caulking” is indicated on drawings.
- B. Interior colored sealants:
 - 1. Note: Sealant on materials to be painted will be installed after painting is completed and shall match paint color. A “sacrificial” backer rod shall be installed prior to painting to protect joints from paint over spray. This backer rod may be pushed into the joint or removed prior to installation of final backer rod and sealant.
 - 2. Interior joints around hollow metal, including joint between hollow metal and hard surface flooring.
 - 3. Miscellaneous joints where “sealants” or “caulk/caulking” is indicated on Drawings.
- C. Related work specified in other sections:
 - 1. Caulking around windows, storefront and curtainwall – Division 8.
 - 2. Sealants at tilework – Section 09 30 00.
 - 3. Sealing at plumbing fixtures and mechanical penetrations through rated walls – Division 21-25.
 - 4. Sealing of electrical penetrations through rated walls – Divisions 26-28.

1.03 REFERENCES

- A. ASTM C 920 – Specification for Elastomeric Joint Sealants.
- B. ASTM C 1193 – Standard Guide for Use of Joint Sealants.

1.04 SUBMITTALS

- A. Submit in accordance with Section 01 33 00.
- B. Product Data: Manufacturer’s data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods including joint design, surface preparation, and application instructions.
 - 4. Submit manufacturer’s test reports indicating test results of adhesion and/or compatibility testing of samples of substrates which either come in contact with or are in close proximity to sealants.
- C. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer’s full range of available colors or samples of custom color matches for Architect’s acceptance.

- D. Samples of Warranty.
- E. Manufacturer's approval of installer.

1.06 QUALITY ASSURANCE

A. Applicator Qualifications

1. Company specializing in performing work of this section with minimum three years documented experience, minimum three successfully completed projects of similar scope and complexity, and approved by manufacturer.
2. Designate one individual as project foreman who shall be on site at all times during installation.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Accept materials on site in manufacturer's unopened original packaging. Inspect for damage.
- B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.
 1. Store materials in a clean, dry area indoors in accordance with manufacturer's instructions.
 2. Store sealants within temperature range in accordance with manufacturer's instructions.
 3. Keep containers sealed until ready for use.
 4. Do not use materials after manufacturer's use-before date.

1.08 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.
 1. Do not apply sealants to surfaces that are wet, damp, or contain frost.
 2. Do not apply sealants when air or surface temperature is below 40 degrees F.
 3. Use caution when applying sealants when air or surface temperature is above 120 degrees F.

1.09 WARRANTY

- A. Special Installer's Warranty: Installer's standard form in which Installer agrees to repair or replace elastomeric joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 1. Warranty Period: Two years from date of Substantial Completion.
- B. Special Manufacturer's Warranty for Exterior Sealants: Manufacturer's standard form in which elastomeric sealant manufacturer agrees to furnish elastomeric joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.
 1. Warranty Period: Ten years from date of Substantial Completion.

PART 2: PRODUCTS

2.01 INTERIOR SEALANTS

- A. Polyurethane Sealant: Multi-component, high-performance polyurethane sealant conforming to ASTM C 920, Type M, Grade NS, Class 25. Maximum VOC: 25 g/L.
 - 1. Manufacturers/product:
 - a. Pecora, Dynatrol II
 - b. SIKA, SIKAFLEX 2-C
 - c. BASF MaterSeal NP2
 - d. Tremco, Dymeric 240/240FC
 - 2. Colors: Custom colors to match material or finish sealant occurs in.

2.02 ACCESSORIES

- A. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.
- B. Primer: Non-staining type, recommended by sealant manufacturer to suit application.
- C. Joint Backing: Round foam rod compatible with sealant; oversized 25 to 50 percent larger than joint width; recommended by sealant manufacturer to suit application.
- D. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.
- E. Masking Tape: Non-staining, non-absorbent tape product compatible with joint sealants and adjacent joint surfaces.

PART 3: EXECUTION

3.01 EXAMINATION

- A. Inspect joints for compliance with requirements for joint configuration, installation tolerance, and other conditions affecting joint sealant performance. Correct unsatisfactory conditions before proceeding.

3.02 PREPARATION

- A. Prepare joints in accordance with ASTM C 1193 and manufacturer's instructions.
- B. Clean out joints immediately before installing joint sealants (within 1 to 2 hours of sealant application), in accordance with joint sealant manufacturer's recommendations and the following requirements:
 - 1. Remove from joint substrates foreign material which could interfere with adhesion of joint sealant, including paints other than permanent protective coating tested and approved for sealant adhesion and compatibility by sealant manufacturer, oil, grease, waterproofing, water repellants, water dirt, and frost.
 - 2. Clean porous joint substrates using approved methods such as brushing, grinding, blast cleaning, mechanical abrading, and acid washing as appropriate, or a combination of these methods, to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining from cleaning operations by vacuuming or blowing out joints with oil-free compressed air.
 - 3. Remove laitance and form-release agents from concrete.

4. Clean metal and other nonporous substrates by using chemical cleaners or other means that neither are harmful to substrates nor leave residues capable of interfering with adhesion of joint sealants.
- C. Joint Priming: Prime joint substrates where indicated or where recommended by joint sealant manufacturer. Apply primer to comply with joint sealant manufacturer's recommendations. Confine primers to area of joint sealer bond; do not allow spillage or migration onto adjoining surfaces. Allow primer to dry before applying sealant.
- D. Masking Tape: Use masking tape where required to prevent contamination of adjacent surfaces; remove tape immediately after tooling and before sealants begin to cure without disturbing seal.

3.03 EXISTING WORK

- A. Mechanically remove existing sealants.
- B. Clean joint surfaces of residual sealant and other contaminants capable of affecting sealant bond to joint surface by mechanical means.
- C. Allow joint surfaces to dry before installing new sealant.

3.04 SEALANT INSTALLATION

- D. Comply with joint sealant manufacturer's printed installation instructions.
- E. Installation of Sealant Backings:
 1. Install joint filler to provide support of sealant during application and at position required to produce the cross-sectional shape and depth of installed sealant relative to joint width that allows optimum sealant movement capability.
 - a. Do not leave gaps between ends of joint fillers.
 - b. Do not stretch, twist, puncture, or tear joint fillers.
 - c. Remove fillers which have become wet prior to sealant application and replace with dry materials.
 2. Install bond breaker tape when joint depth is shallow to allow backer rod.
- F. Installation of Sealant:
 1. Install sealants by proven techniques that result in direct contact with and full wetting of joint substrates by joint sealant, completely filling recesses provided and providing uniform cross-sectional shapes and depths relative to joint widths. Sealant depth to be $\frac{1}{2}$ the width of the joint and $\frac{1}{3}$ the width at the center, creating an hourglass shape. Maximum depth of caulk at center to be $\frac{3}{8}$ ". Air pockets or voids are not acceptable.
 2. Immediately after sealant application and prior to the skinning or curing begins, tool sealants to form smooth, uniform beads of configuration indicated, to eliminate air pockets, and to ensure contact and adhesion of sealant with sides of joint. Remove excess sealant from surfaces adjacent to joint. Do not use tooling agents which discolor sealants or adjacent surfaces or which are not approved by sealant manufacturer.

3.05 PROTECTION AND CLEANING

- A. Protect joint sealers, during and after curing, from contamination or damage. Cut out and remove damaged or deteriorated sealers and replace with new materials.
- B. Clean excess sealants or sealant smears adjacent to joints as work progresses.

3.06 FIELD QUALITY CONTROL

- A. Perform adhesion tests on exterior sealant in accordance with manufacturer's instructions and ASTM C1193, Method A, Field-Applied Sealant Joint Hand-Pull Tab.
 - 1. Perform 5 tests for first 1,000 linear feet of applied exterior sealant and 1 test for each 1,000 feet of seal thereafter. If there is less than 1,000 feet, perform 1 test per floor per building elevation minimum.
 - 2. For sealant applied between dissimilar materials, test both sides of joint.
- B. Sealants failing adhesion test shall be removed, substrates cleaned, sealants re-installed, and re-testing performed.
- C. Maintain test log and submit report to Architect indicating tests, locations, dates, results, and remedial actions.

END OF SECTION 07 92 00

SECTION 08 14 00

WOOD DOORS

PART 1: GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings, Details of Construction and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Sections, apply to work specified in this section.

1.02 SUMMARY

- A. Section includes:
 - 1. Solid core flush wood doors and transom panels.
 - 2. Rated doors as noted on schedule and/or Code Plan.
 - 3. Factory fitting to frames (prefitting).
 - 4. Factory preparation for hardware (premachining).
- B. Related sections:
 - 1. Metal doorframes: Section 08 10 00.
 - 2. Finish hardware: Section 08 71 00.

1.03 REFERENCES

- A. Most current printing of the noted standards apply.
- B. Window and Door Manufacturers Association (WDMA) Industry Standard: WDMA I.S.1A.
- C. NFPA 80 Standard for Fire Doors and Other Opening Protectives. National Fire Protection Association.
- D. American National Standards Institute (ANSI) A115.W Series.
- E. NFPA 252: Standard Methods of Fire Tests of Door Assemblies.
- F. How to Store, Handle, Finish, Install and Maintain Wood Doors; National Wood Window and Door Association (NWWDA); undated.
- G. International Building Code (IBC) Current Edition.
- H. WDMA I.S. 1S: Industry Standard for Architectural Wood flush Doors, Window and Door Manufacturers Association.

1.04 SUBMITTALS

- A. Submit in accordance with Section 01 33 00.
 - 1. Product Data: Submit door manufacturer's product data for each type of wood door, including details of core and edge construction, and trim for openings.

2. Shop Drawings:
 - a. Location and size of each door.
 - b. Elevation of each kind of door.
 - c. Details of construction.
 - d. Location and extent of hardware blocking.
 - e. Fire ratings of doors as noted on door/opening schedule and/or Code Plan.
 - f. Requirements for factory finishing.
 - g. Documentation for UL 10C or other approved testing agency stating doors have passed UBC Standard 7-2.
3. Samples:
 - a. Beads for glazed openings: Submit 6-inch-long sections of glazing beads for each material, type, and finish required.

1.06 QUALITY ASSURANCE

- A. Quality Standards: Provide flush doors complying with the following standards:
 1. Manufacturer must be an approved WDMA Door Manufacturer in accordance with WDMA I.S.1A.
- B. Fire-Rated Wood Doors:
 1. Provide wood doors which are identical in materials and construction to units tested in door and frame assemblies per NFPA 252.
 2. Acceptable testing and inspection agencies include:
 - a. Underwriters Laboratories, Inc.
 - b. Warnock Hersey International, Inc.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Protect wood doors during transit, storage, and handling to prevent damage, soiling and deterioration. Comply with requirements of referenced standard and recommendations of NWWDA I.S. 1, Appendix, "How to Store, Handle, Finish, Install, and Maintain Wood Doors," as well as with manufacturer's instructions.
 1. Package doors at factory prior to shipping, using manufacturer's standard method.
- B. Identify each door with individual opening numbers using temporary, removable, or concealed markings.
 1. Correlate door identification with designation system used on shop drawings.

1.08 WARRANTIES

- A. Door Manufacturer's Warranty: Submit written agreement on door manufacturer's standard form signed by manufacturer, installer, and contractor, agreeing to repair or replace defective doors which warp (bow, cup, or twist), which show telegraphing of core construction in face veneers, or which do not conform to tolerance

limitations of specified quality standards. This warranty shall be in addition to, and not a limitation of, other rights the Owner may have against the contractor under the contract documents.

1. Include reinstallation which may be required due to repair or replacement of defective doors where defect was not apparent prior to hanging.
2. Warranty shall be in effect during the following period of time after date of substantial completion:
 - a. Solid core flush interior doors: Life of installation.
3. Submit per Section 01 78 23.

PART 2: PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Manufacturer:

1. Provide products complying with requirements of the contract documents and made by one of the following:
 - a. Algoma Hardwoods, Inc.
 - b. Marshfield DoorSystems Inc.
 - c. Eggers Industries.
 - d. VT Industries

B. Flush Doors: comply with requirements of WDMA I.S.1A.

C. Fire Rated Doors:

1. Construction: Manufacturer's standard core construction in accordance with testing agency requirements for fire rating indicated, and as specified herein.
2. Edges: Provide manufacturer's standard laminated edge (stile) construction for use with mortise hinges and for indicated fire resistance ratings.
3. Labels: Permanently affixed to hinge stile and in compliance with NFPA 80. For doors with continuous hinges or other hardware which may obscure the label install label at top edge of door.

2.02 SOLID CORE WOOD FACED DOORS

A. Solid Core Door (non-rated):

1. PC-5 WDMA Premium
2. Application: Non-rated interior door.
3. Faces:
 - a. Wood Veneer:
 - 1) Species: Red oak
 - 2) Cut: Plain sliced.
 - b. Solid wood:
 - 1) Natural ash or birch or maple (heartwood/sapwood).
 - 2) Cut: Plain sliced.

- 1) White ash or birch or maple (sapwood).
- 2) Cut: Plain sliced.
- 1) Brown ash or red birch (heartwood).
- 2) Cut: Plain sliced.
- b. High Pressure Decorative Laminate (HPDL):
 - 1) Laminate Color/Pattern: See Material Finish / Color Schedule on Architectural Drawings.
- c. Medium Density Overlay (MDO):
4. Construction: 5-ply Standard construction is per WDMA Extra Heavy Duty Performance Levels.
5. Core: Extra heavy duty wood based particleboard, PC. Meet WDMA performance criteria without additional blocking.
- B. Solid Core Door (rated):
 1. FD-5 WDMA Premium
 2. Application: Labeled fire door.
 3. Faces and Construction: Same as non-rated door.
 4. Core: High-density mineral core laminated to both sides of 3/4" fire retardant plywood.
 5. Reinforcing for Hardware: Fire retardant treated top rail and lockblocks for secure anchorage of hardware, without thru bolts as noted in NWWDA I.S. I-A.
 6. For 60 minute and greater rated doors installed in interior exit stairways, ramp and exit passageways, conform to maximum transmitted temperature end point of 450° when tested in accordance with ASTM 252.
 7. Provide factory primed rated astragals or metal edges as required by listing agency.
 8. Provide intumescent fire and smoke material for fire rated openings as required by door and frame manufacturer to comply with testing requirements of ASTM 252/UL 10C.
 - a. Positive Pressure Category "A" type doors required.
 9. Door assemblies installed in fire-rated corridor walls or smoke barrier walls shall meet IBC requirements for smoke and draft control as tested in accordance with UL 1784. These door assemblies shall be installed in accordance with NFPA 105.

2.03 GLAZING

- A. Glazing Stops:
 1. Non-Rated and 20 minute
 - a. Wood, of the same species/compatible with door species.
 2. Fire-Rated 45 minute or above, manufacturers options:
 - a. Flush, wood veneer clad PVC, of same species/compatible to door facing.

- b. Veneer wrapped rolled steel, of same species/compatible to door facing.
- c. Manufacturer to verify compatibility of glazing system with positive pressure requirements.

B. Glass and Glazing for Acoustical Doors:

- 1. Provided by the wood door manufacturer in accordance with requirements of Section 08 80 00.

2.04 FABRICATION

A. Fixed Panels: Provide panels of same quality, construction, and appearance as adjacent doors, as follows:

- 1. Grain and pattern matching: Comply with specified quality standards for matching of faces between doors and panels.
- 2. Transom panels: Mark top edge of transom panel to ensure correct orientation in opening.

B. Openings: Cut, trim, and seal openings in doors at the factory.

C. Prefitting: Fabricate and trim doors to size at factory to conform to hollow metal frames as shown on approved frame shop drawings and floor finishes as indicated in the finish schedule.

D. Premachining: Make all mortises and cutouts required for hardware at the factory to conform to approved hardware schedules, hardware templates, and door frame shop drawings.

2.05 FACTORY FINISHING

A. Doors to be factory finished to meet or exceed WDMA I.S. 1A TR-6.

B. Transparent Finish:

- 1. Type: Factory finish to be water-based stain and ultraviolet (UV) cured polyurethane sealer to comply with EPA Title 5 guidelines for Volatile Organic Compound (VOC) emissions limitations.
- 2. Stain color/finishing: See Material Finish/Color Schedule, on Architectural Drawings.
- 3. Grain effect: Closed.
- 4. Sheen: Satin (low luster).
- 5. Grade: Premium.

PART 3: EXECUTION

3.01 INSPECTION

A. Require installer to examine door frames after their installation, and doors prior to their hanging, for the following purposes:

- 1. To verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with plumb jambs and level heads.
- 2. To verify that doors are free of defects.

B. Obtain installer's written report listing conditions detrimental to compliance with requirements of this section.

- C. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Condition doors to average prevailing humidity in installation area prior to hanging.
- B. Hardware Installation: Section 08 71 00.
- C. Install wood doors in accordance with manufacturer's instructions and referenced standards.
 - 1. Installation of the wood doors, and labeled wood doors shall comply with WDMA I.S.1A-04, Installation and NFPA 80.
 - 2. Dimensional tolerances for hardware cutouts, undercuts, meeting edges, heights and width shall comply with WDMA I.S.1A-04
- D. Prefit Doors: Fit to frames and machine for hardware to whatever extent not previously worked at factory as required for fit and uniform clearance at each edge.
- E. Shop-Finished Doors: Restore finish on edges of shop-finished doors before installation, if fitting or machining is required at the project site. Touch up any scratched doors to satisfaction of Architect prior to substantial completion or replace doors.

3.03 CLEANING AND ADJUSTMENT

- A. Replace doors that are warped, twisted, show through or not true in plane and that do not follow the warranty.
- B. Operation: Rehang or replace doors which do not swing or operate freely, as directed by the Architect.
- C. Refinish or replace doors damaged during installation, as directed by the Architect.
- D. Institute protective measures as recommended and accepted by door manufacturer to ensure that wood doors will be without damage or deterioration at time of substantial completion.

END OF SECTION 08 14 00

SECTION 08 31 00

ACCESS PANELS

PART 1: GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings, Details of Construction and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Sections, apply to work specified in this section.

1.02 SUMMARY

- A. Section includes: Wall and ceiling access panels as noted on Drawings and specified herein.
- B. Related work specified elsewhere:
 - 1. Openings in masonry - Section 04 20 00.
 - 2. Cylinder locks - Section 08 71 00.
 - 3. Openings in gypsum board - Section 09 21 16.

1.03 SUBMITTALS

- A. Submit in accordance with Section 01 33 00.
 - 1. Shop Drawings

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Package, handle, deliver and store at the job site in a manner that will avoid damage.

PART 2: PRODUCTS

2.01 MANUFACTURERS

- A. Nystrom Products are specified, with comparable units by Milcor, Inc., Karp Associates, JL Industries and Cesco Products acceptable.

2.02 UNITS

- A. Access Panel #1 (AP #1): Flush mounted wall or ceiling access panel model NW (cam latch), (mortise prep cylinder by 08 71 00) (22x22 door) for drywall.
- B. Access Panel #3 (AP #3): Flush mounted access panel model NT (mortise prep, cylinder by 08 71 00), (24x24 door) for masonry.
- C. Access Panel #4 (AP #4): Fire rated access panel model IT (36x48 door) for masonry with mortise prep (cylinder by Section 08 71 00).
- D. Access Panel #5 (AP #5): Fire rated access panel model IW for drywall (36x48 door) with mortise prep (cylinder by Section 08 71 00).

PART 3: EXECUTION

3.01 INSPECTION

- A. Verify that openings are correctly dimensioned to receive doors.
- B. Verify proper rating on fire rated panel.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's current printed recommendations, in locations indicated on architectural reflected ceiling plans and architectural floor plans.
- B. Coordinate exact locations to access mechanical/electrical equipment.
- C. Attach double layer of gypsum board to recessed ceiling panels in gypsum board ceilings and a single layer of gypsum board and a layer of acoustical tile in areas with acoustical tile glued to gypsum board.

3.03 ADJUST AND CLEAN

- A. Adjust latching mechanism to operate smoothly.
- B. Leave work area clean and free of debris.

END OF SECTION 08 31 00

SECTION 08 71 00

FINISH HARDWARE

PART 1: GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings, Details of Construction and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Sections, apply to work specified in this section.

1.02 SUMMARY

- A. This Section includes the furnishing and installing of all finish hardware material specified herein, listed in the hardware schedule, or required by the Drawings.
- B. Cylinders for:
 - 1. Access panel doors as required by Section 08 31 00.
- C. Items of hardware include:
 - 1. Finish hardware
 - 3. Thresholds and weatherstrip

1.03 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 08 14 00 - Wood Doors.
- B. Section 08 31 00 - Access Panels.
- C. Division 10 - Toilet Partitions: Hardware.

1.04 REFERENCES

- A. Builders' Hardware Manufacturers Assoc., Inc. (BHMA), 60 E. 42nd St., New York, NY 10017.
 - 1. Recommended locations for builders' hardware.
- B. American National Standards Institute, Inc. (ANSI), 1430 Broadway, New York, NY 10018.
 - 1. A115.2 - Specifications for standard steel door and frame preparations for bored cylindrical locks for 1-3/8" and 1-3/4" doors.
- C. National Fire Protection Association, Inc. (NFPA), Battery March Park, Quincy, MA 02269.
 - 1. NFPA 80 - Standard for fire doors and windows.
 - 2. NFPA 101 - Code for safety to life from fire in buildings and structures.
- D. Underwriters Laboratories, Inc. (UL), 333 Pfingsten Road, Northbrook, IL 60062.
 - 1. Building Materials Directory.

- E. Builders' Hardware Manufacturers Assoc., Inc. (BHMA), 60 E. 42nd Street, New York, NY 10017.
 - 1. Recommended locations for builders' hardware.
- F. Building Codes: International Building Code, Adopted Edition.
 - 1. Include State amendments modifying model codes in jurisdiction where project is constructed.

1.05 QUALITY ASSURANCE

- A. Except where specified in the hardware schedule, furnish products of only one manufacturer for each type of hardware.
- B. Supplier: Company specializing in the builders' hardware industry.
- C. Provide hardware for fire-rated openings conforming to UBC Standard 7-2.
- D. Provide hardware for fire-rated openings conforming in compliance with NFPA 80 1995 Edition.

1.06 REGULATORY REQUIREMENTS

- A. Furnish hardware listed by UL testing agency for all rated openings in conformance with requirements for the class of opening scheduled.
- B. Rating requirements have precedence over this specification where conflict exists.
- C. Furnish and install hardware that is in compliance with American with Disabilities Act of 1990 (ADA) technical standards, and current State Building Code.

1.07 SUBMITTALS

- A. Submit in accordance with Section 01 33 00.
 - 1. Schedules
 - a. Immediately after award of the hardware contract, submit a detailed, vertical type hardware schedule and cut sheets for each type of hardware for approval. On existing buildings field verify existing swings and functions prior to submitting schedule.
 - b. Itemize hardware in the sequence and format established by this specification.
 - 1. List and describe each opening separately; include door number, room designations, degree of swing, and hand.
 - 2. List related details; include dimensions, door and frame material, and other conditions affecting hardware.
 - 3. List all hardware items; include manufacturer's name, quantity, product name, catalog number, size, finish, attachments, and related details where applicable.
 - c. Submit manufactures cut sheets on each type of hardware proposed.
 - d. Resubmit the corrected schedule when required.

- e. Determine keying requirements by meeting with the Owner coordinated through the Architect, and submit a detailed keying schedule for review; resubmit the corrected schedule when required.
3. Samples: Submit samples of hardware items as may be required by the Architect; identify each sample and indicate the location of subsequent installation in the project.
4. Templates: Furnish a copy of the approved hardware schedule and all pertinent templates or template information to each fabricator of material factory-prepared for the installation of hardware.
5. Include documentation for UL 10C or other approved testing agency stating hardware has passed UBC Standard 7-2.

1.08 DELIVERY, STORAGE AND HANDLING

- A. Deliver hardware to the job site in the manufacturer's original containers that have been marked to correspond with the approved hardware schedule for installation location.
- B. Store hardware in dry surroundings and protect against loss and damage.

PART 2: PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS/MATERIALS

A. Hinges

1. Butt hinge manufacturers and respective catalog numbers:

	<u>IVES</u>	<u>Hager</u>	<u>Stanley</u>	<u>McKinney</u>	<u>Bommer</u>
a.	5PB1	1279	F179	T2714	5000
b.	5BB1	BB1279	FBB179	TB2714	BB5000
c.	5BB1 630	BB1191	FBB191	TB2314	BB5002
d.	5BB1HW	BB1168	FBB168	T4B3786	BB5004
e.	5BB1HW630	BB1199	FBB199	T4B3386	BB5006

2. Continuous hinges manufacturers and respective catalog numbers:

<u>Markar</u>	<u>Stanley</u>	<u>Ives</u>	<u>McKinney</u>
300 Series	600 Series	700 Series	MCK-300 Series

- a. Continuous hinges shall be full height pin and barrel type hinge providing full height door support up to 600 pounds. Edge mount (unless noted otherwise).
- b. Hinges shall be constructed of heavy-duty 14-gauge material. The stainless internal pin shall have a diameter of .25 and the exterior barrel diameter of .438.
- c. Hinge shall be non-handed with symmetrical templated hole pattern and factory drilled. Hinge must accept a minimum of 21 fasteners on the door and 21 fasteners on the frame.
- d. Each knuckle to be 2", including split nylon bearing at each separation for quiet, smooth, self-lubricating operation.
- e. Hinge to be able to carry Warnock Hersey Int. or UL for fire rated doors and frames up to three hours. Note: Fire label for doors and frames should be placed on the header and top rail of rated doors and frames.

- f. Provide adjusting screws equal to Markar's "AdjustaScrew" for continuous hinges specified as HG-305. Adjustment to be able to correct frame fit problems up to 3/8".

3. When hinges are specified on the hardware schedule, furnish:

- a. Interior openings through 36 inches wide and 60 inches high without a door closer: Two (2) standard-weight, plain bearing hinges #1279 per leaf.
- b. Interior openings through 36 inches wide and 90 inches high without a door closer: Three (3) standard-weight, plain bearing hinges #1279 per leaf.
- c. Interior openings through 36 inches wide and 60 inches high with a door closer: Two (2) standard-weight, ball bearing hinges #BB1279 per leaf.
- d. Interior openings through 36 inches wide and 90 inches high with a door closer: Three (3) standard-weight, ball bearing hinges #BB1279 per leaf.
- e. Interior openings over 36 inches in width and/or 90 inches in height: One (1) continuous hinge per leaf.
- f. Exterior hollow metal or stainless steel openings: One (1) continuous hinge per leaf.
- g. Exterior aluminum openings through 36 inch wide and 90 inches high: Four (4) heavyweight ball bearing hinges #BB1199xNRP per leaf.
- h. Exterior aluminum openings over 36 inches wide in width and/or 90 inches in height: One (1) continuous hinge per leaf.

B. Flush Bolts and Dustproof Strikes

1. Manufacturers and respective catalog numbers:

	<u>Ives</u>	<u>Door Controls</u>	<u>Hager</u>	<u>Rockwood</u>
a.	DP2	80	280X	570
b.	FB31P	842	292D	1842
c.	FB41P	942	291D	1942
d.	FB458	780	282D	550

- 2. Non-labeled openings: Furnish two flush bolts FB458 for the inactive leaf of pairs of locked or latched doors. Locate centerline of the top bolt not more than 78" from the finished floor. Furnish dustproof strike DP2 for the bottom bolt.
- 3. Labeled openings: Furnish automatic flush bolt set FB31P or FB41P, as applicable, for the inactive leaf of pairs of doors; furnish dustproof strike DP2 for the bottom bolt.

D. Locks

1. Manufacturers and respective catalog numbers:

Corbin-Russwin
ML2000 LWA

- 2. Furnish lock types and functions specified in the hardware schedule, with the following provisions:
 - a. Provide interchangeable cores at all exterior doors and all exit devices.
 - b. Provide interchangeable cores at all locations.

c. Strikes:

- 1) Wrought box type for the inactive leaf of pairs of wood doors, or wood frames.
 - 2) Lip length sufficient to protect trim, frame or inactive leaf.
3. Furnish knurled lock knobs or lever handles on doors to stairs other than exit stairs, loading platforms, stages, boiler rooms, and other hazardous locations.
4. Lever handles must be cast brass, bronze or stainless steel construction and conform to ASNI A117.1.
5. Provide and install wiring from electric lockset to power supply.

E. Cylinders: Corbin-Russwin

F. Pulls, Push Plates/Bars, Flush cup pulls

1. Manufacturers and respective catalog numbers:

	<u>Item</u>	<u>Hager</u>	<u>Hiawatha</u>	<u>Burns</u>	<u>Rockwood</u>
a.	Pull	10Q 18"	518B-18"	26C-18"	118
b.	Push Plate (flush doors	30s 8x16	200K	57	70F
c.	Push Plate (6" stile doors)	30s 4x16	200F	54	70C
d.	Pushbar	130s	1081LBP	422	47
e.	Flush Cup Pulls	27p	-	-	BF97

G. Coordinators

1. Manufacturers and respective catalog numbers:

<u>Ives</u>	<u>Door Control</u>	<u>Hager</u>	<u>Rockwood</u>
COR	600	297D	1600

2. Furnish a COR series coordinator for labeled pairs of doors equipped with automatic flush bolts or vertical rod-mortise lock fire exit device combinations with astragals.
3. Furnish filler bars for total opening width, closer mounting brackets, carry bars, and special preparation for top latches where applicable.
5. Determine closer size in accordance with manufacturer's recommendations for application on the room side of corridor doors, stair side of stair doors, and interior side of exterior doors.
6. Provide SRI rust inhibitor primer for all closers in pools and corrosive areas.

H. Closers

1. Manufacturers and respective catalog numbers:

<u>LCN</u>	<u>Sargent</u>	<u>Norton</u>	<u>Yale</u>
4011/4111 Series	351P10	7500 Series	4400 Series

2. Where closers are listed in the hardware schedule, furnish 4011/4111, 351P10, PR7500, PR4400 series unless other functions/series are specified in the hardware groups.

3. Furnish complete with all mounting brackets, drop plates and special shoes as may be required by the door and frame conditions.
 4. Furnish through bolt attachments for closers specified for mineral core doors, unless solid wood blocking is provided for attachment.
 5. Determine closer size in accordance with manufacturer's recommendations for application on the room side of corridor doors, stair side of stair doors, and interior side of exterior doors.
 6. Provide SRI rust inhibitor primer for all closers in pool and corrosive areas.
- I. Kick Plates: Where kick plates are specified in the hardware schedule, furnish 16 gauge, .050" plates, with the following dimensions:
1. Width: 2" less than door width.
 2. Height: 8" (unless noted different on door schedule.)
 3. All kick plates shall be beveled 4 sides and counter sunk.

J. Overhead Stops

1. Manufacturers and respective catalog numbers:

	<u>Glynn-Johnson</u>	<u>Rixson-Firemark</u>
a. GJ450		10
b. GJ90		9
c. GJ100		1
2. Furnish a GJ90 series overhead stop for all doors equipped with regular arm surface type closers that swing more than 140 degrees before striking a wall and for all doors that open against equipment, casework, sidelights, or other objects that would make wall bumpers inappropriate.
3. Furnish a GJ90 or GJ100 series overhead holder where listed in the Hardware Schedule.
4. Furnish sex bolt attachments for mineral core door applications, unless solid wood blocking is provided in the door for attachment.

K. Floor and Wall Stops and Holders

1. Manufacturers and respective catalog numbers:

	<u>Ives</u>	<u>Hager</u>	<u>Burns</u>	<u>Rockwood</u>
a. Wall bumper	WS407CVX	232W	570	407
b. Wall stop	WS11X	255W	530	475
c. Floor stop	FS435/FS436	241F/246B	510/525	441U
d. Wall holder	WS40	326W	533	490
e. Exterior Floor Stop	FS9			
2. Furnish a WS407CVX series wall stop, as applicable, for each door leaf except where wall bumper WS11X, floor stops FS435/FS436, holders WS20X, wall holder WS40 or overhead stops/holders are specified in the hardware schedule.
3. Where wall stops are not applicable, furnish overhead stops as previously specified within this section of the specification.

L. Thresholds, Weatherstrips and Jamb Gaskets

1. Manufacturers and respective catalog numbers:

	<u>Reese</u>	<u>Pemko</u>	<u>National Guard</u>
a. Saddle threshold	S205A	171A	425E
b. Half saddle threshold	S245A	229A	325 Alum
c. Bumper seal threshold	S483AV	2005AV	896 Alum (Vinyl)
d. Weatherstrip	755A	2891APK	700NA
e. Astragal weatherstrip	804	Pair 309	185
f. Sweep	964C	18061CP	B606A
g. Head and Jamb Gasket	797	S88	5050
h. Drip	R201	346	16
i. Jamb sound seal	F499	350CSR	1038
j. Auto door bottom	F521	430CPKL	420

2. Where specified in the hardware groups, furnish the above products unless otherwise details in groups.

3. Furnish 5050 head/jamb gaskets and NGP 9605 edge stile astragals for pairs, at all fire labeled doors whether listed in group or not. *Reese and Pemko equivalents approved based on passing UL 10C, UBC test Standard 7-2.

4. Coordinate with door manufacturer the intumescent fire and smoke material for fire rated openings as required by door and frame manufacturer to comply with UL 10C, UBC test 7-2.

5. When “threshold” appears within a hardware group provide the following:

- At aluminum entrances on new buildings provide a half saddle threshold.
- At aluminum entrances on existing buildings provide a saddle threshold.
- At interior door ways provide a saddle threshold.
- At exterior doorways from occupied rooms and HM or FRP exit only doors provide a bumper seal threshold.
- At exterior HM or FRP doors to receiving areas, loading docks and boiler rooms provide a saddle threshold.

M. Lock Protectors

1. Manufacturers and respective catalog numbers.

Ives
LG1-LG14

O. Accessibility Closers

1. Manufacturer: LCN is specified.

- When the term “accessibility closers” appears on the hardware schedule, provide a complete system, including all necessary brackets, mounting plates, tubing and the following items:

1) Closer: Auto Equalizer #4822.

2) Actuators: #8310-856 Provide two (2) per door leaf.

3) Control Box: #7982ES Provide one (1) box for every two (2) door leafs for vestibule locations. Provide one box for single door leafs at other locations.

4) Tubing: #925 (Length as required.)

P. Bifold Door Hardware

1. Acceptable manufacturers and respective catalog numbers:

Stanley
BFC-125

Lawrence
ED600

K.N. Crowder
C-106-4-C-104

2. Bifold hardware to include track, hangers, hinges, snugger, top and bottom pivots and pulls.

2.03 ACCESSORIES AND ATTACHMENTS

A. Furnish all necessary hardware accessories such as wood or machine screws, bolts, nuts, anchors, toggle bolts, and other fasteners, each of the type, size, material and finish for its intended purpose and each according to the material to which the hardware is being applied.

2.04 FINISH AND BASE METALS

A. Finish and Base Metal:

Butt Hinges-Interior	US26D on steel
Flush Bolts	US26D on brass or bronze
Exit Devices	US26D on brass or bronze
Locks	US26D on brass or bronze
Pulls And Push Plates/Bars	US32S on stainless steel
Closers	Sprayed AL on cast iron or aluminum
Protective Plates	US32D on stainless Steel
Overhead Stops	US32D on stainless steel
Wall Stops	US26D on brass, bronze, or steel
Miscellaneous	US26D on brass or bronze

2.05 KEYING

- A. Change key and masterkey all lock cylinders as directed by the Architect.
- B. Furnish two change keys for each lock, six masterkeys for each masterkey set, and two removable core control keys.
- C. Stamp keys with file key number and "Do Not Copy."
- D. Ship masterkeys and control keys to the Owner via registered mail.
- E. Permanent cylinder cores shall be installed by the contractor under the supervision of an owner's representative.

PART 3: EXECUTION

3.01 INSTALLATION

- A. Install hardware in accordance with manufacturer's recommendations / instructions, and the adopted Building Code.
- B. Install hardware on UL labeled openings in accordance with manufacturer's requirements, so as to maintain the label.
- C. Install hardware mountable weatherstripping continuous throughout opening prior to installation of other hardware.

- D. Mortise and cut to close tolerance and conceal evidence of cutting in the finished work.
- E. Remove, cover or protect hardware after fitting until paint or other finish is applied; permanently install hardware after finishing operations are complete.
- F. Install closers on the room side of corridor doors, stair side of stairways, and interior side of exterior doors.
- G. Mounting heights:
 - 1. Install hardware at mounting heights conforming to the recommended mounting locations of the Builders' Hardware Manufacturing Association, and the adopted Building Code.
 - 2. Install wall stops WS11X, wall holders WS20X, and magnetic holders to strike near top of doors, but not more than 78" from the finished floor line; install wall stops WS407CVX to engage knobs, levers or pulls.
- H. Install pulls at 40" to top of pull and push bars at 36" above finished floor. Off set pull on exterior door rails to allow access to cylinders.
- I. Deliver to the Owner one complete set of installation and adjustment instructions, and tools as furnished with the hardware.
- J. Before hardware installation, general contractor/construction manager shall coordinate a hardware installation seminar to be conducted on the rough-in of electrical boxes for hardware and the installation of hardware, specifically of locksets, closers/accessibility closers, exit devices, hardware, mountable weatherstrip and overhead stops. Manufacturer's representative of the above products to present seminar. Seminar to be held at the job site and attended by installers of hardware (including low voltage hardware) for aluminum, hollow metal and wood doors. Training to include use of installation manuals, hardware schedule, templates and physical product samples. The architect needs to be informed of the meeting and contractor is to distribute meeting minutes on issues raised at seminar.
- K. Install per door and/or frame manufacturer's supplemental "S" label instructions on fire rated openings.

3.02 ADJUSTING AND CLEANING

- A. At final completion, adjust and test all hardware for function, performance, building code compliance and leave in good operating condition. Panic Hardware device manufacturer's representative to inspect panic hardware installation and provide a report to contractor and architect on items that need correction.
- B. Clean all hardware to restore the original finish.

3.03 PROTECTION

- A. Protect the finished installation until acceptance of the project.
- B. Provide final adjustment or cleaning where necessary.

3.04 DEMONSTRATION

- A. Engage a factory-authorized service representative(s) to train Owner's maintenance personnel to adjust, operate, and maintain door hardware and door hardware finishes. At a minimum, provide the following training:

1. Miscellaneous hardware	1 hour
2. Exit devices	2 hours
3. Locks	1 hour
4. Closers	1 hour

- | | | |
|----|-----------------------|---------|
| 5. | Electromagnetic locks | 2 hours |
| 6. | Accessibility closers | 2 hours |

Refer to Section 01 79 00 Demonstration and Training.

3.05 HARDWARE GROUP #1

3.06 HARDWARE GROUP #2

END OF SECTION 08 71 00

SECTION 09 21 16

GYPSUM BOARD

PART 1: GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings, Details of Construction and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Sections, apply to work specified in this section.

1.02 SUMMARY

A. Section includes:

1. Non load bearing interior metal stud framing for drywall.
2. Gypsum wallboard and joint system.
3. Installation of acoustic spray system at top of walls and penetrations (sealing of mech/elec penetrations is specified in Div 21-28) as noted on drawing.
4. Mold and moisture resistant gypsum board at inside face of exterior walls.
5. Tackwall board laminated to gypsum board and adhered to concrete block, with snap reveal trim at perimeter to terminate fabric by 09 72 00.
6. Installation of rubber closures at steel roof deck.
7. Sound batt insulation and acoustic sealant at gypsum board.
8. Gypsum tile backer board as a substrate for porcelain or ceramic wall tile.
9. "Z" furring and rigid wall insulation.
10. Abuse resistant and/or high impact gypsum board.
11. Cement board as called out on the drawings.
12. Shaft wall framing and board.

B. Related work specified in other sections:

1. Load bearing, exterior and structural stud framing - Section 05 40 00.
2. Lath and plaster - Section 09 23 00/09 24 00.
3. Rubber closures for steel deck - Section 05 30 00.
4. Priming and fabric for tackwalls - Section 09 91 00 and 09 72 00.
5. Insulation - Section 07 21 00.
6. Spray Polyurethane Foam Insulation Section 07 21 29.

1.03 SUBMITTALS

- A. Submit in accordance with Section 01 33 00.
 - 1. UL listings for gypsum board partitions for proposed products.
 - 2. UL listings for shaft wall assemblies proposed.
 - 3. Samples of mold and moisture resistant gypsum board.
 - 4. Samples of gypsum tile backer board.
 - 5. Samples of abuse-resistant gypsum board.
 - 6. Samples of high impact-resistant gypsum board.
 - 7. Tackwall: Samples of trim reveal and board. Product data on adhesives.

1.05 QUALITY ASSURANCE

- A. Referenced Specifications: Current Gypsum Associates publications (www.gypsum.org).

1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Delivery and Handling
 - 1. Deliver materials to the project site with manufacturer's labels intact and legible.
 - 2. Handle materials with care to prevent damage.
 - 3. Deliver fire-rated materials bearing testing agency label and required fire classification numbers.
 - 4. The plastic packaging used to wrap gypsum panel products for shipment is intended to provide temporary protection from moisture exposure during transit only and is not intended to provide protection during storage after delivery. Such plastic packaging shall be removed immediately upon receipt of the shipment.
 - a. Failure to remove protective plastic shipping covers can result in condensation which can lead to damage, including mold.
- B. Storage
 - 1. Store materials inside under cover, stack flat, properly supported on a level surface, all in same direction, off of floor. Gypsum panel products to be fully protected from weather, direct sunlight exposure and condensation.
 - 2. Avoid overloading floor system
 - 3. Store adhesives in dry area; provide protection against freezing at all times.
 - 4. Steel framing and related accessories shall be stored and handled in accordance with AISI's "Code of Standard Practice".

1.07 JOB CONDITIONS

A. Environmental Conditions

1. Do not install gypsum board products at temperatures below 40°F for mechanical installation and 50°F for adhesive installation, unless approved by manufacturer.
2. Measure temperature and humidity on a daily basis during taping operations. Re-application of taping compound shall not occur sooner than shown on the table in Gypsum Association Brochure GA-236.
3. Temperature: During cold weather, in areas receiving wallboard installation, maintain temperature range between 55° F to 90° F for 48 hours before, and during gypsum board and joint treatment application. Maintain specified temperature range until joint treatment is completely dry.
4. Ventilation
 - a. Provide ventilation during and following adhesives and joint treatment applications.
 - b. Use temporary air circulators in enclosed areas lacking natural ventilation.
 - c. Under slow drying conditions, allow additional drying time between coats of joint treatment.
 - d. Protect installed materials from drafts during hot, dry weather.

B. Protect adjacent surfaces against damage and stains.

1.08 JOB COORDINATION

A. Coordinate Work with installation of metal framing and electrical work.

B. Coordinate framing and blocking for wall mounted accessories with Section 06 10 53.

PART 2: PRODUCTS

2.01 PANELS, GENERAL

- A. Size: Provide in maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.
- B. General: Complying with ASTM C 1396/C 1396M, as applicable to type of gypsum board indicated and whichever is more stringent.

2.02 GYPSUM BOARD

A. Standard

1. Panel Physical Characteristics.
 - a. Core: Regular
 - b. Surface Paper: 100% recycled content paper on front, back and long edges.
 - c. Long Edges: Tapered; square edge acceptable at areas with Level 1 finish.
 - d. Thickness: As noted on drawings.
 - e. Panel shall comply with requirements of ASTM C 1396 Standard Specification for Gypsum Board.

B. Fire-Resistance Rated.

1. Type X, Panel Physical Characteristics

- a. Core: Fire-resistant rated gypsum core.
- b. Surface Paper: 100% recycled content paper on front, back and long edges.
- c. Long Edges: Tapered; square edge acceptable at areas with Level 1 finish.
- d. Thickness: 5/8"
- e. Panel shall comply with Type X requirements of ASTM C 1396 Standard Specification for Gypsum Board.

2. Type C, Panel Physical Characteristics

- a. Core: Fire-resistant rated gypsum core.
- b. Surface Paper: 100% recycled content paper on front, back and long edges.
- c. Long Edges: Tapered; square edge acceptable at areas with Level 1 finish.
- d. Thickness: 1/2"
- e. Panel shall comply with Type C requirements of ASTM C 1396 Standard Specification for Gypsum Board.

C. Mold and Moisture Resistant

1. Panel Physical Characteristics

- a. Core: Moisture resistant (moisture and fire-resistant rated at Type X).
- b. Surface Paper: Coated fiberglass mat on face, back and long edges.
- c. Long Edges: Tapered; square edge acceptable at areas with Level 1 finish.
- d. Thickness: As noted on drawings. (5/8" at fire-resistant applications)
- e. Humidified Deflection: Not more than 1/4" when tested in accordance with ASTM C473 and C1658.
- f. Water Absorption: Less than 5% of weight when tested in accordance with C1396M and C1658.
- g. Mold/Mildew Resistance: 10 when tested in accordance with ASTM D 3273

D. Gypsum Tile Backer Board:

1. Panel Physical Characteristics

- a. Core: Moisture resistant (moisture and fire-resistant rated at Type X).
- b. Surface Paper: Coated fiberglass mat on face, back and long edges.
- c. Long Edges: Tapered; square edge acceptable at areas with Level 1 finish.
- d. Thickness: As noted on drawings. (5/8" at fire-resistant applications)
- e. Humidified Deflection: Not more than 1/4" when tested in accordance with ASTM C473 and C1178.
- f. Water Absorption: Less than 5% of weight when tested in accordance with C1396M and C1178.
- g. Mold/Mildew Resistance: 10 when tested in accordance with ASTM D 3273
- h. Permeance: Not more than 1.0 perms when tested in accordance with ASTM E96.

E. Cement Board

1. Panel Physical Characteristics

- a. Core: Cementitious, water-durable.
- b. Surface: Fiberglass mesh on front and back.
- c. Long Edges: Tapered.
- d. Overall Thickness: 1/2" or 5/8" as noted on drawings.
- e. Panel shall comply with requirements of ASTM C 1325.
- f. Water Absorption: Not greater than 8% when tested for 24 hours in accordance with ASTM C 473.

F. Metal Framing:

1. Protective Coating: ASTM C 645/C, 645M G40 (Z120) or equivalent corrosion resistance.
 - a. Metal studs and runners.
 - 1) Metal Thickness
 - a) 20 gauge or ProSTUD 20 gauge equivalent.
 - b) 25 gauge or ProSTUD 25 gauge equivalent.
 - 2) Size: 1 5/8", 2 1/2", 3 5/8", 4" or 6" deep as noted on drawings.
 - b. Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.
 - c. Fire Stop Track: Top runner designed to allow partition head to move while maintaining integrity of assembly fire-resistance rating. Thickness not less than indicated for studs, and of width to accommodate depth of studs.
 - d. Hat-Shaped, Rigid Furring Channels
 - 1) Base Metal Thickness: 0.0179 inch.
 - 2) Depth: 7/8" or 1 1/2" as noted on drawings.
 - e. Resilient Furring Channels: 1/2" deep, steel members designed to reduce sound transmission.
 - f. Z-Shaped Furring: With slotted or non-slotted web, face flange of 1 1/4", wall attachment flange of 7/8", minimum bare metal thickness of 0.0179 inch and depth required to fit insulation thickness.
 - g. Radius Framing: Steel sheet runner for non-structural curves, bends, variable radii and arches. Design to provide higher strength capacity than conventional lighter gauge material by using a work-hardened steel base strip.
 - 1) Base Metal Thickness and Size: Match studs.
 - h. Flat Strap and Backing Plate Sheet: For blocking or bracing.
 - 1) Base Metal Thickness: 20 gauge.
 - 2) Width: 6 inch.
 - i. Fasteners for Metal Framing: Provide fasteners of type, material, size, corrosion resistance, holding power and other properties required to fasten steel framing and furring member securely to substrates involved; comply with recommendations of gypsum board manufacturers for application indicated.
 - j. Ceiling Suspension Systems. Use one of the following systems:
 - 1) Metal studs with depth required to handle span.
 - 2) 1 1/2" cold rolled steel channels, 8 gauge annealed hanger wire and furring channels.
 - 3) Direct-hung system composed of 8 gauge hanger wire, main beams and interlocking cross furring members as manufactured by:
 - a) Armstrong World Industries, "Furring Systems/Drywall".
 - b) Chicago Metallic Corp. "Drywall Furring 640/Drywall Furring 660".
 - c) USG Interiors, Inc. "Drywall Suspension Systems".

G. Accessories:

1. Trim: ASTM C 1047.
 - a. Material: Galvanized or aluminum-coated steel sheet, rolled zinc.

- b. Shapes:
 - 1) Cornerbead.
 - 2) L-C Bead: J-shaped; exposed long flange receives joint compound.
 - 3) L-Bead: L-shaped; exposed long flange receives joint compound.
 - 4) Off-angle or splayed cornerbead.
 - 5) V-shaped Control Joint protected with plastic tape.
- 2. Acoustical sealant conforming to ASTM C 919.
- 3. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
 - a. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.
 - b. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.
- 4. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.
 - a. Use adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR, 59, Subpart D (EPA Method 24).
- 5. Joint Treatment Materials:
 - a. General: Comply with ASTM C 475/C 475M.
 - b. Joint Tape:
 - 1) Interior Gypsum Wallboard: 2 1/16" wide paper reinforcing tape.
 - 2) Glass-Mat Gypsum Wallboard: 2" wide self adhering fiberglass tape.
 - 3) Tile Backing Panels: As recommended by panel manufacturer.
 - c. Joint Compound for Interior Gypsum Wallboard: Drying type pre-mixed vinyl base compound and/or drying type pre-mixed vinyl base topping compound.
 - d. Joint compound for glass-mat gypsum wallboard: As recommended by wallboard manufacturer.
- 6. Acoustic spray system: Conform to the requirements of Section 07 21 00 Insulation.

PART 3: EXECUTION

3.01 EXAMINATION

- A. Examine substrates to which gypsum board construction attaches or abuts, installed hollow metal frames, cast-in anchors and structural framing with installer present for compliance with requirements for installation tolerances and other conditions affecting performance of gypsum board assemblies specified in this section.
 - 1. Do not proceed with installation until satisfactory conditions have been corrected.

3.02 INSTALLATION OF STEEL FRAMING, GENERAL

- A. Steel framing installation standard: Comply with ASTM C 754.

B. Metal Stud Schedule

1. Use 25 gauge metal studs or equivalent on partitions up to 12'-0" high and soffits.
 2. Use 20 gauge or equivalent metal studs on:
 - a. Metal stud partitions over 12'-0" high.
 - b. Metal stud ceilings.
 - c. Double studs at each door and borrowed light jamb and head.
 - d. For partitions of any height covered with cement board.
- C. Install supplementary framing, blocking and bracing at terminations in work and for support of fixtures, equipment services, heavy trim, grab bars, toilet accessories, door bumpers, furnishings and similar construction to comply with details indicated and with recommendations of gypsum board manufacturer.**
- D. Isolate steel framing from building structure to prevent transfer of loading imposed by structural movement, at location indicated below to comply with details shown on drawings.**
1. Where suspended ceiling assemblies abut building structure horizontally at ceiling perimeters or penetrations of ceiling.
 2. Where partitions and wall framing abut overhead structure.
 - a. Provide slip or cushioned type joints to attain lateral support and avoid axial loading.
- E. Do not bridge building expansion and control joints with steel framing or furring members, independently frame both sides of joints with framing or furring members or as indicated.**

3.03 INSTALLATION OF STEEL FRAMING FOR CEILINGS AND SOFFITS

A. Suspend ceiling hangers from building structural members and as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum not part of supporting structural or ceiling suspension system.
 - a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, counter splaying or other equally effective means.
 2. Where widths of ducts and other construction within ceiling plenum produce hanger spacing that interfere with the location of hangers at spacing required to support standard suspension system members, install supplemental suspension system members and hangers in form of trapezes or equivalent devices.
 - a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.
 3. Secure wire hangers to structure, by looping or wire tying, directly to supporting structure, including intermediate framing members. Attach to inserts, eye screws, or other devices appropriate for structure to which hangers are attached as well as for type of hanger involved in manner that will not cause deterioration or failure, due to age, corrosion or elevated temperatures.
 4. Do not attach hangers to metal roof deck or metal deck tabs.
 5. Do not connect or suspend steel framing from ducts, pipes or conduits.
- B. Keep hangers and braces 2 inches clear of ducts, pipes and conduits.**
- C. Wire-tie or clip furring members to main runners and to other structural supports.**

- D. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension system abuts vertical surfaces. Mechanically join main beam and cross furring members to each other and butt cut to fit wall track.

3.04 INSTALLATION OF STEEL FRAMING FOR WALLS AND PARTITIONS

- A. Install runners (tracks) at floors, ceilings and structural walls and columns where gypsum board stud system abuts other construction.
1. Use proprietary tracks for non-rated and fire rated walls and partitions.
 2. Install studs full height for all partitions unless noted otherwise.
 3. Where studs are installed directly against masonry or concrete walls, set studs in acoustical sealant.
- B. Installation Tolerances: Install each steel framing and furring member so that fastening surface does not vary more than 1/8" from plane of faces of adjacent framing.
- C. Extend partition framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at or just above suspended ceilings. Continue framing over frames for doors and openings and frame around ducts penetrating partitions above ceiling to provide support for gypsum board.
1. Cut studs 1/2 inch short of full height to provide perimeter relief.
 2. For STC-rated or fire-resistance rated partitions that extend full height, install framing around structural members, as required to support gypsum board closures needed to make partitions continuous from floor to underside of structure above.
 3. Install bridging/spacing bar.
- D. Brace partition framing, not extending full height to structure above, with studs same size and thickness as partition framing. Provide bracing at:
1. 6'-0" o.c. intervals along length of partitions.
 2. Not less than 6'-0" from partition ends and corners.
 3. Door and window openings.
- E. Terminate partition framing at suspended ceiling where indicated.
- F. Install metal studs and furring in sizes and at spacings indicated.
1. Single and Multi Layer Construction: Space studs 16 inches o.c., unless otherwise indicated.
- G. Install metal studs with flanges in same direction and leading edge or end of gypsum board panel can be attached to open (unsupported) edges of stud flanges first.
- H. Frame door openings to comply with details indicated, with GA-219 and with applicable published recommendations of gypsum board manufacturer. Attach vertical studs at jambs with screws either directly to frames or to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
- I. Frame openings other than door openings to comply with details indicated, or if none indicated, in same manner as required for door openings; and install framing below sills of openings to match framing required above door heads.
1. Extend vertical jamb studs through suspended ceilings and attach to underside of floor or roof structure above.
- J. Install rigid wall insulation vertically and hold in place with Z-furring members spaced at 24 inches.
1. Except at exterior corners, securely attach narrow flanges of furring members to wall with concrete stub nails or screws designed for masonry attachment, spaced at 24 inches o.c.

2. At exterior corners attach wide flange of furring members to wall with short flange extending beyond corner; on adjacent wall surface, screw attach short flange of furring channel to web of attached channel. Start from this furring channel with standard width insulation and continue in regular manner.
3. At interior corners, space second member no more than 12 inches from corner and cut insulation to fit.

3.06 APPLICATION OF GYPSUM BOARD

- A. Install the following gypsum board types as follows:
 1. Regular type: All non-rated areas unless noted differently below.
 2. Type X or C: As required to meet fire-resistant rated assemblies.
 3. Mold and Moisture Resistant: All gypsum board on the interior face of an insulated stud exterior wall. (Note: Gypsum Board on furred masonry walls can be regular type.)
 4. Gypsum tile backer board: As a substrate for walls covered with porcelain or ceramic tile.
 5. Cement Board: As noted on drawings.
- B. Gypsum Board Application and Finishing Standards: Comply with ASTM C 480 and GA-216.
- C. Install sound attenuation insulation blankets where indicated, prior to gypsum board, unless readily installed after board has been installed on one side.
- D. Single-Layer Application: Install gypsum wallboard as follows:
 1. Locate exposed end-butt joints as far from center of walls and ceilings as possible, and stagger not less than 24 inches in alternate courses of board.
 2. On partitions/walls apply gypsum board vertically (parallel to framing), unless otherwise indicated or required by fire resistance rated assembly, and provide sheet lengths which will minimize end joints.
 - a. On partitions/walls 8'-1" or less in height, apply gypsum board horizontally (perpendicular to framing); use maximum length sheets possible to minimize end joints.
 - b. At stairwells and other high walls, install gypsum board horizontal, unless otherwise indicated or required for fire resistance rating.
 - c. On Z-furring, apply gypsum panels vertically (parallel to framing). Locate edge joints over furring member.
- E. Double-Layer Application: Install gypsum backing board for base layer and exposed gypsum board for face layer.
 1. On ceilings apply base layer prior to application of base layer on walls/partitions; apply face layer in same sequence. Offset joints between layers minimum one stud space. Apply base layers at right angles to supports, unless otherwise indicated.
 2. On partitions/walls apply base layer and face layer vertically (parallel to framing) with joints of base layer over supports and face layer joints offset minimum one stud space with base layer joints.
- F. Install exposed gypsum board with face side out. Do not install imperfect, damaged or damp boards. Butt boards together for light at edges and ends with not more than 1/16 inch open space between boards. Do not force into place.
- G. Locate both edge or end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints.
 1. Position boards so like edges abut, tapered edges against tapered edges and mill-cut or field-cut ends against mill-cut or field-cut ends.
 2. Do not place tapered edges against cut edges or ends.
 3. Gypsum panel product joints shall be located so that no joint will align with the edge of an opening unless control joints are to be installed at these locations.
 4. Joints on opposite sides of a partition shall not occur on the same stud.

5. In single layer gypsum panel products systems, end joints parallel to and on the same side of framing members shall be staggered between alternate courses of gypsum panel products and from joints on the opposite side of the framing members.
 6. In multi-layer gypsum panel product systems, end joints parallel to and on the same side of framing members shall be staggered between alternate courses of gypsum panel products.
 7. Base layer end joints parallel to and on one side of framing shall be staggered from base layer end joints on the opposite side of the framing members.
 8. Install ceiling boards across framing in manner to minimize end-butt joints, and avoid end joints in central area of each ceiling. Stagger end joints at least 24 inches.
- H. Spot grout hollow metal door frames for solid core wood doors, hollow metal doors and doors over 32 inches wide except where full grout is shown. Apply spot grout at each jamb anchor clip just before inserting board into frame.
- I. Form control joints and expansion joints at locations indicated or as recommended, with space between edges of boards, prepared to receive trim accessories.
1. Where a control joints occurs in an acoustical or fire-rated system, blocking shall be provide behind the control joint by using a backing material such as 5/8" type X gypsum panel product, or other tested equivalent.
- J. Cover both faces of metal stud partition framing with gypsum board in concealed spaces (above ceiling, etc.), except in chase walls which are braced internally.
1. Except where concealed application is indicated or required for sound, fire, air or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq.ft. area, and may be limited to not less than 75 percent of full coverage.
 2. Fit gypsum board around ducts, pipes and conduits.
- K. Isolate perimeters of non-load-bearing drywall partitions at structural abutments. Provide ¼ to ½ inch space to accept trim edge.
- L. Where STC-rated gypsum board assemblies are indicated or drawings indicate acoustical sealant, seal construction at perimeters, behind control and expansion joints, openings, and other penetrations with a continuous bead of acoustical sealant. Include a bead of sealant at both faces of partitions.
1. Comply with ASTM C 919 and manufacturer's recommendations for location of edge trim and closing off sound flanking paths around or through gypsum board assemblies, including partitions extending above ceilings.
 2. Where resilient furring channels are used over steel framing, the screws used to attach the gypsum panel product to the furring channels shall not contact the framing.
- M. Gypsum panel products applied to walls shall be applied with the bottom edge spaced a minimum of 1/8 inch and maximum of ¼ inch above the floor.
- N. Laminating to Substrate: Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum board manufacturer's written recommendations and temporarily brace or fasten gypsum panels until fastening adhesive has set.
- O. Installation of Sound Isolated Ceilings:
1. Anchor isolators to structure per the following guidelines.
 - a. Located at the perimeter not more than 16" from the edge and not close than 3" from the perimeter.
 - b. Isolators should be located no further than 48" o.c. along framing for drywall.
 2. Attach the drywall framing system to the isolation hangers with threaded rod/bolted connections.

P. Wall Tile Substrates: For substrates scheduled to receive ceramic or porcelain tile, comply with the following:

1. Install gypsum tile backer board panels to comply with manufacturer's installation instructions at locations scheduled to receive wall tile. Install with 1/4" open space where panels abut other construction.

3.07 METHODS OF GYPSUM BOARD FASTENING

- A. Fastener lengths shall be at least 1 1/8" long for 1/2" gypsum panels and 1 1/4" long for 5/8" gypsum panels used for metal framing.
- B. Screws shall be spaced not more than 12 in. o.c. for ceilings and 16 in. o.c. for walls where the framing members are 16 in. o.c. Screws shall be spaced not more than 12 in. o.c. for both ceilings and walls where framing members are 24 in. o.c.
- C. Fasteners at gypsum panel product edges or ends shall be located not less than 3/8" from the edge or end. Fasteners at edges or ends in a perpendicular application shall be located not more than 1 in. from the edge or end. Perimeter attachment into partition top and bottom plates is neither required nor recommended except where fire ratings, structural performance requirements, or other special conditions require such attachment.
- D. While driving fasteners, gypsum panel products shall be held in firm contact with framing members or underlaying support. Application of fasteners shall proceed from the center or field of the gypsum panel product toward the ends and edges, or shall begin along one edge and proceed toward the other edge.
- E. To provide a more flat surface at joints, attach gypsum board to steel studs so leading edge or end of each board is attached to open (unsupported) edge of stud flanges first.
- F. Attach gypsum board to supplementary framing and blocking provided for additional support at openings and cutouts.
- G. Screws shall be driven so that screw heads are slightly below the gypsum panel product surface without breaking the face paper, fracturing the core, or stripping the framing member around the screw shank.
- H. Double-Layer Fastening Methods: Apply base layer of gypsum board and face layer to base layer as follows:
 1. Fasten base layer with screws and face layer with adhesive and supplementary fasteners, except where otherwise required for fire-resistance rated assemblies.

3.08 INSTALLATION OF DRYWALL TRIM ACCESSORIES

- A. General: Where feasible, use same fasteners to anchor trim accessory flanges as required to fasten gypsum board to supports. Otherwise, fasten flanges to comply with manufacturer's recommendations.
- B. Install corner beads at external corners.
- C. Install metal edge trim whenever edge of gypsum board would otherwise be exposed or semi-exposed. Provide type with face flange to receive joint compound except where "U" bead (semi-finishing type) is indicated.
 1. Install "J" bead where drywall construction is tightly butted to other construction and back flange can be attached to framing or supporting substrate.
 2. Install "L" bead where edge trim can only be installed after gypsum board is installed.

D. Install control joints at locations as follows:

1. At ceilings, 50'-0" o.c. each way maximum and/or where shown on drawings. At corners and at tee intersections of soffits that change directions.
2. At walls, 30'-0" o.c. maximum, and/or where shown on drawings.
3. Full height door frames shall be considered equivalent to a control joint.

3.09 FINISHING OF GYPSUM WALL BOARD

A. General: Apply joint treatment at gypsum board joints (both directions); flanges of corner bead, edge trim and control joints; penetrations; fastener heads, surface defects and elsewhere as required to prepare work for decoration.

B. Prefill open joints using setting-type joint compound.

C. Apply joint tape at joints between gypsum boards, except where trim accessories are indicated.

D. Glass-Mat Water Resistant Backer Board: Comply with glass mat backer board manufacturer's recommendations.

E. Water or additive shall not be added to joint compound unless recommended by manufacturer. See quality assurance for application temperature and drying times.

F. Levels of Gypsum Board Finishing per Gypsum Association GA-214 and as note herein:

1. Level 1/Fire Taping: All joints and interior angles shall have tape set in joint compound. Surface shall be free of excess joint compound. Tool marks and ridges are acceptable. Tape and fasteners need not be covered.
 - a. For use in plenum areas above ceilings, gypsum board not scheduled for paint or wallcovering, gypsum board concealed from view in the finished work, except as noted in level 2.
2. Level 2: All joints and interior angles shall have tape embedded in joint compound and wiped with a joint knife leaving a thin coating of joint compound over all joints and interior angles. Fastener heads and accessories shall be covered with a coat of joint compound. Surface shall be free of excess joint compound. Tool marks and ridges are acceptable. Joint compound applied over the body of the tape at the time of tape embedment shall be considered a separate coat of joint compound and shall satisfy the conditions of this level.
 - a. For use on areas that are a substrate for tile or wood paneling.
3. Level 3: All joints and interior angles shall have tape embedded in joint compound and one additional coat of joint compound applied over all joints and interior angles. Fastener heads and accessories shall be covered with two separate coats of joint compound. All joint compound shall be smooth and free to tool marks and ridges.
 - a. For use on surfaces of mechanical and electrical spaces scheduled to receive paint.
4. Level 4: All joints and interior angles shall have tape embedded in joint compound and two separate coats of joint compound applied over all flat joints and one separate coat of joint compound applied over interior angles. Fastener heads and accessories shall be covered with three separate coats of joint compound. All joint compound shall be smooth and free of tool marks and ridges. When necessary, sand between coats and following final coat to provide smooth surface ready for decoration.
 - a. For use on all walls scheduled for paint or wallcovering except those areas noted under Level 3 and 5.

5. Level 5: All joints and interior angles shall have tape embedded in joint compound and two separate coats for joint compound applied over all flat joints and one separate coat of joint compound applied over interior angles. Fastener heads and accessories shall be covered with three separate coats of joint compound. A thin skim coat of joint compound trowel applied, or a material manufactured especially for this purpose and applied in accordance with manufacturer's recommendations, shall be applied to the entire surface. The surface shall be smooth and free of tool marks and ridges. When necessary, sand between coats and following final coat to provide smooth surface ready for decoration.
 - a. For use on all ceilings; walls and/or soffits under skylights and clerestories, and as noted on drawings.
Note: when Level 5 finish is used, it shall extend to nearest inside or outside corner.

3.10 FINISHING ADJUSTMENT

A. Screw Pop

1. Repair nail pop by driving new screw approximately 1-1/2 inches away and reseal screw.
2. When face paper is punctured drive new screw approximately 1-1/2 inches from defective fastening and remove defective fastening.
3. Fill damaged surface with compound in coats specified by required finish level.

B. Ridging

1. Sand ridges to reinforcing tape without cutting through tape.
2. Fill concave areas on both sides of ridge with topping compound.
3. After fill is dry, blend in topping compound over repaired area.

C. Fill cracks with compound and finish smooth and flush.

D. Application of acoustic spray system

1. Install mineral wood backing at depth required per manufacturer's details.
2. Apply acoustic spray to required thickness and overlap onto adjacent surfaces as recommended by manufacturer to achieve specified sound transmission classification.

2.09 CLEANING AND PROTECTION

A. Promptly remove any residual joint compound from adjacent surfaces.

B. Protect installed products from damage from weather, condensation, construction, and other causes during remainder of the construction period.

C. Remove and replace panels that are wet, moisture damaged, or mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 09 21 16

SECTION 09 30 00

TILE

PART 1: GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings, Details of Construction and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Sections, apply to work specified in this section.

1.02 SUMMARY

- A. Section includes:

1. Mortar bed installations in toilets, showers, kitchens and other areas shown on drawings with floor drains over depressed substrates.
2. Removal of concrete curing compound on tile installations installed directly over concrete substrates.
3. Ceramic tile on walls, floors, and railings.
4. Porcelain tile on walls, floors.
5. Quarry tile floors.
6. Caulking of joints in tile on inside corners of tiled rooms and sealing of joints in tile.

- B. Related work specified in other sections:

1. Concrete Substrates - Section 03 30 00.
2. Drywall substrates - Section 09 21 16.

1.03 SUBMITTALS

- A. Submit in accordance to Section 01 33 00:

1. Submit samples for colors on 12" x 12" panels in duplicate for each tile specified for Architect's selection and approval.
2. Submit two (2) samples each for each different trim piece required for this project.
3. Furnish Master Grade Certificates to Architect for all tile, indicating compliance with TCA 137.1-76.
4. Submit product information on grout and samples indicating color range anticipated, texture.
5. Submit samples of sealant that match grout color.
6. Submit installation system manufacturer qualifications, installer qualifications, and laboratory confirmation of installation materials as outlined in Quality Assurance.

1.04 REFERENCE SPECIFICATIONS

- A. The latest edition of following specifications and standards are incorporated by reference.
 - 1. Tile Council of North America, Inc., Handbook for Ceramic Tile Installation (TCNA).
 - 2. American National Standard Specifications for the installation of ceramic tile (ANSI).
- B. Maintain a copy of publications in the Contractor's office, available for reference.

1.05 QUALITY ASSURANCE

- A. Installation System Manufacturer (single source responsibility): Company specializing in adhesives, mortars, grouts and other installation materials with ten (10) years minimum experience and ISO 9001 certification. Obtain installation materials from single source manufacturer to insure consistent quality and full compatibility.
- B. Submit laboratory confirmation of adhesives, mortars, grouts and other installation materials:
 - 1. Identify proper usage of specified materials using positive analytical method.
 - 2. Identify compatibility of specified materials using positive analytical method.
 - 3. Identify proper color matching of specified materials using a positive analytical method.
- C. Installer qualifications: company specializing in installation of ceramic tile, mosaics, pavers, trim units and thresholds with five (5) years documented experience with installations of similar scope, materials and design.

1.06 MOCK-UPS

- A. Provide mock-up of each type/style/finish/size/color of ceramic tile, mosaics, pavers, trim unit and threshold, along with respective installation adhesives, mortars, grouts and other installation materials. Mock may be part of final installation if accepted.

1.07 PRE-INSTALLATION CONFERENCE

- A. Pre-installation conference: at least three weeks prior to commencing the work attend a meeting at the jobsite to discuss conformance with requirements of specification and job site conditions. Representatives of Owner, Architect, General Contractor or Construction Manager, Tile Subcontractor, Tile Manufacturer, Installation System Manufacturer and any other parties who are involved in the scope of this installation must attend the meeting.

1.08 WARRANTY

- A. The manufacturer of adhesives, mortars, grouts, and other installation materials shall provide a written twenty-five (25) year warranty, which covers materials and labor; reference Manufacturer Warranty Data Sheet for complete details and requirements.
- B. For exterior facades over steel or wood framing, the manufacturer of adhesives, mortars, grouts and other installation materials shall provide a written ten (10) year warranty, which covers replacement of Manufacturer products only – reference Warranty Data Sheet for complete details and requirements.

1.09 PRODUCT HANDLING, DELIVERY AND STORAGE

- A. Package, handle, deliver and store at the job site in original unbroken containers in a manner that will avoid damage or contamination. All containers shall bear grade seals, manufacturer's name, size, color and quantity.
- B. Reject any tiles that are cracked or broken.

1.10 JOB CONDITIONS

- A. Set and grout tile when ambient temperature is at least 50° F. and rising.

PART 2: PRODUCTS

2.01 APPROVED MANUFACTURERS

- A. Manufacturers listed in this specification are approved under the following conditions:
 - 1. A manufacturer listed in both the specification and the Material Finish/Color Schedule, on Architectural Drawings is not required to submit a pre-bid approval.
 - 2. Manufacturers listed in this specification, but not in the Material Finish/Color Schedule, on Architectural Drawings shall submit color samples for pre-bid approval by addendum. Refer to Section 01 25 00.
 - 3. When no colors are listed in the Material Finish/Color Schedule, on Architectural Drawings, any manufacturer listed in this specification are not required to submit a pre-bid approval.

2.02 PORCELAIN FLOOR TILE

- A. Manufacturer: Products by American Olean Dal-Tile, Lea Ceramiche, Roca Tile, Mirage, Crossville, Mirage
- B. 100% Porcelain Floor Tile
 - 1. Size:
 - a. Tile 1: 12" x 24"
 - 2. Colors: See material Finish/Color Schedule, on Architectural Drawings.
 - 3. Patterns: Provide as shown on drawings.
 - 4. Grout joint width: 3/16".

2.03 PORCELAIN WALL TILE

- A. Manufacturer: Products by American Olean Dal-Tile, Lea Ceramiche, Roca Tile, Mirage, Crossville, Ergon
- B. 100% Porcelain Tile
 - 1. Sizes:
 - a. Tile 4: 12" x 24"
 - 2. Colors: See material Finish/Color Schedule, on Architectural Drawings.
 - 3. Patterns: Provide as shown on drawings.
 - 4. Grout joint width: 3/16".

2.05 SETTING MATERIALS

- 1. Manufacturers: Products and systems by Bostik Construction Products are specified. Equivalent products and systems by Ardex, Mapei, Bonsal, H.B. Fuller, Laticrete, Custom Building Products, and American Olean are acceptable subject to approval of submittals.

2. Tile Setting Systems:

- a. Setting bed for tile on concrete slabs-on-grade or masonry walls: Acrylic latex modified thin set meeting ANSI A118.4, Hydroment "Tile Mate" mixed with Hydroment "Multi-Purpose Acrylic Latex Mortar Admixture".
 - b. Setting bed for tile on floors of showers, toilet rooms and locker rooms on above grade locations: Waterproofing membrane and setting adhesive, Hydroment "Ultra-Set", two step application.
 - c. Setting bed for tile on gypsum board walls: Hydroment "Ultra-Set".
 - d. Setting tile over existing painted concrete block: Mapei Kerabond Premium Tile Mortar mixed with Keralastic Premium latex additive.
3. Mortar Bed: Mixture of portland cement and sand, roughly in proportions of 1:5 with latex polymer as the liquid portion of the mixture.
- a. Cleavage Membrane: Asphalt felt, ASTM D 226, Type I (No. 15); or polyethylene sheeting, ASTM D 4397, 4.0 mils thick.
 - b. Reinforcing: Galvanized, welded wire fabric, 2 by 2 inches by 0.062 inch diameter; comply with ASTM A 185 and ASTM A82 except for minimum wire size.
4. Polyethylene Membrane: Schluter "Ditra"
5. Grout
- a. For glazed ceramic and mosaic tile: Acrylic latex modified grout meeting ANSI A118.6, Hydroment "Designer Series Ceramic Tile Grout" mixed with Hydroment "Multi-Purpose Acrylic Latex Grout Additive".
 - 1) Color: See Material Finish/Color Schedule, on Architectural Drawings.

2.06 MISCELLANEOUS MATERIALS

- A. Sealant: One component silicone, color to match tile grout.
- B. Silicone sealer for tile joints: "Grout Sealer" at manufactured by Aqua Mix, Inc.
- C. Cleaners: As manufactured by Hillyard Chemical Company or American Olean.
- D. Crack/Joint isolation and waterproofing membrane: Laticrete Hydroban. Waterproofing membrane shall be used for tile on floors in toilet rooms, locker rooms and showers in above grade locations.
- E. Thresholds: Solid polymer made from homogeneous solid sheets of filled plastic resin complying with material and performance requirements in ANSI Z124.3, for Type 5 or Type 6, without precoated finish. Sizes as detailed on drawings. Colors as selected by Architect to match field color of tile.
- F. Metal Trim for Tile: As manufactured by Schluter Systems, LP or equal. Material: Brushed Aluminum.
 1. CT Corner Trim: (For use at outside corners of tile to tile and terminations of ceramic/porcelain tile to other materials). RONDEC profile RO x tile height x AE.
 - a. Provide, splice connectors, end caps, inside and outside corners as warranted by application.

2. CT Corner Trim: (For use at inside corners of tile to tile and termination of ceramic/porcelain tile to other materials). DILEX-AHK/PHK.
 - a. Provide, splice connectors, end caps, inside and outside corners as warranted by application.
3. CT Transition Strip:
 - a. Carpet to Ceramic/Porcelain Tile Transition: RENO-ETK x Tile Height.
 - b. Resilient Tile to Ceramic/Porcelain Tile Transition: RENO-EBU x Tile Height.

2.07 EXTRA STOCK

- A. Furnish 1% of each type/shape/color of tile used on this project to Owner as maintenance stock.

PART 3: EXECUTION

3.01 EXAMINATION OF SURFACES

- A. Inspect surfaces to which tile is to be applied. Commencement of work implies acceptance of surface and assumption of responsibility for satisfactory results.

3.02 MORTAR BEDS

- A. Mix and install mortar, cleavage membrane and reinforcing per ANSI A108.B, sloping top of mortar bed with a constant slope from walls to floor drains.
- B. Allow mortar bed to fully cure prior to commencing with tile work.

3.03 SETTING BEDS

- A. Floor tile over mortar bed: Thin set acrylic latex modified cement mortar (TCNA F111).
- B. Floor tile above grade over mortar bed: Thin set mortar over waterproofing membrane (TCNA F121).
- C. Wall Tile: Thinset (TCNA W202) on masonry, organic adhesive (TCNA W242) on gypsum board.

3.04 TILE INSTALLATION

- A. General
 1. Installation and workmanship shall be in accordance with ANSI Specifications and as specified herein. The printed instructions of the tile manufacturer and the manufacturer of proprietary mortars and grouts shall be followed where applicable.
 2. Before commencing work, establish field pattern and border line locations and center the work symmetrically so that no tile need be cut to less than half size. Cut tile at base so top of base is level around entire room. Joints in wall tile shall be aligned vertically and horizontally; staggered joints will not be accepted. Rub exposed edges smooth.
 3. Do not install any cracked or chipped tiles.
- B. Movement Joints
 1. Install joints to control the effects of substrate movement on tile finishes.
 2. Construct joints in tile work according to movement joint details" EJ171" as published in TCNA "Handbook for Ceramic Tile Installation."

3. Locate movement joints at the following locations:
 - a. Interior: 20' to 25' maximum in each direction.
 - b. Exterior and Interior tile work exposed to direct sunlight or moisture: 8' to 12' maximum in each direction.
 - c. Where tile work abuts restraining surfaces including but not limited to perimeter walls, dissimilar floors, curbs, columns, pipes, ceilings, inside corners of abutting walls, and where changes occur in backing materials.
 - d. All expansion, control, construction, cold and seismic joints in the structure. Expansion joints in tile work must match width of joint in building structure.
- C. Crack isolation membrane: Install over minor cracks and non-structural slab joints to prevent transmission of cracking to tile. Strictly follow membrane and mortar manufacturers' printed instructions.
- D. Waterproofing membrane: Install per manufacturers printed instructions, including two wet on wet applications @ 20-30 mils thick. Full bonding to metal and PVC.
 1. Perform 24-hour flood testing. Repeat application as required until flood test passes.
- E. Install thresholds at transition from ceramic tile floors to other flooring materials and as shown on drawings.
- F. Remove concrete curing compound with shot blasting or other appropriate mechanical means and vacuum floor on installations without mortar bed.
- G. Existing Surface Preparation: Completely remove all paint, soap scum, wax, coatings, oil, etc. from existing surfaces to receive tile. Perform mechanical abrasion with a carborundum disk followed by a clear water wash. Use other cleaning methods of soapless detergents, commercial tile cleaners or solvents or acids if required to adequately prep surfaces. Substrate must be thoroughly rinsed and dry before setting the new tile.

3.05 CLEANING, PATCHING, PROTECTION, SEALING

- A. After completion, clean all work, point open joints and replace defective work.
- B. Cleaning and Sealing
 1. Quarry tile Floors and Base: Clean floor once with a 2X strength of oil-based cleaning solution, such as Murphy's Oil Soap, Janitor in a Drum, Pinesol. Mop liberally over floor and allow to dry.
 2. Ceramic Porcelain Tile Walls, Floors and Base: Clean with water, rinse and allow to dry. Apply one coat of silicone sealer. Wipe excess sealer from face of tile.
- C. Protection
 1. Floors: Close off workspaces to traffic during installation and at least 48 hours after completion of work.
 2. Finished tile floors: Covered with clean building paper before foot traffic is permitted on them. Place board walkways on floors that are to be continuously used as passageways by workmen. Protect tiled vertical outside corners with board corner strips in areas used as passageways by workmen.
 3. Remove protection just prior to substantial completion and re-clean tile as necessary.

END OF SECTION 09 30 00

SECTION 09 51 00
ACOUSTICAL CEILINGS

PART 1: GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings, Details of Construction and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Sections, apply to work specified in this section.

1.02 SUMMARY

- A. Section includes:
1. Lay-in acoustic ceilings.
 2. Lay-in vinyl gypsum ceilings.
- B. Related work specified in other sections:
1. Mechanical penetration of ceilings - Divisions 21-25.
 2. Electrical penetration of ceilings - Divisions 26-28.

1.03 SUBMITTALS

- A. Submit Shop Drawings indicating installation layouts in accordance with Section 01 33 00.
- B. Submit samples of all acoustical and suspension materials to Architect for approval.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver materials in original, unopened, protective packaging, with manufacturer's labels indicating brand name, pattern, size, thickness and fire rating as applicable, legible and intact.
- B. Store materials in original protective packaging to prevent soiling, physical damage or wetting.
- C. Store cartons open at each end to stabilize moisture content and temperature.
- D. Do not begin installation until sufficient materials to complete a room are received.

1.06 ENVIRONMENTAL REQUIREMENTS

- A. Complete installation of dampening materials before beginning work.
- B. Maintain humidity of 65% - 75% in area where acoustical materials are to be installed, 25 hours before, during, and after installation.
- C. Maintain a uniform temperature in the range of 55 F. to 70 F. prior to, during, and after installation of materials.

PART 2: PRODUCTS

2.01 ACOUSTICAL MATERIALS

A. Products specified are as follows:

1. Armstrong, www.armstrong.com
2. USG, www.usg.com
3. National Gypsum, www.nationalgypsum.com
4. Tectum, Inc., www.tectum.com
5. CertainTeed Corporation (COLORADO)

B. ACT 1: Square edge, 5/8" thick, sag and abuse resistant, anti-microbial, low VOC, lay-in tile. Provide 24" x 24" or 24" x 48" tile as shown on drawings.

1. Minimum NRC: 0.50
2. Minimum CAC: 30
3. Minimum LR: 0.86
4. Minimum Recycled Content: 33%
5. Armstrong "Ceramaguard" #607.
6. USG "Sheet Rock Lay-in ClimaPlus" SCI820

C. ACT 3: Stepped tegular edge, 3/4" thick, sag resistant, anti-microbial, low VOC, lay-in tile. Provide 24" x 24" or 24" x 48" as shown on drawings.

1. Minimum NRC: 0.65
2. Minimum CAC: 35
3. Minimum LR: 0.84
4. Minimum Recycled Content: 65%
5. Armstrong "Cirrus Profiles Classic Step" #591
6. USG "Eclipse ClimaPlus Pedestals" #72716

D. Furnish extra materials equal to 1% of each type of acoustical material supplied. Provide materials in new, unopened cartons labeled as to contents.

2.02 SUSPENSION SYSTEMS

A. Systems specified are by Chicago Metallic. Equivalent systems by USG or Armstrong are acceptable.

B. Suspension System for Non-Rated Lay-In Panels (except locations listed below): 200 Intermediate Duty Snap-Grid System, standard white finish.

C. Systems for use in kitchens, kitchen serving areas, toilets and locker rooms to be 1830 intermediate duty hot dipped galvanized capped with white aluminum capping.

D. Perimeter treatment components for all systems to be 0.020 inch thick hot dipped galvanized steel, 15/16" wide x 3/4" high. Edges to be hemmed. Finished identical to main runners and cross tees.

PART 3: EXECUTION

3.01 CONDITION OF SURFACES

A. Examine surfaces scheduled to receive suspended or directly attached acoustical units for unevenness, irregularities, and dampness that would affect quality and execution of work.

- B. Mark access provisions as to size and location before beginning installation.

3.02 REQUIREMENTS FOR ALL MECHANICAL SUSPENSION SYSTEMS

- A. Grid layout in each space, area located symmetrically in room, space. Coordinate work with other trades so that lighting fixtures, grilles, other ceiling fixtures work to grid layout.
- B. Do not use universal splices or other types whose use would obstruct passage of recessed lighting fixtures through grid openings, or make untenable their reposition upon flanges of beams.
- C. Support suspension system from structure above, not from ductwork, equipment or piping.
- D. Space hangers not more than 6" from ends, not more than 4'-0" o.c. Between ends of main runners, provide extra hangers as required to support other work resting in or on ceiling.
- E. Provide additional tee supports, hangers and cut tiles to support and fit to all sides of light fixtures, linear diffusers and other ceiling penetrations. Coordinate with mechanical and electrical drawings.

3.03 ACOUSTICAL MATERIALS

- A. Install ceiling panels and tiles using clean gloves, to avoid soiling materials.
- B. Install lay-in panels snugly against support system without damaging panels.
- C. Field rabbit edges of panels where field-cut to match shadow-line profile.
- D. Adjust any sags or twists which develop in the ceiling systems and replace any part which is damaged or faulty.
- E. Clean exposed surfaces of acoustical ceilings, including trim, edge moldings and suspension members; comply with manufacturer's instructions for cleaning and touch up of minor finish damage. Remove and replace work which cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.
- F. Replace any damaged tile just prior to substantial completion.

END OF SECTION 09 51 00

SECTION 09 91 00

PAINTING

PART 1: GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings, Details of Construction and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Sections, apply to work specified in this section.

1.02 SUMMARY

- A. Section includes:

1. Field finish all materials scheduled and/or specified for paint, trim, stain or seal. Including but not limited to:
 - a. Concrete block
 - b. Galvanized metal
 - c. Aluminum
 - d. Gypsum Board
 - e. Plaster
 - f. Field finishing of wood doors and frames

- B. Related work specified in other sections:

1. Finishing of wood doors - Section 08 14 00.
2. Shop finishing - Applicable Sections.
3. Colored sealants – Section 07 92 00

1.03 SUBMITTALS

- A. Provide three (3) copies of a schedule detailing each substrate in the same order as the schedules used in Part 2 of this section. Include the following:

1. The specific products to be used for each coat.
2. Documentation that the manufacturer has reviewed and approved each painting system.
3. Data pages for all products listed, highlight the following:
 - a. Type of resin.
 - b. Dry Film Thickness.
 - c. Volume Solids.
 - d. Units of Sheen.
 - e. VOC content and chemical components.
 - f. Other performance or descriptive data required by Part 2 of this section.
 - g. If this information is not on the data page provide the information in a letter of certification from the manufacturer. Attach the letter to the appropriate data page.

- B. Submit three (3) drawdowns of each product and color combination. Drawdowns shall be applied using a 4 mil WFT drawdown bar on Leneta form WD plain white coated cards size 3-7/8" x 6".
 - 1. Label each card with the following:
 - a. Job name.
 - b. Date.
 - c. Product name.
 - d. Product number.
 - e. Color number as stated in the material finish/color schedule.
 - f. Name, address, and phone number of the supplying facility.
 - g. Surface material product is to be applied onto.
- C. Do not deliver material to site until having received written approval of submitted information and samples.
- D. Complete sample area on project as selected by Architect on each type surface and with each type of paint system specified. Do not proceed further with application until receiving acceptance of each sample area by Architect. Accepted areas will serve as standard of quality for entire project.

1.05 EXAMINATION OF DOCUMENTS

- A. Examine the specifications for the work of other trade contractors and to become familiar with their work. All surfaces that are left unfinished by the requirements of other specifications to be finished by this section.

1.06 EXISTING CONDITIONS

- A. The existing building may contain lead-containing materials, including paint. It is the Contractor's responsibility to meet all governmental regulations when dealing with and disposing of lead containing materials.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use, in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg. F.
 - 1. Maintain containers in clean condition, free for foreign materials and residue.
 - 2. Remove rags and waste from storage areas daily.

1.08 PROJECT CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 degrees F.
- B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 degrees F above the dew point; or to damp or wet surfaces.
- C. Do not apply coatings during cold, rainy or frosty weather.
- D. Do not apply to surfaces, which are exposed to hot sun.

1.09 QUALITY ASSURANCE

- A. MPI Standards:
 - 1. Products: Complying with MPI standards indicated and listed in "MPI Approved Products List."

2. Preparation and Workmanship: Comply with requirements in “MPI Architectural Painting Specification Manual” for products and paint systems indicated.
3. Previously Painted Surface Preparation and Workmanship: Comply with requirements in “MPI Maintenance and Repainting Manual” for products and paint system indicated.

PART 2: PRODUCTS

2.01 PAINTING SYSTEMS

- A. Painting systems for normal applications are specified using the products of Sherwin-Williams Co. (S-W), PPG Paints [Glidden Professional: (GP); DEVOE COATINGS: (DC); (Sika)] (PPG) and Benjamin Moore & Co.: (BM) to establish standards of quality, except as noted.
 1. Other manufacturers can submit for approval through the pre-bid process defined in Section 01 25 00 Substitutions and Product options.
 - a. For approval, submit data sheets for each paint type with volume solids and VOC's highlighted to indicate they meet or exceed products specified in Part 2.
- B. Painting systems for specialty applications are specified using the products of Aquarius Coatings, Carboline, Seal-Krete, Rosco, Sika Corporation and manufacturers listed in 2.01A.
- C. Use the materials of the same manufacturer for each system.
- D. VOC Content of Field-Applied Interior Paints and Coatings: Provide products that comply with the following limits for VOC content, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24); these requirements do not apply to paints and coatings that are applied in a fabrication or finishing shop:
 1. Flat Paints, Coatings, and Primers VOC content of not more than 50 g/L.
 2. Non-flat Paints, Coatings and Primers: VOC content of not more than 150 g/L.
 3. Anti-Corrosive and Anti-Rust Paints Applied to Ferrous Metals: VOC not more than 250 g/L.
 4. Floor Coatings: VOC not more than 100 g/L.
 5. Shellacs, Clear: VOC not more than 730 g/L.
 6. Shellacs, Pigmented: VOC not more than 550 g/L.
- E. For color selection see Material Finish/Color Schedule, on Architectural Drawings.

2.02 PRIMERS (INTERIOR AND EXTERIOR)

- A. Rust Inhibitive, Universal, Metal Primer:
 1. Minimum Volume Solids: 37%.
 2. Maximum VOC: 250 g/L
 - a. S-W Pro-Cryl Universal Primer B66-310 Series.
 - b. DC Tru-Glaze-WB 4030 Waterborne Epoxy Primer.
 - c. PPG Pitt-Tech Int/Ext Primer DTM, 90-712.
 - d. BM Corotech Waterborne Bonding Primer V175.
- B. 100% Acrylic, Interior Alkali Resistant Primer:
 1. Minimum Volume Solids: 24%.
 2. Maximum VOC: 150 g/L

3. Alkali Resistance: Tolerance of PH levels up to 13.
 - a. S-W Loxon Concrete and Masonry Primer A24W8300
 - b. GP Gripper Interior/Exterior Primer Sealer 3210-1200.
 - c. PPG Perma-Crete Int/Ext Alkali Resistant Primer, 4-603.
 - d. BM Super Spec High Building Masonry Primer N068.

C. 100% Acrylic Interior Primer:

1. Shall be certifiable for use on gypsum drywall or wood, and paint.
2. Minimum Volume Solids: 35%.
3. Maximum VOC: 150 g/L
 - a. S-W Multi Purpose Latex Primer / Seal B51W8020
 - b. GP Gripper Interior/Exterior Primer Sealer 3210-1200.
 - c. PPG Seal Grip Int/Ext. Acrylic Universal Primer/Sealer, 17-921.
 - d. BM Fresh Start High Hiding All Purpose Primer N046.

D. Rust-inhibitive Waterborne Acrylic Primer:

1. Minimum Volume Solids: 37%.
2. Maximum VOC: 250 g/L
 - a. S-W DTM Acrylic Primer/Finish B66W1.
 - b. DC Devflex 4020PF Direct to Metal Primer and Flat Finish.
 - c. PPG Pitt-Tech Int/Ext Primer DTM, 90-712.
 - d. BM Corotech Waterborne DTM Metal Primer/Finish V110.

E. Wash Primer:

1. Minimum Volume Solids: 27%.
2. Maximum VOC: 400 g/L
 - a. S-W DTM Wash Primer B71Y1
 - b. DC Tru-Glaze-WB 4030 Waterborne Epoxy Primer.
 - c. PPG Multi Prime Epoxy Primer, 94-109.
 - d. BM Corotech Waterborne Bonding Primer V175.

2.03 BLOCKFILLERS (INTERIOR AND EXTERIOR)

A. Vinyl Acrylic Blockfiller:

1. Minimum Volume Solids: 44%.
2. Maximum VOC: 150 g/L
 - a. S-W PrepRite Block Filler B25W25.
 - b. GP Concrete Coatings Block Filler Interior/Exterior Primer 3010-1200.
 - c. PPG Speedhide Int/Ext Masonry Block Filler, 6-7.
 - d. BM Corotech Acrylic Block Filler V114.

B. High Performance Blockfiller:

1. Minimum Volume Solids: 43%.
2. Wind Driven Rain Resistance: Passes TT-C-555B, 98 MPH wind velocity.
 - a. S-W Kem Cati-Coat HS Epoxy filler / sealer B42W400
 - b. DC Tru-Glaze-WB 4015 High Performance Waterborne Epoxy Block Filler.
 - c. PPG Aquapon-Polyamide Epoxy Block Filler, 97-685/97-686.
 - d. BM Corotech Epoxy Block Filler B163.

2.05 STAINS, VARNISHES AND WATER REPELLENTS (INTERIOR AND EXTERIOR)

A. Wiping Stain:

1. Maximum VOC: 545 g/L
 - a. S-W Wood Classics Interior Oil Stain A49 Series.
 - b. GP Woodpride Interior Oil Wood Finishing Stain 1700.
 - c. PPG Olympic Interior oil stain, 44500.
 - d. BM Lenmar Alkyd Wiping Stain 1AS.1200.

B. Waterborne Polyurethane Satin Varnish

1. Minimum Volume Solids: 22%
2. Maximum VOC: 309 g/L
3. Sheen: 20-35 units at 60 degrees.
 - a. S-W wood classics waterborne polyurethane varnish, satin.
 - b. GP Wood Pride Interior Water Based Satin Varnish 1802-0000.
 - c. PPG REZ Interior Acrylic Polyurethane Satin Finish, 77-49.
 - d. BM Benwood Stays clear Polyurethane Satin N423.

2.06 INTERIOR FINISH PAINTS

A. Vinyl Acrylic Interior Eggshell Finish:

1. Minimum Volume Solids: 35%.
2. Maximum VOC: 0 g/L
 - a. S-W ProMar 200 0 VOC Interior Latex Eg-Shel, B20-2600 Series.
 - b. GP No VOC Interior Eggshell, 1411.
 - c. PPG Pure Performance Interior Eggshell Latex, 9-300 Series.
 - d. BM Ultra Spec 500 Interior Eggshell 538.

B. Vinyl Acrylic Interior Flat Finish:

1. Minimum Volume Solids: 32%.
2. Maximum VOC: 0 g/L
3. Sheen: 0-8 units at 85 degrees.
 - a. S-W ProMar 200 0 VOC Interior Latex, B30-2600 Series.
 - e. GP No VOC Interior Flat 150, 1209
 - b. PPG Pure Performance Interior Flat Latex, 9-100 Series.
 - c. BM Ultra Spec 500 Interior Flat 536.

C. 100%, Modified Acrylic, Interior Semi-Gloss Coating:

1. Minimum Volume Solids: 33%.
2. Maximum VOC: 150 g/L
 - a. S-W Pro Industrial Pre-Catalyzed Epoxy.
 - b. DC Devflex 4216HP Water-Borne Acrylic or GP Lifemaster Oil Interior/Exterior Semi-Gloss Paint 1506.
 - c. PPG PITT-GLAZE WB1 Interior Semi-Gloss Pre-Catalyzed Water-Borne Acrylic Epoxy.
 - d. BM Corotech WB Pre-Cat Epoxy Coating Semi-Gloss V341.

D. Two-component, Semi-Gloss Waterbased Catalyzed Epoxy:

1. Minimum Volume Solids: 29% (catalyzed).
2. Maximum VOC: 150 g/L

3. Sheen 20-50 units at 60 degrees.
 - a. S-W Water Based Catalyzed Epoxy B70 Series/B60V25.
 - b. DC Tru-Glaze-WB 4426 Waterborne Epoxy Semi Gloss Coating.
 - c. PPG Pitt-Glaze WB. Epoxy Semi-Gloss, Series 16-551.
 - d. BM Corotech Waterborne Amine Epoxy Gloss V440.

E. Two-component Polyamide Epoxy:

1. Minimum Volume Solids: 50%.
2. Maximum VOC: 450 g/L
3. Sheen: 75-90 units at 60 degrees.
 - a. S-W Tile-Clad High Solids Epoxy B62 Series.
 - b. DC Tru-Glaze 4508 HIPAC Epoxy Gloss Coating.
 - c. PPG Aquapon 35 Polyamide Epoxy Gloss, 95-1.
 - d. BM Corotech Polyamide Epoxy Coating Gloss V400-62.
4. Color(s): Clear, Gray, Tan, Red, White.

2.08 EXTRA STOCK

- A. Provide left over paint with Owner for touch-up purposes. At completion of project, provide one complete set of drawdowns in each maintenance manual with a schedule noting the locations each paint color was used. Refer to Section 01 78 39.

PART 3: EXECUTION

3.01 PREPARATION OF SURFACES

A. General

1. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates indicated.
2. Do not start work until preparation specified in surface Section is completed.
3. Ensure surfaces are dry and adequately protected from dampness.
4. Thoroughly clean surfaces free of loose, rough and foreign substances which will affect adhesion or appearance of applied coats.
5. Remove mildew and neutralize surface.
6. Remove plates, machined surfaces, and similar items already in place that are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface applied protection before surface preparation and painting.
 - a. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
 - b. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
7. Complete repainting or refinishing will be required if coats are applied over improperly prepared surfaces.

B. Wood

1. Hand sandpaper to smooth surface. Sand direction of grain, taking care not to mar character of details and sharp edges. Remove sanding dust.
2. After first coat is dry, thoroughly coat, with shellac (suitably reduced with alcohol for flowing consistency) or known sealer, knots, pitch pockets and resinous sapwood areas.
3. After first coat is dry, fill nail holes, cracks and defects with colored putty tinted to match stain or paint.
4. Previously painted surfaces must be free of dirt, mildew, loose paint, etc. Excessive chalking or dirt must be removed by washing with water. Hard glossy surfaces are to be lightly sanded or dulled with deglosser/cleaner. Openings permitting entrance of water should be caulked prior to painting. Surfaces in poor condition must be prepared for repainting by removing loose paint and blisters by scraping, sanding or burning. Paint in these areas is to be removed at least 12 inches beyond the failing area. Prime before applying finish coats.

C. Gypsum Board:

1. Fill minor irregularities with patching material and sand to smooth level surfaces taking care not to raise nap of paper.
2. Previously painted gypsum wallboards must be completely dry, smooth-sanded, clean and free of dust, dirt, powdery residue, grease, oil, wax or any other contaminants such as flaking or peeling paint before paint application is started. Treat or remove all contaminants and correct defects. Dull glossy old paint by light sanding or with a commercial deglosser/cleaner to assure maximum adhesion of the new coating. Patch holes and cracks with a latex patching compound, sand smooth and spot prime with the paint or enamel to be used as the final coat.

D. Plaster

1. Fill cracks, holes or imperfections with patching plaster and smooth off to match adjoining surfaces. Do not sandpaper.
2. In case of high alkali or lime conditions, neutralize with solution recommended by paint manufacturer.
3. Do not paint until moisture content of surface is 12% or below, except as may be required by paint manufacturer.
4. Previously painted plaster surfaces must be dry, clean, and free of dust, dirt, powder residue, grease, oil, wax or any other contaminants; free of flaking, crumbling or chalking conditions before paint application is started. Contaminants must be treated or removed. Defects corrected as necessary. Dull glossy old paints by light sanding or with deglosser/cleaner to assure maximum adhesion of the new coating. Remove any loose, chipped, peeling or blistered old paint by scraping and smooth sanding. If highly porous old paint needs reconditioning before receiving the new application, prime the entire surface with undercoater oil primer. Patch holes and cracks with latex patching compound per manufacturer's instructions after removing plaster as far back as necessary to reach firm areas. Spot prime patched areas with sealer-primer.

E. Formed Concrete

1. Remove all traces of form oil.
2. Do not paint until moisture content of surface is 15% or below except as may be required by paint manufacturer.

3. Previously painted surfaces must be free of grease, oil, wax or any other contaminants and loose or flaking paint. Clean concrete of oil and grease with detergent, hot water and vigorous scrubbing. All loose and peeling paint must be scraped or sand blasted back to sound adhesion.

F. Masonry

1. Do not paint until moisture content of surface is 15% or below except as may be required by paint manufacturer.
2. After prime coat is dry, fill remaining small holes, cracks and other defects with Swedish putty made by mixing dry spackle with prime paint.
3. Previously painted masonry surfaces must be dry, clean and free of dust, dirt and any other contaminants. Hard glossy surfaces are to be lightly sanded or dulled with deglosser/cleaner. Surfaces in poor condition must be prepared for repainting by removing loose paint and blisters by scraping, sanding or burning. Paint in these areas are to be removed at least 12 inches beyond the failing area. Patch all holes left after removal of nails, screws, and anchors. Prime before applying finish coats.

G. Ferrous or Galvanized Metal

1. Remove dirt and grease with mineral spirits or solvent recommended by paint manufacturer and clean cloths.
2. If prime coat is not smooth, sand to bare metal, reprime. Touch up scratched or abraded primer.
3. Previously painted metal must be dry, clean and free of contaminants. Hard and glossy surfaces are to be sanded lightly or dulled with deglosser/cleaner. Remove peeling, loose, chipped, and blistered paint and rust by scraping and sanding. Prime all sanded areas and areas devoid of paint with an all-purpose metal primer.

H. Aluminum:

1. Remove dirt and grease with mineral spirits or solvent recommended by paint manufacturer and clean cloths.
2. All chipped, peeling or blistered paint must be removed by hand or power tool cleaning. Remove all oil, grease, dirt or other foreign materials. Remove excessive chalking or sanding. Remove any mildew present by scrubbing with detergent and bleach. Thoroughly clean surface with water prior to repainting.

I. Concrete Floors:

1. To receive paint or non-slip paint: Shotblast floor to resemble 100 grit sandpaper. Fill cracks, voids, bug holes, gouges or divots with Crack Filler.

3.02 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 1. Concrete: 12 percent
 2. Masonry: 12 percent
 3. Wood: 15 percent
 4. Gypsum Board: 12 percent
 5. Plaster: 12 percent
- C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

D. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.

1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

E. Conditions

1. Do no work when surface, coating product, air temperature, humidity or dewpoint does not meet requirements of PROJECT CONDITIONS in Part 1 of this specification.
2. Do no interior work until building is properly enclosed.
3. Do work under adequate illumination and dust-free conditions.

3.03 APPLICATION

A. Methods: Paint may be applied by brush, roller or spray methods except where particular method will produce unsatisfactory results. Where spray method is used on concrete block, follow with roller to work paint into voids.

B. Materials: Do not open containers until required for use. Stir materials thoroughly and keep at uniform consistency during application.

C. Coats

1. Number specified is minimum. Provide sufficient number of coats to provide even, consistent, opaque coverage of substrate.
2. Touch up suction spots between coats.
3. Refinish surfaces affected by refitting work.
4. Tint prime and under coats of paint approximately 1/2 to 3/4 depth of final color.
5. Touch up suction and "hot" spots in plaster and concrete after application of first coat and before second coat.
6. Do not apply next coat until previous is thoroughly dry.
7. Provide final coat which is solid and even in color; free from runs, laps, sags, brush marks, air bubbles and excessive roller stipple and worked into crevices, joint and similar areas.
8. Do not paint sealant / sealant joints.

3.05 SCHEDULE OF INTERIOR WORK

A. General

1. Paint complete all surfaces noted with a "PT" on Room Finish Schedule.
 - a. New Work: In rooms with surfaces not scheduled for paint on Room Finish Schedule, paint hollow metal doors and frames.
 - b. Existing Areas:
 - 1) Remodeling work: In rooms with surfaces not scheduled for paint on Room Finish Schedule, paint hollow metal doors and frames, metal stairs and railings as occur.

- 2) In unscheduled areas where patching has occurred, paint all walls corner to corner and floor to ceiling. Match adjacent wall color. Paint both sides of doors and frames at locations where replacement or modifications have been made.
2. Provide specified finish on exposed surfaces including, but not limited to the following:
 - a. Prime coated mechanical units, piping, pipe covering, sprinkler piping, interior duct surfaces visible behind grilles, tanks without factory finish, radiation covers, cabinet unit heaters, exposed ductwork, louvers and grilles.
 - b. Electrical panel box covers and surface raceways (over factory finish), conduits and boxes and all factory primed electrical equipment. (Except in maintenance, service and electrical rooms).
 - c. Hollow metal doors and frames, steel stairs, ladders and railings, catwalks and safety mesh grilles, access panels, prime painted hardware, painted astragals and vision lite kits on doors, coiling grilles and doors (unless factory finished), metal supports for counters and exposed miscellaneous metals.
 3. Do not paint sealant.
 4. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
 5. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
 6. Partition Identification
 - a. Place identification on all partitions indicated on Code Drawings as having a required fire or smoke rating.
 - b. Identification shall be as follows:
 - 1) Rating (i.e. 2 HR Fire Wall; Smoketight; 2 HR Fire Barrier): Same as indicated on Code Drawing Legend.
 - 2) Location: With-in 15 feet at the end of each wall and a maximum of 30 feet on center, both sides of partitions, above ceiling line and below access floors.
 - a) Place above access panels in hard ceilings.
 - 3) Style of Lettering: 3 inches high, Arial Bold style, painted with aid of stencils.
 - 4) Color: Red.

B. Concrete, Cement Plaster – Ceilings Without Exposed Mechanical:

1. 1st Coat: 100% Acrylic, Interior Alkali Resistant Primer.
 - a. Minimum DFT: 3.0 mils.
2. 2nd and 3rd Coat: Vinyl Acrylic Interior Flat Finish.
 - a. Minimum DFT: 1.4 per coat.

C. Concrete Masonry Units and Restored Masonry (not scheduled for epoxy):

1. 1st Coat: Vinyl Acrylic Blockfiller.
(1st Coat Option due to schedule constraints: 100% Acrylic Exterior Masonry Primer).
 - a. Minimum DFT: 8.0 mils (75-125 sq. ft./gal).
2. 2nd and 3rd Coat: Vinyl Acrylic Interior Eggshell Finish.
 - a. Minimum DFT: 1.5 per coat.

D. Gypsum Drywall – Wall (not scheduled for epoxy):

1. 1st Coat: 100% Acrylic Interior Primer.
 - a. Minimum DFT: 1.5 mils.
2. 2nd and 3rd Coat: Vinyl Acrylic Interior Eggshell Finish.
 - a. Minimum DFT: 1.5 per coat.

E. Gypsum Drywall – Soffits/Ceilings (not scheduled for epoxy):

1. 1st Coat: 100% Acrylic Interior Primer.
 - a. Minimum DFT: 1.5 mils.
2. 2nd and 3rd Coat: Vinyl Acrylic Interior Flat Finish.
 - a. Minimum DFT: 1.4 per coat.

F. Plaster – Walls (not scheduled for epoxy):

1. 1st Coat: 100% Acrylic, Interior Alkali Resistant Primer.
 - a. Minimum DFT: 3.0 mils.
2. 2nd and 3rd Coat: Vinyl Acrylic Interior Eggshell Finish.
 - a. Minimum DFT: 1.5 per coat

G. Plaster – Ceilings (not scheduled for epoxy):

1. 1st Coat: 100% Acrylic, Interior Alkali Resistant Primer.
 - a. Minimum DFT: 3.0 mils.
2. 2nd and 3rd Coat: Vinyl Acrylic Interior Flat Finish.
 - a. Minimum DFT: 1.4 per coat.

H. Wood – Painted:

1. 1st Coat: 100% Acrylic Interior Primer.
 - a. Minimum DFT: 1.5 mils.
2. 2nd and 3rd Coat: 100% Acrylic Interior Gloss Coating.
 - a. Minimum DFT: 1.3 mils per coat.

I. Wood – Transparent Finish:

1. 1st Coat: Wiping Stain.
 - a. Spreading Rate: As needed to match architect's sample.
2. 2nd and 3rd Coat: Waterborne Polyurethane Satin Varnish.
 - a. Minimum DFT: 0.8-1.1 mils per coat.

J. Ferrous Metal (not scheduled for epoxy):

1. Touch-up: Rust-inhibitive Waterborne Acrylic Primer
 - a. DFT: 2.0-5.0 mils.
2. 2nd and 3rd Coat: 100% Modified Acrylic Interior Semi-Gloss Coating.
 - a. Minimum DFT: 1.3 mils per coat.

K. Zinc-coated Metal:

1. Touch-up: Rust-inhibitive Waterborne Acrylic Primer
 - a. DFT: 2.0-5.0 mils.
2. 2nd and 3rd Coat: 100% Modified Acrylic Interior Semi-Gloss Coating.
 - a. Minimum DFT: 1.3 mils per coat.

- L. Cotton or Canvas Covering Over Insulation (except exposed overhead work):
1. 1st Coat: 100% Acrylic Interior Primer.
 - a. Minimum DFT: 1.5 mils.
 2. 2nd Coat: Vinyl Acrylic Interior Flat Finish.
 - a. Minimum DFT: 1.4 mils per coat.
- M. Aluminum – Mill Finish (not scheduled for epoxy):
1. 1st Coat: 100% Modified Acrylic Interior Semi-Gloss Coating.
 - a. Minimum DFT: 1.3 mils.
 2. 2nd Coat: 100% Modified Acrylic Interior Semi-Gloss Coating.
 - a. Minimum DFT: 1.3 mils.
- N. Wall Surfaces Scheduled to Receive Vinyl Wallcovering or Wall Fabric:
1. 1st Coat: Wallcovering Primer
 - a. Minimum DFT: 1.2 mils.
- O. Exposed Overhead Work:
1. Touch-up: Rust-inhibitive Waterborne Acrylic Primer.
 - a. DFT: 2.0-5.0 mils.
 2. 2nd Coat: 100% Acrylic, Waterborne Eg-Shel Dryfall.
 - a. DFT: 2.1-4.5 mils.
- P. Gypsum Drywall – Walls (scheduled to receive epoxy except showers):
1. 1st Coat: 100% Acrylic Interior Primer.
 - a. Minimum DFT: 1.5 mils.
 2. 2nd and 3rd Coat: Two-component, Semi-Gloss Waterbased Catalyzed Epoxy.
 - a. DFT: 2.0-3.0 mils per coat.
- Q. Concrete, Cement Plaster, and Gypsum or Veneer Plaster - Walls (scheduled to receive epoxy except showers):
1. 1st Coat: 100% Acrylic, Interior Alkali Resistant Primer.
 - a. Minimum DFT: 3.0 mils.
 2. 2nd and 3rd Coat: Two-component, Semi-Gloss Waterbased Catalyzed Epoxy.
 - a. DFT: 2.0-3.0 mils per coat.
- R. Concrete Masonry Units and Restored Masonry (scheduled to receive epoxy except showers):
1. 1st Coat: Vinyl Acrylic Blockfiller.
(1st Coat Option due to schedule constraints: 100% Acrylic Exterior Masonry Primer).
 - a. Minimum DFT: 8.0 mils.
 2. 2nd and 3rd Coat: Two-component, Semi-Gloss Waterbased Catalyzed Epoxy.
 - a. DFT: 2.0-3.0 mils per coat.
- S. Gypsum Drywall – Walls and Ceilings (scheduled to receive epoxy for showers):
1. 1st Coat: 100% Acrylic Interior Primer.
 - a. Minimum DFT: 1.5 mils.
 2. 2nd and 3rd Coat: Two-component Polyamide Epoxy.
 - a. DFT: 2.0-4.0 mils per coat.

- T. Plaster, Concrete, Cement Plaster, and Galvanized Metal, Wood - Walls and Ceilings (scheduled to receive epoxy for showers):
 - 1. 1st and 2nd Coat: Two-component Polyamide Epoxy.
 - a. DFT: 2.0-4.0 mils per coat.
- U. Ferrous Metal (scheduled to receive epoxy for showers):
 - 1. 1st Coat: Rust Inhibitive, Universal, Metal Primer.
 - a. DFT: 2.0-4.0 mils.
 - 2. 2nd and 3rd Coat: Two-component Polyamide Epoxy.
 - a. DFT: 2.0-4.0 mils per coat.
- V. Aluminum (scheduled to receive epoxy for showers):
 - 1. 1st Coat: Wash Primer.
 - a. DFT: 0.7-6 mils.
 - 2. 2nd and 3rd Coat: Two-component Polyamide Epoxy.
 - a. DFT: 2.0-4.0 mils per coat.

3.06 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.07 FIELD QUALITY CONTROL

- A. Testing and Painting Application: Owner reserves the right to test DFT of painted surfaces.
 - 1. If testing discovers that DFT of installed paint does not meet specification, the Contractor will pay for initial and final testing and recoat surfaces until testing agency confirms specification is met.

END OF SECTION 09 91 00

SECTION 09 97 00

ACF FOR INTERIOR CEILINGS

PART 1: GENERAL

1.01 SUMMARY

- A. Drawings, Details of Construction and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Sections, apply to work specified in this section.

1.02 SUMMARY

- A. Architectural coatings and finishes (ACF) for interior ceilings over glass fiber reinforced gypsum tile backer as noted on drawings.

1.03 RELATED SECTIONS

- A. Section 09 21 16 - Gypsum Board Assemblies

1.04 REFERENCES

- A. ASTM B117 Test Method for Salt Spray (Fog) Testing
- B. ASTM D2247 Practice for Testing Water Resistance of Coatings in 100 Percent Relative Humidity
- C. ASTM D3273 Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber
- D. ASTM E84 Test Method for Surface Burning Characteristics of Building Materials.
- E. ASTM E331 Test Method for Water Penetration by Uniform Static Air Pressure Difference.
- F. ASTM E2485 Standard Test Method for Freeze/Thaw Resistance of Exterior Insulation and Finish Systems (EIFS) and Water Resistive Barrier Coatings
- G. ASTM G155/G153 Accelerated Weathering for Exposure of Nonmetallic Materials.

1.05 ASSEMBLY DESCRIPTION

- A. ACF for Interior Humid Areas: Basecoat with embedded Reinforcing Fabric Mesh, Primer, Finish Coat and Sealer. These materials are applied to glass fiber reinforced gypsum tile backer (Dens Shield, DensArmour Plus by GP Gypsum, or GoldBond e2XP Tile Backer by National Gypsum) approved by Parex USA.
- B. Functional Criteria:
 - 1. General:
 - a. Coatings are for high humidity atmosphere but not continuous wetting or constant washing.
 - b. Substrates for coating application shall have interior exposure only and shall be protected from standing water exposure.
 - c. Building code conformance: The construction shall be acceptable for use under the building code in force in the jurisdiction of the project.
 - 2. Performance Requirements
 - a. Shall meet the testing requirements of the Product Performance Sheet.
 - 3. Precaution: Sufficient continuous thermal insulation between the substrate board and exterior is required to maintain the interior surface at a temperature above the dew-point of the interior room air.

4. Vapor barriers or retarders shall not be placed in back of the tile backer board.

1.06 SUBMITTALS

- A. Submit in accordance with Section 01 33 00. Submit Samples, Evaluation Reports, warranties and Certificates.

1.07 QUALITY ASSURANCE

- A. Qualifications:

1. All ACF materials must be manufactured or sold by a single-source manufacturer and must be purchased direct from the manufacturer or its authorized distributor.
2. Applicator:
 - a. Must have attended manufacturer's Educational Seminar.
 - b. Must possess a current manufacturer's certificate of education.
 - c. Must be experienced and competent in installation of plaster-like materials and specialty finishes.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Delivery: Deliver materials in original packaging with manufacturer's identification.
- B. Storage: Store materials in a cool, dry location, out of sunlight, protected from weather and other harmful environment, and at a temperature above 40°F (4°C) and below 110°F (43°C) in accordance with manufacturer's instructions.

1.09 PROJECT / SITE CONDITIONS

- A. Installation Ambient Air Temperature: Minimum of 40°F (4°C) and rising, and remain so for 24 hours thereafter.
- B. Substrate Temperature: Do not apply materials to substrates whose temperature are below 40°F (4°C) or contain frost or ice.
- C. Inclement Weather: Do not apply materials during inclement weather unless appropriate protection is employed.
- D. Sunlight Exposure: Avoid, when possible, installation of the materials in direct sunlight. Application of Acrylic Finishes in direct sunlight in hot weather may adversely affect aesthetics.
- E. Materials shall not be applied if ambient temperature exceeds 120°F (49°C) or falls below 40°F (4°C) within 24 hours of application. Protect materials from uneven and excessive evaporation during hot, dry weather.
- F. Prior to installation, the wall shall be inspected for surface contamination, or other defects that may adversely affect the performance of the materials and shall be free of residual moisture.

1.10 COORDINATION AND SCHEDULING

- A. Coordination: Coordinate water-resistive membrane & air barrier coating materials installation with other construction operations.

1.11 WARRANTY

- A. Warranty: Upon request, at completion of installation, provide manufacturer's Standard Limited Warranty.

PART 2: PRODUCTS

2.01 MANUFACTURERS

- A. Specification is based on system by PAREX.USA, www.parex.com. Equivalent system by STO Corp, www.stocorp.com is acceptable.

2.02 MATERIALS

A. Basecoat:

1. Parex USA WeatherDry: Waterproof Basecoat mixed with portland cement in the field.

B. Reinforcing Mesh:

1. 355 Standard Mesh: Weight 4.5 oz. per sq. yd. coated for protection against alkali.
2. Short Detail Mesh: Reinforcing mesh used for backwrapping and details.
3. Corner Mesh: Reinforcing mesh used as corner reinforcement.

C. Primer:

1. Primer: 100% acrylic based coating to prepare surfaces for acrylic or elastomeric finishes.

D. Finish:

1. 100% acrylic polymer based finish, enhanced DPR acrylic finish with hydrophobic and photocatalytic properties, repels water, reflects UV rays, and reduces smog particles near the finish surface. Finish texture and sand smooth. Color: Ivory.
2. Clear Sealer: 100% acrylic, transparent, permeable, dirt resistant sealer for use as a protective coating over acrylic finishes.

E. Water: Clean, cool, potable water.

F. Portland Cement: ASTM C150, Type I or Type I-II.

2.03 RELATED MATERIALS AND ACCESSORIES

A. Substrate Materials:

1. Georgia-Pacific Gypsum LLC; Product DensArmor Plus: www.gp.com/gypsum.
2. GoldBond e2XP Tile Backer by National Gypsum.

B. Fasteners: Shall be galvanized or rust resistant alloy or polymer coated for equivalent corrosion resistance.

C. Trim Accessories:

1. Control joints and casing beads shall be exterior grade rigid PVC.
2. Ceramic tile base or similar construction shall be provided at the base of the wall to protect sheathing board edges from exposure to moisture.

D. Sealant System: Sealant material shall be in compliance with sealant manufacturer's requirements for casing bead material, coating system, and adjoining materials.

PART 3: EXECUTION

3.01 EXAMINATION

A. Compliance: Comply with manufacturer's instructions for installation.

B. Substrate Examination: Examine prior to installation of materials as follows:

1. Substrate shall be free of dust, dirt, laitance, efflorescence, and other harmful contaminants.
2. Substrate construction in accordance with substrate material manufacturer's specifications and applicable building codes.
3. Substrate shall have no irregularities as recommended by sheathing manufacturer and shall be sound and free of foreign substances, including paint, bond breakers, form oils, laitance, scaling and flaking.
4. Unsatisfactory conditions shall be corrected before the application of the coatings.

5. Painted surfaces shall have paint removed to achieve a substrate with 90% or more of the surface free of paint.
 6. Sanding surfaces shall be eliminated mechanically, then washed with clear water.
 7. Remove efflorescence using mechanical removal and/or a diluted acid solution followed by complete rinsing.
 8. Concrete surfaces shall be level and free of voids over 1/8" (3 mm) across. Glossy surfaces shall be dulled by chemical or mechanical means. Thoroughly remove all residues.
- C. Sealants and Backer Rod: To be installed, where required, in accordance with the sealant manufacturer's specifications and published literature, and using the sealant manufacturer's recommended primers.
- D. Advise Contractor of discrepancies preventing proper installation of the ACF materials. Do not proceed with the work until unsatisfactory conditions are corrected.

3.02 PREPARATION

- A. Protection: Protect surrounding material surfaces and areas during installation of system.
- B. Clean surfaces thoroughly prior to installation.
- C. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 MIXING

- A. Mix materials in accordance with manufacturer's instructions.

3.04 APPLICATION

- A. General: Installation shall conform to this specification and manufacturer's written instructions.
- B. Apply Basecoat and fully embed mesh in Basecoat; include diagonal mesh patches at corners of openings and reinforcing mesh patches at joints of track sections. Apply multiple layers of Basecoat and mesh where required for specified impact resistance classification.
- C. Apply primer to Basecoat after drying. Primer may be omitted if it is not required by the manufacturer's product data sheets for the specified finish coat or otherwise specified for the project.
- D. Finish Coat: Apply finish coat to match specified finish type, texture, and color. Do not apply finish coat to surfaces to receive sealant. Keep finish out of sealant joint gaps.
- E. Clear Sealer: Apply Clear Sealer when finish has dried according to the published product data sheet.

3.05 CLEAN-UP

- A. Removal: Remove and legally dispose of materials from job site.
- B. Clean surfaces and work area of foreign materials resulting from material installation.

3.06 PROTECTION

- A. Provide protection of installed materials from dust, dirt, precipitation, and freezing during installation, and continuous high humidity until fully cured and dry.
- B. Clean exposed surfaces using materials and methods recommended by the manufacturer of the material or product being cleaned. Remove and replace work that cannot be cleaned to the satisfaction of the Project Designer/Owner.

END OF SECTION 09 97 00

SECTION 10 21 13

SOLID PLASTIC TOILET PARTITIONS

PART 1: GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings, Details of Construction and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Sections, apply to work specified in this section.

1.02 SUMMARY

- A. Section includes: Provide and install toilet partitions and urinal screens as indicated on drawings.
- B. Related work specified in other sections:
 - 1. Blocking in walls - Section 06 10 53.
 - 2. Toilet accessories (except combination coat hook-bumpers, purse shelf) - Section 10 28 13.

1.03 SUBMITTALS

- A. Submittal Procedures:
 - 1. Product data for compartments, panels, finishes, hardware, and accessories.
 - 2. Shop drawings, showing partition plans, elevations, field verified, dimensions, door swings, details for supports, and method of anchorage.
 - 3. Samples of manufacturer's colors/finishes.
 - 4. Installation instructions.
 - 5. Submit the following per Section 01 78 23.
 - a. Maintenance instructions.
 - b. Copy of warranty.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver compartments in suitable crating or packaging to prevent damage in transit and storage.
- B. Coordinate delivery to reduce period of on-site storage. Store under cover in a dry area.

1.06 QUALITY ASSURANCE

- A. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84, or another standard acceptable to authorities having jurisdiction, by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame-Spread Index: 200 or less.
 - 2. Smoke-Developed Index: 450 or less.
- B. Regulatory Requirements: Comply with applicable provisions in Americans with Disabilities Act (ADA) and local Building Code.

1.07 WARRANTY

A. Provide 15 year warranty to cover panels, doors, and pilasters against breakage, delamination, and corrosion. Submit per Section 01 78 23.

PART 2: PRODUCTS

2.01 POLYMER RESIN PARTITIONS

A. Products produced by General Partitions Mfg. Corp. are specified. Other manufacturers with products that conform to requirements of specification are acceptable.

1. Construction

- a. Toilet Partition Type: Floor to Ceiling "Series 60". Panel height between 55"-60".
- b. Doors: 24" wide x 55" high unless noted otherwise. Accessible stall doors shall have minimum clear width of 32" x 55" high.
- c. Finish: Uniform color throughout. Color: See Material Finish/Color Schedule, on Architectural Drawings.
- d. Accessories: Combination coat hook and bumper (for all stalls).
- e. Hardware: Include gravity style self closing continuous hinge and bracket assemblies, steel bar saddle for attachment to floor or ceiling with threaded steel studs and leveling studs, pilaster shoes, aluminum anti-grip headrail on panels, door latches with emergency access, door handles, door strikes and keepers. Provide continuous anchor strip to attach panels to walls. Finish: Aluminum or stainless steel.
- f. Fasteners: Stainless steel. Provide theft-proof head thru-bolt sex bolt fasteners at hinge brackets, keeper and strike with rubber bumper.

2. Panels

- a. Material: Molded under pressure from high density polymer resin in uniform color throughout.
 - 1) Resistant to delamination, water, steam, corrosion, soaps, detergents, and mildew. Does not absorb odors.
 - 2) Self-lubricating surface that is graffiti resistant to markings from pen, pencil, marker, and paint.
 - 3) Edges: Machine radius eliminating sharp edges.
 - 4) Surface texture: Orange peel.
- b. Heat sinks: Attach anti-grip handrail to bottom edges of panels and doors to protect panel from being ignited by vandals.
- c. Nominal Thickness:
 - 1) Panels: 1 inch.
 - 2) Doors: 1 inch.
 - 3) Pilasters: 1 inch.

B. Miscellaneous Construction

1. Provide factory cut-outs and reinforcing for grab bars and accessories in partitions as required.
2. Meet Building Code requirements for handicapped access.

PART 3: EXECUTION

3.01 PREPARATION

- A. Coordinate requirements for blocking in stud walls to ensure proper support is provided for wall attachments.
- B. Coordinate requirements for structural support members and bracing above ceiling for adequate suspension of ceiling hung toilet compartments or attachment of floor to ceiling pilaster.
- C. Verify that site conditions are ready to receive work and opening dimensions are as indicated on shop drawings.
- D. Verify correct spacing of plumbing fixtures.

3.02 INSTALLATION

- A. Install partitions secure, plumb, and level in accordance with manufacturer's instructions.
- B. Maintain 3/8 to 1 inch uniform space between wall and panels and between wall and end pilasters.
- C. Attach continuous panel brackets securely to walls using tamper proof anchor devices recommended by manufacturer.
- D. Where indicated on approved shop drawings, pilasters intersecting adjacent walls shall be terminate 12 inches above floor and attach to wall with continuous brackets.
- E. Where indicated on approved shop drawings, pilasters intersecting adjacent walls shall be attached with continuous brackets.
- F. Attach panels and pilasters to brackets with tamper-proof sheet metal screws.
- G. Brace pilasters with overhead rail. Locate headrail joints at pilaster center lines.
- H. Anchor pilaster to floor with stainless steel angle plate, sheet metal screws, and anchors. Conceal floor fastenings with pilaster shoes.
- I. For floor to ceiling installations anchor pilaster to floor and to ceiling support with stainless steel angle plate, sheet metal screws, and anchors. Conceal floor and ceiling fastenings with pilaster shoes.
- J. Anchor urinal screen panels to walls with continuous aluminum channel.
- K. Door installation: Hang doors from pilasters. Equip each door with full length continuous hinge, door latch, door strike and keeper, and coat hook and bumper. Install door pull on out swinging doors.

3.03 ERECTION TOLERANCES

- A. Maximum variation from true position: 1/4 inch.
- B. Maximum variation from plumb: 1/8 inch.

3.04 ADJUSTING

- A. Replace significantly damaged, bent, deeply scratched, or dented panels.
- B. Adjust hinges to locate inswinging doors in partial open position and out swinging doors in closed position when unlatched.

- C. Adjust and align hardware to uniform clearance at vertical edge of doors.

3.05 CLEANING

- A. Clean surfaces with liquid spray furniture or counter top polish. Do not use abrasives.

3.06 DEMONSTRATION

- A. Engage factory-authorized representative to train Owner's maintenance personnel on cleaning procedures and damage repair. Refer to Section 01 79 00 Demonstration and Training.

END OF SECTION 10 21 13

SECTION 10 28 13

TOILET ACCESSORIES

PART 1: GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings, Details of Construction and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Sections, apply to work specified in this section.

1.02 SUMMARY

- A. Section includes: Toilet accessories where shown on the Drawings and specified herein.
- B. Related work specified in other sections:
 - 1. Blocking - Section 06 10 53.
 - 2. Coat hook/bumpers for installation in partitions - Section 10 21 13/10 21 15.

1.03 SUBMITTALS

- A. Brochure: Submit brochure and schedule of materials in accordance with Section 01 33 00.
- B. Submit a sample of each item dispensed by each type dispensing accessory machine or accessory to Construction Manager.

1.04 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver items in manufacturer's original unopened protective packaging.
- B. Store materials in original protective packaging to prevent soiling, physical damage, or wetting.
- C. Handle so as to prevent damage to finished surfaces.
- D. Protection:
 - 1. Maintain protective covers on all units until installation is complete.
 - 2. Remove protective covers at final clean-up of installation.

PART 2: PRODUCTS

2.01 MANUFACTURER

- A. The products of Bobrick are specified, comparable products of Bradley are acceptable. All units and trim stainless steel, #4 finish.

2.02 ACCESSORIES

A. Grab Bars (Field verify sizes)

1. G.B. No. 1: B-6806 x 42" horizontal and B-6806 x 18" vertical.
2. G.B. No. 2: B-6806 x 36".
3. G.B. No. 6: B-68616 'L' shaped 24" x 36".

B. Mirrors

1. M No. 4: B290 6036.

C. Coat Hook: B-677 (locate at each toilet compartment and each shower compartment).

D. Shower Seat:

- a. #1: B-5181 Reversible folding 'L' shaped seat.

E. Shower Curtain Rod and Shower Curtain

1. Shower Curtain Rod: HDWT-AO458 by lengths shown.
2. Shower Curtain: HDWP-COMAK.

F. Mounting Kits: Provided with each unit shall suit wall construction.

PART 3: EXECUTION

3.01 INSPECTION

- A. Check opening scheduled to receive recessed units for correct dimensions, plumbness of blocking or frames, preparation that would affect installation of accessories.
- B. Check areas to receive surface mounted units for conditions that would affect quality and execution of work.
- C. Verify spacing of plumbing fixtures and toilet partitions that affect installation of accessories.
- D. Coordinate blocking requirements with Section 06 10 53, prior to enclosure of walls.
- E. Do not begin installation of washroom accessories until openings and surfaces are acceptable.

3.02 INSTALLATION

- A. Drill holes according to manufacturer's mounting templates or printed instructions.
- B. Mount recessed accessories into wall openings with wood screws through cabinet side into wood blocking, or sheet metal screws into metal frames.
- C. Mount surface mounted accessories to back up with toggle bolts, plumb and align.
- D. Anchor grab bars to through-wall anchor plates.

3.03 ADJUST AND CLEAN

- A. Adjust accessories for proper operation.
- B. After completion of installation, clean and polish all exposed surfaces.
- C. Deliver keys and instruction sheets to Owner's Representative.

END OF SECTION 10 28 13

INDEX OF SPECIFICATION SECTIONS

SECTION

TITLE

Division 22 – Plumbing

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22 05 10	Plumbing Systems Testing, Cleaning, Water Treatment and Startup
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22 06 00	Plumbing Specialties
22 07 00	Plumbing Pipe Insulation
22 10 00	Plumbing Piping

Division 23 – Heating, Ventilating and Air Conditioning

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Divisions 26 & 28

26 01 00	Basic Electrical Requirements
26 02 00	Minor Electrical Demolition for Remodeling
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28 31 00	Fire Alarm System

SECTION 22 05 00

PLUMBING REQUIREMENTS

PART 1 GENERAL

1.1 RELATED SPECIFICATIONS AND DOCUMENTS

- A. Drawings and related specifications for this project including General and Supplementary Conditions, Division 1, General Requirements, Instructions to Bidders, Addenda's, etc. apply to and are considered a part of Division 22 - Mechanical Work.
- B. Information in this division is intended to clarify or make additions to the requirements set forth in the General Conditions, Supplementary Conditions, and Division I of these specifications. Any conflict between this Division 22 and other sections or divisions of the specifications or drawings shall be brought to the attention of the Architect/Engineer in writing as a request for addendum prior to the bid opening.
- C. Furnish all equipment, materials, articles, items, operations or methods listed, mentioned or scheduled on drawings, these specifications, manufacturer's installation instructions and include all labor, materials, equipment and incidentals necessary for their complete installation and operation.
- D. All information contained in this section applies to all sections within Division 22 as if it was part of each section.

1.2 DRAWINGS AND SPECIFICATIONS

- A. The drawings and these specifications are intended to supplement each other and any material or labor called for in one shall be furnished even if not specifically mentioned in both. Any material or labor which is neither shown on the drawings nor listed in this specification, but is normally incurred or required for completion of work shall be furnished. If there is a discrepancy between the drawings and specifications, the more stringent of the two shall be followed.
- B. Drawings are diagrammatic and are intended to show approximate location and general arrangement of systems and equipment. No attempt has been made to show every ell, tee, etc. Drawings shall not be scaled for location of systems, equipment, etc. All dimensions whether given on drawings or scaled shall be verified in field and coordinated with all other trades and existing field conditions. Some plumbing, piping, equipment, etc. locations may require changes in location due to field conditions and coordination with other trades will be made with no additional cost to the Owner. Failure to check will be no reason for additional compensation.
- C. These drawings and the associated specifications are intended to provide complete furnishing, installation and operational plumbing systems as specified under Division 22 and as called for on the drawings. If these drawings and associated specifications have information omitted that would not allow a completely operational system as is the intent of the Engineer, the bidder shall notify the Engineer a minimum one week prior to the bid date to allow for addenda. Once bids have been received, the Contractor shall be responsible for material, labor, etc., to furnish and install a completely operational plumbing system as is the intent of these drawings and associated specification.

- D. The installation of all systems, equipment, etc., is subject to clarification with submitted shop drawings and field coordination requirements. Equipment outlines shown on drawings or dimensioned on drawings are limiting dimensions. Any equipment that reduces the indicated clearances or exceeds specified or scheduled equipment dimensions shall not be used.
- E. The Architect/Engineer and Owner reserve the right to make minor changes in the location of equipment, piping, ductwork, etc. at the time of rough-in without additional cost to the Owner.
- F. The Mechanical Trades Contractor shall have completed for his portion of work, at least one installation of size and type comparable to this project and has been in satisfactory operation for at least two complete years. The Mechanical Trades Contractor shall also have a developed service department capable of negotiating service contracts with the Owner for systems herein specified.

1.3 MANUFACTURER'S SPECIFICATIONS AND CAPACITIES

- A. Some equipment, plumbing fixtures, materials, etc. that are scheduled on the drawings or listed in any addenda may not be specified in this specification. The manufacturer's specification and capacities shall be considered included and part of this specification whether it is specified in this specification or noted or scheduled on the drawings. The contractor shall remove and replace any "substituted" equipment or material, that has been installed or is on site, which in the opinion of the Architect/Engineer does not meet the scheduled equipment or materials manufacturer's capacities or specification at no additional cost to the Owner.

1.4 DEFINITIONS

- A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions.
- D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in pipe shafts.
- E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.
- F. The following are industry abbreviations for plastic materials:
 - 1. ABS: Acrylonitrile-butadiene-styrene plastic.
 - 2. CPVC: Chlorinated polyvinyl chloride plastic.
 - 3. PE: Polyethylene plastic.
 - 4. PVC: Polyvinyl chloride plastic.

- G. The following are industry abbreviations for rubber materials:
1. EPDM: Ethylene-propylene-diene terpolymer rubber.
 2. NBR: Acrylonitrile-butadiene rubber.

1.5 LOCAL CONDITIONS

- A. Before submitting proposals, each contractor shall examine these specifications and associated drawings, addenda, etc. and shall examine the site of the project. The bidder shall fully investigate the site of this project, investigate coordination of his work with all other trades and existing conditions and completely satisfy himself as to the conditions to which the work is to be performed before submitting his/her bid. No allowances or considerations will be given at a later date for alleged misunderstanding as to the requirements of the work, materials to be furnished, or conditions required by the nature of this project site and coordination by the neglect on the bidder's part to make such an examination and coordination.
- B. Drawings show approximate location of existing services. The mechanical and electrical trades shall check with local utility companies or municipal agencies for exact location of services which they expect to encounter. The Mechanical Trades Contractor shall be responsible for hiring a company such as "Miss Dig" to stake out and locate all utilities in areas of excavation before commencing any work. The Mechanical Trades Contractor shall verify all elevations and locations of existing underground lines which are to be connected into or routed over or under. This verification shall be done prior to beginning work at this project.

1.6 QUALITY ASSURANCE

- A. All work shall be performed in accordance with all local and state codes, laws and regulations applicable to the work for this project. The contractor shall be responsible for all permits and costs for inspections, etc., and for checking with each utility company supplying service to this project and shall determine from them all, any changes in boxes, meters, valves, service, etc., and shall include all cost for inspections, revisions to services, etc. in his bid as required by local agencies, utilities, etc. No extra payment will be made for such items after the contractor submits his bid.
- B. In addition to all applicable Federal, State and local codes, the standards and codes listed below shall apply to all mechanical work. The reference to codes and standards shall be referenced to the latest edition or revision.
1. American Gas Association (AGA)
 2. American National Standard Institute (ANSI)
 3. American Society of Mechanical Engineers (ASME)
 4. American Society for Testing materials (ASTM)
 5. American Water Works Association (AWWA)
 6. American Welding Society
 7. ANSI code of Pressure Piping and Unified Pressure Vessels
 8. Cast Iron Soil Pipe Institute
 9. National Electrical Manufacturer's Association (NEMA)
 10. Standards of the Hydraulic Institute
 11. Underwriters' Laboratories (UL)

12. Williams-Steiger Occupational Safety & Health Act (OSHA)

- C. In the event of conflict between drawings, codes, standards or specifications, the most stringent requirement shall apply

1.7 SUBMITTALS AND SHOP DRAWINGS

- A. Submit electronic shop drawings for all plumbing equipment and materials associated with Division 22 and associated drawings to the Architect/Engineer for review before fabrication of work or ordering of equipment. Shop drawings shall be submitted at the earliest possible time.
- B. Shop drawings shall be first reviewed by the contractor. Inaccurate shop drawings shall be corrected by the contractor to meet specifications and schedules for this project. The contractor shall then initial the shop drawings as having been reviewed before submitting to the Architect/Engineer. Shop drawings shall have, in addition to the mechanical information, the electrical requirements for minimum circuit amperes and maximum fuse size ratings of the equipment.
- C. Drawings which are rejected must be corrected and returned for Architect/Engineer review before ordering.
- D. Furnish to the job site copies or prints of shop drawings that have been reviewed by the Engineer as soon as possible.
- E. Include a copy of each shop drawing in the Operation and Maintenance Manual.
- F. The checking and reviewing of shop drawings by the Architect/Engineer shall be construed as assisting the contractor and the Architect/Engineer's action does not relieve the contractor from the responsibility for errors or omissions which may exist thereon. The contractor shall be held responsible for errors or omissions that are discovered after approval process and must be made good by the contractor.

1.8 PERMITS, INSPECTIONS AND TESTS

- A. The Mechanical Trades Contractor shall take out all permits and arrange for necessary inspections and shall pay all assessments, fees and costs, etc., and make all tests as required by applicable codes. At the completion of the project, the Mechanical Trades Contractor shall furnish certificates of inspection and approval and secure final occupancy permit. Record copies shall be included in the Operation and Maintenance manuals.

1.9 RECORD DRAWINGS

- A. Maintain an up-to-date set of "record" drawings showing actual equipment, plumbing piping, etc. installation locations. Exact dimensions from column lines for all concealed work and tie-ins with elevations noted shall be included.
- B. Include a set of reproducible drawings and a set of prints in each Operation and Maintenance Manual.

- C. The Engineer reserves the right to request and be furnished any additional information he deems necessary to be shown on the record drawings.

1.10 OWNER'S INSTRUCTIONS

- A. Upon completion of the project, the contractor shall be responsible for instructing the Owner's operating staff, in the presence of the Architect/Engineer's representative, in the proper operation and maintenance of the mechanical systems and equipment. Include a statement signed by the Owner that instructions have been given for proper operation and maintenance of the mechanical systems and equipment.

1.11 GUARANTEES

- A. Furnish a written guarantee, to the Architect/Engineer, that will make the contractor responsible at his own expense for any imperfections in material and/or workmanship which may develop under ordinary use within a period of one (1) year from final Owner's acceptance of the work.
- B. Furnish all written guarantees from equipment and/or material manufacturers which shall include the operating and performance conditions and capabilities upon which they are based.

1.12 PORTABLE AND DETACHABLE PARTS

- A. Retain all portable and detachable parts of installation such as keys, spare accessories, operating manuals, etc. include in the Operation and Maintenance Manual.

1.13 OPERATION AND MAINTENANCE MANUALS

- A. Furnish to the Architect/Engineer two (2) copies of an approved bound (3 ring binder) book with tabs for sections covering each item of equipment. These notebooks shall include shop drawings, maintenance manuals, operating manuals and parts lists to instruct the Owner on proper operation and use as well as maintenance for each piece of equipment. These books shall also include contractors', subcontractors' and manufacturers' names, telephone numbers and addresses.
- C. The manuals must be approved by the Architect/Engineer before final payment to the contractor. The Engineer reserves the right to request and be furnished any additional information that he deems necessary to be included in the manuals.

1.14 RESPONSIBILITIES FOR USE OF SUBSTITUTE MATERIALS

- A. Contractor shall notify Architect/Engineer in writing at least ten (10) calendar days before bids are due for approval to use materials and/or equipment other than that which has been specified or scheduled. If substitute materials and/or equipment are approved and used, it will be this contractor's responsibility to guarantee that the items will function as the specified equipment or materials, will in no way alter the design of the structure or system, and will not require any additional mechanical work such as piping, plumbing, etc. Any additional cost required by substitute materials will be the responsibility of the contractor.

- B. It will be the contractor's responsibility, at his own expense, to remove or replace any non-approved equipment or material or any approved equipment or materials not originally specified or scheduled if equipment and materials do not meet with the satisfaction of the Architect/Engineer.
- C. It shall be the Contractor's (Mechanical Trades) responsibility to coordinate and pay for any Electrical Contractor costs due to any changes in substitute materials and/or equipment's power requirements, which differ from that shown on the design documents.
- D. No consideration will be given to requests for substitute materials because of delivery problems unless the contractor can prove that orders were placed as soon as possible after contract was awarded and that delays were not caused by submittal of unscheduled or unspecified (substituted) materials to the Architect/Engineer.

1.15 COST BREAKDOWN AND EQUIPMENT LIST

- A. The successful bidder shall be responsible for submitting a cost breakdown to the Architect/Engineer and Owner within ten (10) calendar days after date of request of the breakdown. During progress of the work, if changes occur which cause additional cost, the price on such items shall be broken down in accordance with the items listed in the breakdown.
- B. The bidders shall be responsible for submitting a complete list of all equipment manufacturers, makes, models, etc. that will be used for this project with their proposal. The equipment list shall be typed on the contractors letterhead and shall be signed by the authorized officer.

1.16 MATERIALS AND EQUIPMENT

- A. Materials and equipment furnished under this project shall have a minimum warrantee of one (1) year. All materials and equipment shall be new, of first class quality and shall be furnished, delivered, erected, installed and finished in every detail and shall be so selected and arranged as to fit into the building space. All material or equipment that is not specified but necessary for this project shall be subject to the approval of the Architect/Engineer.
- C. Any materials or equipment not specified or scheduled but similar to that which has had prior approval shall be listed as a substitution and noted on the proposal form as such.
- D. The contractor shall include all miscellaneous materials and labor required to completely install and operate the plumbing systems as is intended by these drawings and specification.

1.17 SCHEDULE, COORDINATION AND INSTALLATION OF WORK

- A. The contractor shall carry on work in such a manner as to meet the dates as scheduled by the General Contractor and shall work overtime at no expense to the Owner as required to comply with the schedule. This contractor shall schedule all work with Owner and Architect/Engineer and schedule shut down of systems with Owner.

- B. Examine the site and all drawings and specifications and coordinate work with all other trades before commencing work for this project. Arrange work essentially as shown with the exact layout to be made on the job to suit actual conditions. Precise locations of equipment and materials shall be coordinated and shall be the responsibility of this contractor. Should any conflicts in location occur, and necessary deviations from drawings are required as determined by the Architect/Engineer, the contractor shall make necessary adjustments without additional cost to the Owner.
- C. All equipment, plumbing piping, etc. shall be located and/or routed to allow for the most convenient access for servicing.
- D. Arrange for necessary access doors, panels, etc. to allow servicing of equipment, piping, valves, etc. Perform any cutting and patching as required, made necessary by failure to make proper arrangements.
- E. Indicated equipment connections, sizes and locations shall be verified and connected according to manufacturer's shop drawings and installation instructions. Thoroughly investigate the space provided for equipment and connections before ordering equipment. All equipment shall be selected to fit into the space allowed, including connections with adequate space allowed for operation and maintenance.
- F. All work shall be installed in a neat and workmanlike manner, using skilled personnel thoroughly qualified in the trade or duties that they are to perform. Rough work will be rejected.
- G. Coordinate all equipment deliveries and schedules to allow timely installation. Contractor shall separate equipment into sections and reassemble in building if required by the installation at no extra cost to the Owner.
- H. Furnish a superintendent approved by the Architect/Engineer to oversee and coordinate the work to be performed with all other trades.
- I. Coordinate location of pipes, plumbing, etc. with other building components such as structural components (beams, joists, columns, etc.), electrical components (lighting, conduits, etc.) and architectural components (walls, ceilings, floors, pipe chases, roof, etc.).
- J. Before starting work, Contractor shall verify that available space for proposed pipes, equipment etc. is adequate for the intended purpose and will result in a first class installation. Regardless of drawings, responsibility for first class operating systems rests with the Contractor.
- K. Arrange for chases, slots, openings, etc. and other building components to allow for plumbing systems installation. Coordinate cutting and patching of these components to accommodate installation. This contractor shall be responsible for accurately locating for the general trades all chases, shafts, etc. and shall be responsible for all cutting and patching if these chases were not accurate or not coordinated in time with the general trades. Coordinate installation of all sleeves in walls, floors or other structural or architectural components.

- L. Sequence, coordinate and integrate installation of equipment and materials for efficient work flow during the project. Particular attention should be spent on larger pieces of equipment.
- M. Install equipment and materials with provisions for necessary access for service and maintenance. Allow space for removal of all parts that may require replacement or servicing.
- N. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.
- O. Coordinate requirements for access panels and doors for mechanical items requiring access that are concealed behind finished surfaces. When access panels are required, valves and equipment components requiring access shall be located to minimize the number of panels.
- P. Examine the work as it progresses and alert the Architect/Engineer in writing of any instances or obstructions that will prevent this contractor from performing his/her work.
- Q. The Mechanical Trade shall be responsible for all coordination of all site utilities, the gas company, etc. including coordination of all new and existing natural gas loads.

1.18 DELIVERY, STORAGE, AND HANDLING

- A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.
- B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.
- C. Furnish and maintain a weatherproof storage facility on the site of adequate size to store miscellaneous equipment and/or materials to prevent exposure to the weather. Location of shed shall be determined by the Owner and Architect/Engineer. The Owner reserves the right to deny storage of materials or equipment in any existing or new buildings.

1.19 COOPERATION WITH ARCHITECT/ENGINEER AND OTHERS

- A. Coordinate all aspects of the plumbing system installation with all other trades, existing conditions, etc.
- B. If the bidder believes that changes in design are required to meet intended design capacities and operation or material and/or equipment is obviously omitted from these specifications and drawings, the bidder shall contact the Architect/Engineer in writing at least ten (10) days before bid date. The acceptance of a bid by the Owner shall be binding and shall indicate that the bidder does not require any changes in design nor additional costs in order to meet the design and performance of the mechanical system as indicated in these specifications and drawings.

1.20 WORK INVOLVING OTHER TRADES

- A. Equipment or materials specified in Division 22 may have to be installed by other trades (such as electrical trades or architectural trades) due to code requirements or union jurisdictional requirements. Where this occurs, this contractor shall include all costs required by other trades to complete the work and hire the respective trade to perform this work.

1.21 PERFORMANCE DATA AND ACCESSIBILITY

- A. All performance data specified in this specification or scheduled on drawings shall be considered actual performance of the equipment after installation. The supplier and installer shall be responsible for suitable allowances to adjust equipment to design capacities when actual operating and installation conditions differ from drawings.
- B. All equipment and materials shall be installed to allow access for servicing and maintenance. Coordinate final location of such equipment and materials that are concealed with required access doors on panels. Allow ample space for replacement or servicing.

1.22 CUTTING AND PATCHING

- A. Unless noted otherwise, the Mechanical Trades shall be responsible for all cutting, patching and associated work required under Division 22. This work shall be performed by trades normally performing this type of work except drilling of holes shall be done by the contractor requiring same. This includes replacing areas of cutting required by this work with proper reinforcing, termite shielding, materials, finishing, etc. to restore the areas to their original condition, and filling all openings around ducts, piping, etc. with approved fire retardant materials. Regardless, all drilling of holes shall be the responsibility of the Contractor requiring same.
- B. If noted on drawings that the General Trades will be responsible for all cutting and patching, it will be the Mechanical Trades responsibility to notify all General Trades during bidding of all areas requiring cutting and patching. Regardless, all drilling of holes shall be the responsibility of the contractor requiring same.

1.23 WORK IN EXISTING BUILDINGS

- A. Coordinate and schedule all work in existing building with Owner and Architect/Engineer. Systems shall be kept in operation at all times if at all possible. If a system shut-down is required, the contractor shall schedule with the Owner, the time and length of shut-down. A system shall not be shut down without written permission from the Owner.
- B. All existing equipment, plumbing, piping, etc. that is to be removed shall remain the property of the Owner. The contractor shall remove and locate this material that remains the property of the Owner to a location determined by the Owner somewhere on site. If the Owner does not want to maintain possession of the removed material, the contractor shall be responsible for removing material from the site and disposing of this material as necessary to meet all codes and requirements and shall pay all costs as required for any disposal fees, inspections, permits, etc.

- C. All existing piping, equipment, etc. whether shown on drawings or not that is to be removed and/or abandoned and does not remain property of the Owner shall be removed from site.
- D. Any existing plumbing, piping, valves, mechanical equipment, etc. serving the existing building which are shown or not shown on drawings and are required for systems operation shall remain in use. If these systems require relocation to allow installation of new systems, the contractor shall be responsible for relocating to an Owner and Architect/Engineer approved location. The contractor shall pay all cost for this work and include such cost in his/her bid. (As specified previously, contractor shall be responsible for examining site and include all cost for work required to complete this project.)
- E. When active services, etc. are encountered in this project, the contractor shall furnish and install bracing, support, etc. as required to protect and keep these services active. (As specified previously, these drawings are diagrammatical. The contractor shall be responsible for verification of all existing services, piping, equipment, etc.).

1.24 ACCESS TO EQUIPMENT, VALVES, ETC.

- A. Coordinate access panels with type of construction and furnish access panels in areas that are non-accessible. Access panels shall be furnished by this contractor and installed by the General Contractor. The access panels shall be all approved, UL labeled and fired rated and shall be located and sized to allow access to equipment, valves, etc.
- B. Where access panels are required, valves, equipment etc. shall be located as to require the least number of access panels.

1.25 EQUIPMENT CONNECTIONS

- A. Connections to equipment, plumbing fixtures, etc. shall be made in accordance with shop drawings, rough-in dimensions furnished by the manufacturer, codes, etc. and may vary with connections shown on drawings. The contractor shall be responsible for making connections and number of connectors as per shop drawings, codes, etc. at no additional cost to the Owner.

1.26 ELECTRICAL CONNECTIONS

- A. The Electrical Trades shall be responsible for furnishing and installing all electrical equipment, wiring, etc. required for operation of mechanical equipment unless otherwise noted on the drawings. The Mechanical Trades shall furnish detailed information and wiring diagrams to the Electrical Trades for all equipment specified and/or scheduled for this project. In the event that the Mechanical Trades furnishes an "approved equal" or "alternate" that require changes in the original electrical design, the Mechanical Trades shall pay all costs to the Electrical Trades as required to make satisfactory adjustments. All electrical work shall be done in accordance with the latest edition of the National Electric Code.

1.27 MOTORS, MOTOR STARTERS AND DISCONNECTS

- A. Unless otherwise noted on drawings, motors shall be of constant speed 1750 rpm, new NEMA Design B, 40°C rise, horse power rated, open drip-proof except TEFC in dirty atmosphere, induction type motor with service factor of 1.15 and be of sufficient capacity to continuously operate the apparatus to which it is connected under all conditions of operation without exceeding nameplate ratings.
- B. Motors shall be premium efficiency as calculated using IEEE test method 112B.
- C. Motors ½ Hp. or larger shall be three phase; motors under ½ Hp. shall be 115 volt, 60 cycle, single phase. Before ordering the motors, the contractor shall verify correct motor voltage with the Electrical Trades and field conditions.
- D. The Mechanical Trades shall furnish, for equipment under Division 22, all special switches, disconnects, starters, alternators, etc. as specified or scheduled to be factory furnished and/or factory installed with the equipment including wiring diagrams, etc. whether it is to be factory installed or field wired. All other motor starters, disconnects, etc. not noted as factory furnished shall be furnished and installed by the Electrical Trades.
- E. Starters that are to be factory furnished with equipment shall be of the combination type and shall be as specified under Electrical Trades Division. Furnish overload protection for each phase.
- F. All wiring methods and materials shall meet NEMA, National Electric Code and State of Michigan Code requirements.
- G. All displays on control panels shall be on face of the panels.

1.28 EXCAVATION AND BACKFILLING

- A. Furnish all excavation, backfilling and removal of excess dirt to accomplish installation of Division 22 mechanical work unless otherwise noted on drawings.
- B. All excavation shall be by open cut from the surface. Contractor shall determine whether excavation shall be by machine or by hand except where existing utilities may be located where excavation shall be by hand. Contractor shall be responsible for all damage to existing facilities and services. Excavation shall be to a depth of at least 6" to allow granular bedding below pipe or duct.
- C. If for any reason the work is suspended, the contractor shall properly protect the excavation and leave the areas unobstructed.
- D. Trench width shall allow sufficient width at centerline of pipe to allow at all times a first class construction/installation method but in no case should be less than 12" larger than the nominal pipe or duct size. This shall especially be true in areas that joints must be connected. Joint holes may have to be made with overhanging sides to make installation safe for workmen.

- E. The excavation shall be at all times finished and backfilled to the required grade after completion and approval of work. Not more than 100 feet of trench shall be excavated and open unless written approval is given by the Architect/Engineer.
- F. The subgrade shall be 4" to 6" below the pipe of granular bedding graded and tamped by hand or mechanical means to the exact elevation required at the bottom of the pipe. Granular materials shall be approved fine aggregate meeting MDOT #2NS specifications. This material shall pass a 1/2" sieve but will be retained on a #4 sieve. If poor soil conditions exist which will not give proper support to the pipe, duct or structure, furnish granular fill as required to remedy this situation and give proper support.
- G. Furnish and install properly sloped sheet piled, shored and braced in areas that the soil requires this to maintain a proper excavation and prevent any movement of earth which could in any way damage the work under construction. When removing the sheeting and bracing, special care should be taken to prevent any caving of the sides of the excavation and injury to the completed work or adjacent property.
- H. Take all necessary action to keep trenches and other excavation areas free from water at all times. Use such methods as pumping, ditching, well pointing, etc. to prevent water in trench or excavation. Dewatering of trench shall have constant supervision.
- I. Backfill excavation and trenches with approved granular material around sides of pipe and at least 12 inches above the top of the pipe laid not more than in 6 inch layers that are thoroughly tamped to 95% of its maximum density. There shall be no backfilling by any mechanical means until the granular material has been firmly tamped around the entire pipe to 12 inches above the pipe. All material used for backfilling shall be approved by the Architect/Engineer. Wherever trenching crosses walks or roadways or isolated inside of building, backfill top 6'-0" of trench with sand or bank run gravel in layers not to exceed 6 inches in depth and carefully compact by hand or machine. Do not backfill with frozen materials.
- J. No piping shall be covered until it has been tested, inspected and approved. Upon completion of backfilling, grade shall be restored in indicated elevation and left in reasonable condition for finish grade by others unless otherwise noted on drawings.
- K. Before final acceptance of work, all disturbed streets, drives, curbs, walks, parking areas, etc. shall be paved, graveled or other to as near their original condition as possible. All unused excavated material shall be removed from site if directed by the Architect/Engineer.

1.29 BASES AND SUPPORTS

- A. This contractor shall be responsible for furnishing all equipment pads and supports for equipment and materials required by Division 22 unless otherwise noted on drawings.
- B. All floor mounted mechanical equipment shall have a reinforced concrete pad furnished unless otherwise noted on drawings. The concrete pads shall be tied to the building floor with expansion bolts located maximum of 4'-0" on centers with a minimum of four (4) bolts, set before pouring and concealed within the pad. The Mechanical Trades shall verify exact pad or support size with the equipment manufacturer and shall size pad with adequate area to allow sufficient room for equipment mounting hardware, etc. Concrete

pads shall have a 45 degree bevel at the top edge. The contractor shall verify exact location of concrete pads.

- C. Furnish all steel, hanging material, rods, etc. for suspending equipment off floor unless otherwise noted on drawings for equipment to be furnished under Division 22. This includes all structural steel for supporting between beams.
- D. All support structure shall be of strength to safely withstand all stresses and loads to which they will be subjected and shall distribute load properly over the building area. Supports shall be designed to avoid undue strain to equipment and to avoid interference with piping, pipe connections, service and maintenance clearances, etc.
- E. Where equipment is to be floor mounted and requires legs, this contractor shall furnish and install structural steel members or steel pipe and fittings for legs. Fasten and brace to equipment and furnish flange at base to allow bolting to floor.
- F. Where equipment is to be ceiling or wall mounted, furnish necessary platform, structural steel, hardware, etc. as is most suitable for support of this equipment.
- G. All supports shall be approved by the Architect/Engineer.
- H. All piping, plumbing, etc. shall be suspended from structural steel members utilizing rods and approved hanger devices. Do not use metal deck for support. Beam clamps such as the Grinnell Fig. 260 or approved equal shall be used. Sheet metal "straps" shall not be used in place of rods.
- I. The mechanical trades shall be responsible for furnishing and setting in place all mechanical equipment, roof curbs and plumbing, piping roof curbs. The general trade shall be responsible for the roof work and associated flashing. The mechanical trade shall furnish and install treated wood base blocking as required to level curb and to match roof insulation thickness. Curb shall be as specified, or if not specified should be similar to Pate or Thy-curb with heavy gauge galvanized steel, insulated and with wood nailer. Height of curb scheduled or specified shall be height required to top of curb above finished roof. If height is not specified or noted, a minimum 12" high above finished roof will be required. (pipe support units shall be at height required).

1.30 SLEEVES, PLATES AND COLLARS

- A. Furnish all sleeves, plates and collars for plumbing piping, etc. passing through walls, floor ceilings, foundations, etc. Coordinate with the General Contractor the exact location and size of required openings. No pipe shall pass through a wall, floor ceiling, etc. without a sleeve. This contractor shall be responsible for sleeve locations and securing sleeves before concrete is formed.
- B. Sleeves for steel pipe shall be standard weight black steel pipe. For walls, foundations and ceilings, sleeve shall be kept flush with finished surfaces. For floors, the sleeve shall be set flush with bottom of concrete construction and be extended up 1/4" above concrete floor. Sleeves shall be set in place before construction of walls, floors, ceilings, etc.

- C. Sleeves for copper pipe shall be type "M" hard copper tubing installed typical to that of steel pipe sleeves.
- D. Sleeves for piping shall be sized to allow insulation to run continuous through sleeve whenever possible and to allow not less than 1/4" all around bare pipe or insulation.
- E. Where insulated piping passes through walls or floor sleeves, furnish 22 gauge galvanized band around insulation of same length as the sleeve length. Band shall fit snugly over insulation and be held in place by steel metal collars all around insulation to cover openings.
- F. All penetration voids shall be sealed smoke tight with non-combustible materials similar to 3M or Hilti firestop systems to maintain the integrity of the fire rated structure. In a non-rated assembly, seal all voids with non-hardening sealant.
- G. Where bare piping 2" and smaller pass through wall or floors, furnish polished chrome plated brass escutcheons, split type. Bare piping 2 1/2" and larger that pass through walls or floor, furnish 22 gauge galvanized steel metal collars so as to cover opening.
- H. Where piping penetrates an outside wall, below grade, utilize a mechanical sleeve, similar to Link-Seal, with stainless steel nuts and bolts on fasteners.

1.31 RIGGING AND HOISTING

- A. Perform all required rigging, hoisting, transportation, moving, etc. of all equipment, materials, etc. to be furnished and/or installed under Division 22 whether furnished by this contractor or by the Owner or other trades.

1.32 STORAGE FACILITY

- A. Furnish and maintain a weatherproof storage facility on the site of adequate size to store miscellaneous equipment and/or materials to prevent exposure to the weather. Location of shed shall be determined by the Owner and Architect/Engineer. The Owner reserves the right to deny storage of materials or equipment in any existing or new buildings.

1.33 PROTECTION FROM DAMAGE

- A. The contractor shall be responsible for all materials, equipment, etc. and all work installed by himself and shall protect it from damage until final acceptance of this project by the Owner.
- B. Furnish all coverings and protection from dirt, dust, rain, storm, heat, traffic, wear, etc. and all possible injury including that by other workmen. Any equipment, workmanship, materials, etc. damaged prior to final acceptance by the Owner of this project shall be properly repaired at no expense to the Owner.
- C. Protect all plumbing fixtures and other equipment from damage by covering or coating. Any dented, scratched, rusted or marred surface finishes will not be accepted.
- D. Protect all equipment, materials, etc. from freezing.

1.34 COMMON PIPE MATERIALS AND INSTALLATION INSTRUCTIONS

- A. Refer to individual Division 22 piping Sections for pipe, tube, and fitting materials and joining methods.
- B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.
- C. Refer to individual Division 22 piping Sections for special joining materials not listed below.
 - 1. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
 - a. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch (3.2-mm) maximum thickness unless thickness or specific material is indicated.
 - 1. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
 - 2. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
 - b. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.
 - 2. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.
 - 3. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.
 - 4. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.
 - 5. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAg1, silver alloy for refrigerant piping, unless otherwise indicated.
 - 6. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
 - 7. Solvent Cements for Joining Plastic Piping:
 - a. ABS Piping: ASTM D 2235.
 - b. CPVC Piping: ASTM F 493.
 - c. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.
 - d. PVC to ABS Piping Transition: ASTM D 3138.
 - 8. Fiberglass Pipe Adhesive: As furnished or recommended by pipe manufacturer.

1.35 PIPE HANGERS AND SUPPORTS

- A. Hangers and saddles shall be Modern Pipe Support Corp., Grinnel/Anvil, Autogrip, or M-CO. Inserts shall be of the type to receive a machine bolt head or nut after installation, permit horizontal adjustment, and shall be flush with the surface. For copper pipe with steel hangers, clean and wrap pipe with two layers of plastic insulating tape at point of contact. Roller supports shall be adjustable type with insulated standoff. Rods shall be used for suspended installation. Sheet metal "straps" shall not be used in place of rods.

- B. Hangers for piping with vapor barrier sealed insulation shall be multipurpose pipe saddles fitting over the insulation. Wire or perforated strap iron will not be permitted for pipe supports. Do not support hangers from roof deck. Furnish and install all support steel as required to suspend from structural steel joist or beams. Hangers shall be clevis or split ring type with vertical adjustment and beam clamp similar to Grinnell/Anvil Fig. 260, with maximum spacing per ASHRAE Standards:

Pipe Size	Steel Pipe	Copper Pipe	PVC Pipe	Rod Size
½ to ¾ inch	6 feet	5 feet	4 feet	3/8"
1 inch	7 feet	5 feet	4 feet	3/8"
1 ¼ inch	7 feet	7 feet	4 feet	3/8"
1½ inch	7 feet	7 feet	4 feet	1/2"
2 inch	10 feet	8 feet	4 feet	1/2"
2½ inch	11 feet	9 feet	4 feet	5/8"
3 inch	11 feet	9 feet	4 feet	5/8"
3 ½ inch	13 feet	11 feet	4 feet	5/8"
4 inch	14 feet	12 feet	4 feet	3/4"
5 inch	14 feet	12 feet	4 feet	3/4"
6 inch	14 feet	--	4 feet	3/4"

- C. Conform to ASME B31.9, ASTM F708, MSS SP58, MSS SP69 and MSS SP89.
- D. Hangers for Pipe Sizes ½ to 1½ Inch : Malleable iron, adjustable swivel, split ring.
- E. Hangers for Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
- F. Hangers for Hot Pipe Sizes thru 4 Inches: Carbon steel, adjustable, clevis.
- G. Hangers for Hot Pipe Sizes 5 Inches and Over: Adjustable steel yoke, cast iron roll, double hanger.
- H. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
- I. Wall Support for Pipe Sizes up thru 3 Inches: Cast iron hook.
- J. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp.
- K. Vertical Support: Steel riser unistrut clamps at high, mid, and low locations.
- L. Floor Support for Cold Pipe all sizes and Hot Pipe Sizes up thru 4 Inches: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
- M. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
- N. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.

- O. Inserts: Malleable iron case of steel shell and expander plug for threaded connection with lateral adjustments, top slot for reinforcing rods, lugs for attaching to forms, size inserts to suit threaded hanger rods.

1.36 PLUMBING, PIPING, AND EQUIPMENT SUPPORT

- A. Attachments of mechanical equipment to structural members are the responsibility of the installing trade. Structural members shall not be field cut, welded or otherwise modified without approval of the Architect/Engineer. Attachment to steel joist shall be made at panel points whenever possible. Steel joist shall be reinforced for non-panel point concentrated loads in accordance with the structural details; this work shall be performed by certified welders and is the responsibility of the trade installing the subject load. Structural members shall not be overloaded as a result of attachments. Attachment/equipment loading for all trades resulting in total load greater than an equivalent uniform 5 psf for any member shall be submitted to the Architect/Engineer for review. Mechanical Trades may contact the project Structural Engineer as required for panel point location assistance and welder certification requirements. Electrical Trades are still responsible for design, layout, and fabrication and installation of electrical supports and support attachment methods. Mechanical Trades shall submit attachment methods to the Structural Engineer for review.
- B. Install products in accordance with manufacturer's instructions.
- C. Do not fasten supports to pipes, ducts, mechanical equipment, and conduit.
- D. Do not use spring steel clips and clamps.
- E. Do not use powder-actuated anchors.
- F. Do not drill or cut structural members without permission from Architect/Engineer.
- G. Fabricate supports from structural steel or steel channel. Rigidly weld members or use hexagon head bolts to present neat appearance with adequate strength and rigidity. Use spring lock washers under all nuts.

1.37 PIPING SYSTEMS SHUT OFF VALVES

- A. Shut off valves shall be installed at all branch lines off main piping, or where mains divide/separate to serve different areas, to allow isolation of all branch piping and systems they serve such as toilet rooms, areas or wings of the building, etc.

1.38 CLEANING AND FINISHING

- A. During construction period, remove all debris, rubbish, tools, equipment, unused materials, etc. as required or requested by the Architect/Engineer. All cost for cleanup and removal will be the responsibility of the contractor.
- B. Upon completion of the project and before final acceptance by the Owner, the entire installation shall be thoroughly cleaned, all rubbish and unused material removed to the satisfaction of the Architect/Engineer. All dust and dirt shall be removed from all equipment, piping, ductwork, etc.

- C. Thoroughly clean all floor drains, cleanouts, and plumbing fixtures. Clean all trays and strainers.
- D. Finish paint all equipment, materials, piping, etc. as noted on drawings or listed in this specification. Match Owner's existing color scheme. Any Division 22 equipment which has been scratched or damaged shall be finished equal to the original finish.

1.39 EQUIPMENT/SYSTEMS START-UP

- A. Furnish and schedule manufacturer's start-up service for all equipment and systems. These start-up services shall be performed in the presence of, and to the satisfaction of the Owner and Architect/Engineer.

1.40 EQUIPMENT/SYSTEMS SIGN-OFF

- A. The Mechanical Trades shall furnish written sign-offs on all systems stating that the equipment and systems have been checked, tested, started and that their operation has been verified correct through the entire range of operation that can be expected through the seasons.

1.41 SUBSTANTIAL COMPLETION

- A. Contractor shall submit a letter to the Architect/Engineer advising that all work has been completed in accordance with plans and specifications and the project is ready for a final walk-thru.

END OF SECTION

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SECTION 22 05 10

PLUMBING SYSTEMS TESTING, CLEANING, WATER TREATMENT AND STARTUP

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Testing of piping systems.
- B. Cleaning of piping systems.
- C. Chemical treatment.
- D. Substantial completion check list and sign-off forms.

1.2 RELATED SECTIONS

- A. All drawings and specification sections apply to work in this section. Furnish all items, articles, materials, equipment, operations or methods that are mentioned, listed or scheduled on drawings or are in this specification including all labor, equipment, materials and miscellaneous incidentals necessary and/or required for the completion of this project. The work covered under this section of the specifications is in no way complete within itself, but is supplementary to the entire specification and drawings.

1.3 SCOPE OF WORK

- A. The work covered by this specification consists of furnishing all labor, equipment, material, chemicals or methods that are mentioned, listed or scheduled on drawings or are in this specification. This includes all labor, equipment, materials and miscellaneous incidentals necessary and/or required for the cleaning, flushing, testing and chemical treatment of the piping systems for this project. The work covered under this section of the specification is in no way complete within itself, but is supplementary to the entire specification and drawings.
- B. The substantial completion forms shall be required to be signed and submitted to the Architect/Engineer for approval prior to any insulation of piping systems or installation of ceiling tiles. The person that signs the substantial completion forms shall witness the testing, flushing and chemical treatment of the systems. The signature person's company shall be responsible for all cost incurred with future work by the Architect/Engineer or Owner due to inadequate testing, cleaning, operation or chemical treatment of the piping systems.

1.4 SUBMITTALS

- A. Submit electronic copies of the completed and signed substantial completion forms included in this section. Submit to the Architect/Engineer as system flushing, testing, and chemical treatment occurs. The Mechanical Trade shall maintain one set of substantial completion forms and submit them to the Architect/Engineer prior to the Architect/Engineer final project walk-through.

- B. Submit electronic copies of all equipment, chemicals and product data being furnished to this project for approval.
- C. Submit electronic copies of manufacturer's installation instructions, including placement of equipment in systems, piping configuration, and connection requirements.
- D. Submit certificate of compliance from authority having jurisdiction, indicating approval of systems that require review by local and state authorities.

1.5 PROJECT RECORD DOCUMENTS

- A. Record actual installation locations of piping and equipment including sampling points and location of chemical injectors.

1.6 REGULATORY REQUIREMENTS

- A. Conform to applicable code for addition of non-potable chemicals to building mechanical systems, and for public sewage systems.
- B. Products requiring electrical connection and listed and classified by UL as suitable for the purpose specified and indicated.

1.7 MAINTENANCE SERVICE

- A. Furnish service and maintenance of treatment systems and system water for one year from date of substantial completion.
- B. Provide monthly technical service visits to perform field inspections and make water analysis on site. Detail findings in writing on proper practices, chemical treating requirements, and corrective actions needed. Submit two copies of field service report to Owner after each visit.
- C. Provide laboratory and technical assistance services during this maintenance period.
- D. Provide training course for Owner's personnel, instructing them on installation, care, maintenance, testing, and operation of the water treatment systems. Arrange course at startup of systems.
- E. Provide on-site inspections of equipment during scheduled or emergency shutdown to properly evaluate success of water treatment program, and make recommendations in writing based on these inspections.

1.8 MAINTENANCE MATERIALS

- A. Provide sufficient chemicals for treatment and testing during warranty period.

PART 2 PRODUCTS – Not used

PART 3 - EXECUTION

3.1 SANITARY AND STORM PIPING SYSTEMS

A. Testing

1. Conduct a water, air or peppermint test on the entire system in accordance with the State Plumbing Code. Test underground sanitary, storm and vent piping with at least a 10 foot head of water.

3.2 DOMESTIC COLD WATER, HOT WATER AND HOT WATER RETURN PIPING SYSTEMS.

A. Testing

1. Before any fixtures are connected, hydrostatically test piping system at 1.5 times the maximum system pressure, but not less than 100 psig in excess of working pressure for (4) hours. This pressure to be on piping only, not equipment.

B. Cleaning, flushing and disinfection.

1. All domestic water piping and equipment shall be completely flushed out and disinfected before placing system in service. Disinfection procedure and results shall be in accordance with all applicable codes and State Department of Public Health. (Piping shall be flushed until water is clear).
2. Ensure pH of water to be used as treatment is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or Acid (hydrochloric).
3. Inject disinfectant, free chlorine in liquid, powder, tablet or gas form, throughout system to obtain 50 to 80 mg/L (50ppm) minimum residual.
4. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 percent of outlets.
5. Maintain disinfectant in system for 2 hours.
6. If final disinfectant residual tests less than 25 mg/L, repeat test.
7. Flush disinfectant from system until residual equal to that of incoming water or 1.0 mg/L or 0.5 ppm maximum.
8. Take samples no sooner than 24 hours after flushing, from 10 percent of outlets and water entry, and analyze in accordance with AWWA-C51.
9. Verify that all tests and results are in accordance with local and state health codes and regulations.

3.3 SYSTEM COMPLETION CHECKLIST

- A. The checklist which follows this specification section is to be considered part of the specifications.
- B. The checklist is to be completed by the Installing Contractor and the prime Mechanical Contractor for each item as directed.

**SYSTEMS COMPLETION
CHECKLIST**

Inspection/Review Item	Notice Required	Installing Contractor		Date	Owner's Representative Signature	Remarks
		Name	Signature			
Plumbing Systems						
Testing of Sanitary and Storm Systems	48 hours					Tested per specification
Testing of Domestic CW, HW and HWR Piping.	48 hours					Tested per specification
Disinfection of Domestic CW, HW & HWR Piping.	48 hours					Disinfect per specification and all applicable codes.
Domestic Water Sample and Approval	When submitted					Submit sample for review and approval by local authorities.
Valving	When completed					Verify that valves have been installed at all branch piping locations
Piping and Fitting Insulation	When Completed					Verify all piping and fitting are insulated per specification.
Pipe Labeling and Valve Tagging Identification	When completed					Verify system identification is complete per specification and valve chart submitted.
Owner's Training	7 days					Verify that Owner has been instructed on operation and maintenance of systems.

By signing this form, the Contractor is certifying that he has personally witnessed completion of that item, and it is complete and complies with all respects to the drawings and specifications.

All items are to be signed off on and submitted to MacMillan Associates Inc. before a final project walk-thru by the Engineer is requested. If the Engineer discovers items incomplete and/or not in accordance with this checklist, the drawings, or the specifications, the Contractor will be backcharged for the Engineer's time and expenses.

SECTION 22 05 53

PLUMBING SYSTEM IDENTIFICATION

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Nameplates.
- B. Tags.
- C. Stencils.
- D. Pipe Markers.

1.2 REFERENCES: Material and/or equipment specified in this section shall meet or exceed one or more of the property requirements or installation requirements of the following specifications/publications as applicable to the specific product or end use:

- A. ANSI or equal standards for the Identification of Piping Systems.

1.4 SUBMITTALS

- A. Submit list of working, symbols, letter size, and color coding for mechanical identification.
- B. Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.
- C. Product Data: Provide manufacturers catalog literature for each product required.
- D. Manufacturer's Installation Instructions: Indicate special procedures, and installation.

PART 2 PRODUCTS

2.1 NAMEPLATES

- A. Description: Laminated three-layer plastic with engraved black letters on light contrasting background color. Furnish and install on all mechanical equipment.

2.2 TAGS

- A. Metal Tags: Brass with stamped letters; tag size minimum 1½ inch diameter with smooth edges.
- B. Chart: Typewritten letter size list in anodized aluminum frame.

2.3 STENCILS

- A. Stencils: With clean cut symbols and letters of following size:

1. $\frac{3}{4}$ to $1\frac{1}{4}$ inch Outside Diameter of Insulation or Pipe: 8 inch long color field, $\frac{1}{2}$ inch high letters.
2. $1\frac{1}{2}$ to 2 inch Outside Diameter of Insulation or Pipe: 8 inch long color field, $\frac{3}{4}$ inch high letters.
3. $2\frac{1}{2}$ to 6 inch Outside Diameter of Insulation or Pipe: 12 inch long color field, $1\frac{1}{4}$ inch high letters.
4. 8 to 10 inch Outside Diameter of Insulation or Pipe: 24 inch long color field, $2\frac{1}{2}$ inch high letters.
5. Over 10 inch Outside Diameter of Insulation or Pipe: 32 inch long color field, $3\frac{1}{2}$ inch high letters.
6. Ductwork and Equipment: $2\frac{1}{2}$ inch high letters.

B. Stencil Paint shall be semi-gloss enamel, colors conforming to ASME A13.1.

2.4 PIPE MARKERS

- A. Color: Match existing or conform to ANSI/OSHA standards.
- B. Plastic Pipe Markers: Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.
- C. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.
- D. Underground Plastic Pipe Markers: Bright colored continuously printed plastic ribbon tape, minimum 6 inches wide by 4 mil thick, manufactured for direct burial service.

2.5 CEILING TACKS

- A. Description: Steel with $\frac{3}{4}$ inch diameter color coded head.
- B. Color code as follows:
 1. Green - Plumbing valves

PART 3 EXECUTION

3.1 PREPARATION

- A. Degrease and clean surfaces to receive adhesive for identification materials.
- B. Prepare surfaces as required by manufacturer's installations for stencil painting.

3.2 INSTALLATION

- A. Install plastic nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.
- B. Install tags with corrosion resistant chain.

- C. Install plastic pipe markers in accordance with manufacturer's instructions.
- D. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.
- E. Install underground plastic pipe markers 6 to 8 inches below finished grade, directly above buried pipe.
- F. Identify each piece of equipment with plastic nameplates. Small devices, such as in-line pumps, may be identified with tags.
- G. Identify valves in main and branch piping with tags.
- H. Identify piping, concealed or exposed, with plastic tape pipe markers or stenciled painting. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 10 feet on straight runs including risers and drops, adjacent to each valve and tee, at each side of penetration of structure or enclosure, and at each obstruction.
- I. Provide ceiling tacks to locate valves above T-bar type panel ceilings. Locate in corner of panel closest to equipment.

END OF SECTION

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SECTION 22 06 00

PLUMBING SPECIALTIES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. General information for piping systems, plumbing fixtures, backflow preventers, water heaters, sump and sewage pumps, etc. and general installation information.

1.2 FIELD MEASUREMENTS

- A. Field verify all equipment and fixture locations.
- B. Confirm that mill work is constructed with adequate provisions for the installation of countertop plumbing fixtures.
- C. Confirm all mounting heights and locations of plumbing fixtures to meet all barrier free and American Disabilities Act codes and regulations.

1.3 EQUIPMENT, FIXTURE & MISCELLANEOUS SPECIFICATIONS

- A. All equipment, plumbing fixtures, specialties, etc. that have been scheduled on drawings shall have the manufacturer's specification automatically included as part of this specification. All "approved substitute" or "voluntary alternate" equipment fixtures, etc. shall meet the capacities, quality, etc. of the scheduled items specification and capacities.

PART 2 PRODUCTS

2.1 PIPE AND PIPE FITTINGS

- A. See Section 22 10 00 for Plumbing Piping.

2.2 MATERIALS AND FINISH

- A. Fixtures shall be of best quality vitreous china, acid resisting enameled cast iron or stainless steel, free from discoloration, chips, dents, warps, flaws, cracks, scratches, etc. or other blemishes. All vitreous china and enamel shall be white unless otherwise noted. Fixtures shall have manufacturer's guarantee label or trademark indicating first quality.
- B. All exposed pipe, fittings, traps, wastes, faucets, valves, handles, escutcheons, bolts, screws and accessories shall be polished chrome plated brass unless noted otherwise. Exposed traps shall be chrome plated brass, adjustable with cleanout plug and escutcheon.

2.3 PLUMBING FIXTURES - GENERAL

- A. Furnish all fixtures as shown and scheduled on drawings.

- B. Unless noted as “no substitutions”, similar fixtures by the following manufacturers with equal or better qualities will be accepted as equal for:
1. Drainage Specialties - Josam, Sioux Chief, Smith, Wade, Watts, Zurn
 2. Plumbing Fixtures - American Standard, Kohler, Mansfield, Sloan, Zurn.
 3. Plumbing Specialties – Schier, Watts, Wilkins, Zurn (Aquavantage).
 4. Flush Valves - Sloan (Royal), Zurn.
 5. Faucets - American Standard, Chicago, Zurn.
 6. Toilet Seats - Bemis, Centoco, Church, Olsonite, Kohler.
 7. Shower Valves and Accessories – Bradley, Powers, Zurn.
- C. Provide all chair carriers, mounting hardware, etc. as required by the plumbing fixtures and wall construction. Where fixtures are located on walls, furnish and install suitable steel shapes well anchored in place and supported from floor as necessary to support fixtures. Each fixture shall be supported solidly and shall be sufficiently strong to withstand severe usage.
- D. Where plumbing fixtures occur in walls with pipe spaces in back of same, the supports for fixtures shall consist of chair carriers built into the wall with bolt projecting through face of wall for attachments of fixture brackets.

PART 3 EXECUTION

3.1 PREPARATION

- A. Coordinate cutting and forming of roof and floor construction to receive drains to required invert and rim elevations.
- B. Coordinate all rough-in and/or final connections to equipment and plumbing fixtures. Plumbing fixtures shall be located as required to meet all barrier free and American Disabilities Act codes and regulations.
- C. Coordinate all piping invert elevations, location, routing, etc. to allow proper drainage from all plumbing fixtures to sewer mains. Verify all services existing and new for elevations, locations, etc. before commencing installation.

3.2 FIXTURE CONNECTIONS

- A. In general, unless otherwise noted on the drawings, the sizes of all the branch connections to fixtures shall be no smaller than those listed in the following schedule and as required by local and state plumbing codes, latest edition:

Fixture	Waste	Vent	C.W.	H.W.
Lavatory	1 1/4"	1 1/4"	1/2"	1/2"
Water Closet-Flush Valve	4"	2"	1 1/4"	---
Urinal-Flush Valve	2"	2"	1"	---
Showers	2"	2"	3/4"	3/4"

3.3 INSTALLATION

- A. Plumbing fixtures and trim shall be protected against damage during construction. Fixtures damaged during this period shall be replaced.
- B. All valves, waste and water supply piping servicing fixtures exposed beyond face of finished walls shall be brass, nickel, and chromium plated. Where fixtures are mounted in countertops and cabinet work concealing valves and piping, chrome plated brass finishes are not required.
- C. All fixtures shall be independently valved with either integral stops or brass stops.
- D. Waste connections to floor or wall outlet fixtures shall be gas and water-tight; fastened with an approved setting compound, gasket or washer. Rubber gaskets or putty are not acceptable. The fixture shall be set the proper distance from the wall or floor.
- E. Where flush valves are specified with fixtures, supply to valve in each room shall be set at same height for that type of fixture, and valve shall be set in place so that center line of valve discharge is directly above center line of fixture spud. Bending of nipple between valve and spud to achieve connection will not be permitted.
- F. All brackets, cleats, plates, anchors, etc. required to support fixtures or piping rigidly in place shall be provided as work of this section and shall be installed behind finished walls.
- G. Provide and install basic fixtures from one major fixture manufacturer. Also, accessories such as faucets, strainers, stops, traps, etc. shall be manufactured by one major company where possible.
- H. All fixtures shall be set rigid, tight, plumb, level and true to assure rigidity and permanence. Provide chair carriers as manufactured by Wade, Josam, Zurn, or J.R. Smith for wall mounted fixtures. Carriers for wall mounted lavatories, drinking fountains, water coolers, and urinals shall have dual foot supports, tubular uprights, adjustable headers, alignment trusses, and all necessary accessories. Lavatory carriers shall be with concealed arms. Urinal carriers shall be with bearing plate. Water cooler and drinking fountain carriers shall be as required for proper support.
- I. All wall mounted fixtures shall be tested by bearing the weight of 500 pounds without sagging or pulling away from the wall. Damage resulting from this test shall be made good by this contractor. All other piping and fixtures shall be secured to walls with wall plates, wall hangers and approved expansion shields and bolts.
- J. Connections between earthenware fixtures and soil pipe flanges shall be made gas and water tight with closet setting compound or approved Neoprene gaskets, without use of

putty. Hold down bolts shall be brass, not less than 1/4" in diameter, and shall be equipped with nuts and washers.

- K. Provide each fixture with an approved compression service stop. Exposed stops shall be either loose key or screwdriver type.
- L. Caulk joint between wall and fixture at wall mounted lavatories, water closets, urinals, drinking fountains and service sinks with Silicone Sealant, white.
- M. Cleanouts:
 - 1. All soil, waste and drain pipes shall have cleanout at foot of stacks, outside near wall where line leaves building, at every change in the direction of run, at upper end of all horizontal runs, at intervals of not more than 100'-0" in straight runs of sanitary sewers and as required by code. All outlets shall be accessible so that drain line may be readily cleaned with a snake or other rodding tool. Extend cleanouts to finished floor or finished wall.
- N. Floor Drains
 - 1. Floor drain pans shall be furnished and installed for all floor drains (except when floor drain is located in floors on fill) and be made of lead sheets weighting 4 lbs. per square foot or of an approved material, extending a minimum of 12" beyond lip of the flashing ring with outer edges turned up. All floor drains, floor sinks, etc. shall have deep traps installed.
 - 2. All fixtures shall be trapped if required by local or state plumbing codes.
 - 3. All trap seals that are subject to loss by evaporation shall have a trap seal primer valve installed as required by Local or State Plumbing Codes.
- O. Flashings: Vent pipe flashings shall be by roofing contractor. Provide lead sleeves for vents.
- P. Install water hammer arrestors as required by Code, complete with means for access if so required by the Plumbing Inspector.
- Q. Cold water supply branch to each toilet room shall be provided with shock absorbers designed and sized as recommended by the manufacturer to eliminate water hammer.
- R. All exposed supplies and valves in finished areas shall be brass chrome plated. Supply lines to all hanging fixtures shall be from the wall, unless otherwise noted on drawings.
- S. Install shutoff valves on all branches. All water supplies to fixtures shall have valve on supply line to the fixture.
- T. All plumbing fixtures shall be installed, vented, piped, trapped, etc. in accordance with all codes and regulations pertaining to this projects location.
- U. Provide access to all thermostatic mixing valves and trap primer valves. If necessary, provide flush mounted stainless steel valve box with hinged cover and key lock.

- V. All fixtures supplied for bathing shall be supplied with a temperature control valve that conforms to ASSE 1016. All fixtures for hand washing shall be supplied with a temperature control valve that conforms to ASSE 1070.

END OF SECTION

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SECTION 22 07 00

PLUMBING PIPE INSULATION

PART 1 GENERAL

1.1 SECTION INCLUDES PIPE INSULATION FOR:

- A. Domestic water piping system including cold water, hot water and hot water return.
- B. Valves and fittings.
- C. Miscellaneous.

1.2 REFERENCES

- A. Thermal insulation materials shall meet the property requirements of the following specifications as applicable to the specific product or end use:
- B. American Society for Testing of Materials Specifications:
 - 1. ASTM C547, "Standard Specification for Mineral Fiber Preformed Pipe Insulation"
 - 2. ASTM C533, "Standard Specification for Calcium Silicate Pipe & Block Insulation"
 - 3. ASTM C585, "Recommended Practice for Inner and Outer Diameters of Rigid Pipe Insulation for Nominal Sizes of Pipe and Tubing (NPS System)"
 - 4. ASTM C1136, "Standard Specification for Barrier Material, Vapor," Type 1 or 2 (jacket only)
- C. Insulation materials, including all water and vapor barrier materials, closures, hangers, supports, fitting covers, and other accessories, shall be furnished and installed in strict accordance with project drawings, plans, and specifications.

1.3 SCOPE

- A. The work covered by this specification consists of furnishing all labor, equipment, materials and accessories, and performing all operations required, for the correct fabrication and installation of thermal insulation applied to the following commercial piping systems, in accordance with the applicable project specifications and drawings, subject to the terms and conditions of the contract:
 - 1. Hot Piping – Piping system with fluids 105°F and higher.
 - 2. Cold Piping – Piping systems with fluids below 105°F. (Includes storm water systems)
- B. Insulation, vapor barriers, jacketing, hangers, supports, accessory materials, etc. shall be installed according to manufacturers recommendations.

1.4 DEFINITIONS

- A. The term "mineral fiber" as defined by the above specifications includes fibers manufactured of glass, rock, or slag processed from a molten state, with or without binder.

1.5 SYSTEM PERFORMANCE

- A. Insulation material furnished and installed hereunder shall meet the minimum thickness requirements of Standard 90.1 (12007), "Energy Efficient Design of new Buildings" of the American Society of Heating, Refrigeration, and Air-Conditioning Engineers (ASHRAE) except minimum thickness shall be 1". However, if other factors such as condensation control or personnel protection are to be considered, the selection of the thickness of insulation should satisfy the controlling factor.
- B. Insulation materials furnished and installed hereunder shall be Class A maximum of 25 flame spread, 35 fuel contributed and 50 smoke developed rating and shall meet the fire hazard requirements of each of the following specifications:
 - 1. American Society for Testing of Materials ASTM E84
 - 2. Underwriters' Laboratories, Inc. UL 723
 - 3. National Fire Protection Associations NFPA 255
- C. Calcium silicate products shall include a visual identification system to permit positive field determination of their asbestos-free characteristic.

1.6 QUALITY ASSURANCE

- A. The contractor shall use whatever means are necessary to protect the insulation materials and accessories before, during and after installation. No insulation material shall be installed that has become damaged in any way. The contractor shall also use all means necessary to protect work and materials installed by other trades.
- B. If any insulation material has become wet because of transit or job site exposure to moisture or water, the contractor shall not install such material, and shall remove it from the job site. An exception may be allowed in cases where the contractor is able to demonstrate that wet insulation when fully dried out (either before installation, or afterward following exposure to system operating temperatures) will provide installed performance that is equivalent in all respects to new, completely dry insulation. In such cases, consult the insulation manufacturer for technical assistance.

PART 2 PRODUCTS

2.1 PIPE INSULATION ON INDOOR SYSTEMS

- A. Molded pipe insulation shall be manufactured to meet ASTM C585 for sizes required in the particular system.
- B. Molded fibrous glass pipe insulation shall comply with the requirements of ASTM C547. Heavy density Fiberglas pipe insulation with factory applied all-service jacket (ASJ) and Doublesure* two-component adhesive closure system, or Fiberglas Pipe and Tank Insulation, heavy density fiberglass insulation with end grain adhered to ASJ all service

jacket. Joints shall be sealed by butt strips having a two-component sealing system or by applying staples and pressure sensitive tape. When self-sealing lap systems are used, sufficient thickness of insulation shall be used to maintain the outer surface temperature of the operating system below +150°F. Manufacturer's data regarding thickness constraints in relation to operating temperature shall be followed. When multiple layers are required, all inner layer(s) shall beunjacketed.

- C. Fittings and valves shall be insulated with preformed fiberglass fittings, fabricated sections of fiberglass pipe insulation, fiberglass pipe and tank insulation, fiberglass blanket insulation, or insulating cement. Thickness shall be equal to adjacent pipe insulation. Finish shall match that used on straight sections.
- D. Flanges, couplings, chilled water pump impeller housings, valve bonnets etc, shall be covered with an oversized pipe insulation section sized to provide the same insulation thickness as on the main pipe section. An oversized insulation section shall be used to form a collar between the two insulation sections with sections of insulation being used to fill gaps. Jacketing shall match that used on straight pipe sections. Rough cut ends shall be coated with a suitable vapor resistant mastic.
- E. On cold systems, vapor barrier performance is extremely important. Particular care must be given to vapor sealing the fitting cover or finish to the pipe insulation vapor barrier. Valve stems shall be sealed with caulking to allow free movement of the stem but provide a seal against moisture incursion. All penetrations of the ASJ and exposed ends of insulation shall be sealed with vapor barrier mastic.
- F. On hot systems where fittings are to be left exposed, insulation ends should be beveled away from bolts for easy access.
- G. All insulated, exposed piping inside the building within 8'-0" above the floor shall be additionally jacketed with a multi-ply, fabric reinforced, self adhesive insulation cladding material with a vapor barrier and a thickness of 0.015". Jacketing system shall be Venture Clad Plus #1579CW-E or equal.

2.2 SUPPORT FOR PIPE WITH INSULATION

- A. All piping shall be supported in such a manner that neither the insulation or the vapor/weather barrier is compromised by the hanger or the effects of the hanger. In all cases, hanger spacing shall be such that butt joints may be made outside the hanger.
 - 1. On all size piping of cold systems, the pipe hanger saddles shall be separated away from the pipe by utilizing inserts. The vapor barrier shall be continuous, including material covered by the hanger saddle.
 - 2. On warm water piping systems 3" in diameter or less, insulated with Fiberglas insulation, may be supported by placing saddles of the proper length and spacing, as designated in Owens-Corning Pub. 1-IN-12534, under the insulation.
 - 3. For hot or cold piping systems larger than 3" in diameter, Owens-Corning Calcium Silicate pipe insulation shall be used for high density inserts. Piping saddles for piping larger than 3" shall not be in contact with the piping.

4. Owens-Corning Calcium Silicate pipe insulation may be used to support the entire weight of the piping system provided the hanger saddle is designed so the maximum compressive load does not exceed 100 psi.
5. Where pipe shoes and roller supports are required, insulation shall be inserted in the pipe shoe to minimize pipe heat loss. Where possible, the pipe shoe shall be sized to be flush with the outer pipe insulation diameter.
6. Thermal expansion and contraction of the piping and insulation system can generally be taken care of by utilizing double layers of insulation and staggering both longitudinal and circumferential joints. Where long runs are encountered, expansion joints may be required where single layers of the insulation are being used.
7. On vertical runs, insulation support rings shall be used.

2.3 ACCESSORY MATERIALS

- A. Accessory materials installed as part of insulation work under this section shall include (but not be limited to):
 1. Closure Materials - Butt strips, bands, wires, staples, mastics, adhesives; pressure-sensitive tapes.
 2. Field-applied jacketing materials - Sheet metal, plastic, canvas, fiberglass cloth, insulating cement; PVC fitting covers.
 3. Support materials - Hanger straps, hanger rods, saddles.
- B. All accessory materials shall be installed in accordance with project drawings and specifications, manufacturer's instructions, and/or in conformance with the current edition of the Midwest Insulation Contractors Association (MICA) "Commercial & Industrial Insulation Standards".

2.4 INSULATION THICKNESSES

- A. Fittings, including valves, flanges, unions, etc. shall be insulated with the same thickness as the required pipe insulation and covered with PVC fitting cover as specified.
- B. Fiberglass insulation thickness shall be as follows:

<u>Piping System</u>	<u>Pipe Size</u>	<u>Insulation Thickness</u>	<u>Insulation Conductivity BTU-in H-FT²-F</u>
Domestic cold water	All sizes	1"	0.28
Domestic hot water and hot water return	Up thru 3" 4" and larger	1" 1½"	0.28

- C. Elastomeric thermal insulation thickness shall be equivalent to fiberglass insulation thickness as indicated above or as indicated on drawing.

PART 3 EXECUTION

3.1 SITE INSPECTION

- A. Before starting work under this section, carefully inspect the site and installed work of other trades and verify that such work is complete to the point where installation of materials and accessories under this section can begin.
- B. Verify that all materials and accessories can be installed in accordance with project drawings and specifications and material manufacturers' recommendations.
- C. Verify by inspecting product labeling, submittal data, and/or certifications which may accompany the shipments that all materials and accessories to be installed on the project may comply with applicable specifications and standards and meet specified thermal and physical properties.

3.2 PREPARATION

- A. Ensure that all pipe and fitting surfaces over which insulation is to be installed are clean and dry.
- B. Ensure that insulation is clean, dry, and in good mechanical condition with all factory-applied vapor or weather barriers intact and undamaged. Wet, dirty, or damaged insulation shall not be acceptable for installation. All damaged insulation installed will be removed and replaced by the Contractor at no extra cost to the Owner.
- C. Ensure that pressure testing of piping and fittings has been completed prior to installing insulation.

3.3 INSTALLATION

- A. General
 - 1. Install all insulation materials and accessories in accordance with manufacturer's published instructions and recognized industry practices to ensure that it will serve its intended purpose.
 - 2. Install insulation on piping subsequent to installation of heat tracing, painting, testing, and acceptance tests.
 - 3. Install insulation materials with smooth and even surfaces. Insulate each continuous run of piping with full-length units of insulation, with single cut piece to complete run. Do not use cut pieces or scraps abutting each other. Butt insulation joints firmly to ensure complete, tight fit overall piping surfaces.
 - 4. Maintain the integrity of factory-applied vapor barrier jacketing on all pipe insulation, protecting it against puncture, tears or other damage. All staples

used on cold pipe insulation shall be coated with suitable sealant to maintain vapor barrier integrity.

B. Fittings

1. Cover valves, fittings, and similar items in each piping system using one of the following:
 - a. Mitered sections of insulation equivalent in thickness and composition to that installed on straight pipe runs.
 - b. Insulation cement equal in thickness to the adjoining insulation.
 - c. PVC fitting covers insulated with material equal in thickness and composition to adjoining insulation.

C. Penetrations

1. Extend piping insulation without interruption through walls, floors, and similar piping penetrations, except where otherwise specified.

D. Joints

1. Butt pipe insulation against hanger inserts. For hot pipes, apply 3" wide vapor barrier tape or band over butt joints. For cold piping apply wet coat of vapor barrier lap cement on butt joints, and seal joints with 3" wide vapor barrier tape or band.
2. All pipe insulation ends shall be tapered and sealed, regardless of service.

3.4 FIELD QUALITY ASSURANCE

- A. Upon completion of all insulation work covered by this specification, visually inspect the work and verify that it has been correctly installed. This may be done while work is in progress, to assure compliance with requirements herein to cover and protect insulation materials during installation.

3.5 PROTECTION

- A. Replace damaged insulation which cannot be satisfactorily repaired, including insulation with vapor barrier damage and moisture-saturated insulation.
- B. The insulation contractor shall advise the general and/or the mechanical contractor as to requirements for protection of the insulation work during the remainder of the construction period, to avoid damage and deterioration of the finished insulation work.

3.6 SAFETY PRECAUTIONS

- A. Insulation contractor's employees shall be properly protected during installation of all insulation. Protection shall include proper attire when handling and applying insulation materials, and shall include (but not be limited to) disposable dust respirators, gloves, hard hats, and eye protection.
- B. The insulation contractor shall conduct all job site operations in compliance with applicable provisions of the Occupational Safety and Health Act, as well as with all state and/or local safety and health codes and regulations that may apply to the work.

3.7 ASBESTOS INSULATION

- A. Any existing asbestos insulation on existing piping, valves, equipment, etc. where tie-ins are required, shall be removed by the Owner at Owner's expense. The contractor and Architect/Engineer shall not be responsible for any cost or work involved with removal or encapsulation of asbestos insulation.

END OF SECTION

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SECTION 22 10 00

PLUMBING PIPING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Sanitary and storm piping system.
- B. Domestic water piping system
- C. Valves.

1.2 REFERENCES: Material and/or equipment specified in this section shall meet or exceed one or more of the property requirements or installation requirements of the following specifications/publications as applicable to the specific product or end use:

- A. ANSI B31.1 - Power Piping.
- B. ANSI B31.2 - Fuel Gas Piping.
- C. ANSI B31.4 - Liquid Petroleum Transportation Piping Systems.
- D. ANSI B31.9 - Building Service Piping.
- E. ASME - Boiler and Pressure Vessel Code.
- F. ASME Sec. 9 - Welding and Brazing Qualifications.
- G. ASME B16.1 - Cast Iron Pipe Flanges and Flanged Fittings Class 25, 125, 250 and 800.
- H. ASME B16.3 - Malleable Iron Threaded Fittings.
- I. ASME B16.4 - Cast Iron Threaded Fittings Class 125 and 250.
- J. ASME B16.18 - Cast Bronze Solder-Joint Pressure Fittings.
- K. ASME B16.22 - Wrought Copper and Bronze Solder-Joint Pressure Fittings
- L. ASME B16.23 - Cast Copper Alloy Solder-Joint Drainage Fittings - DWV.
- M. ASME B16.26 - Cast Bronze Fittings for Flared Copper Tubes.
- N. ASME B16.29 - Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV.
- O. ASTM A47 - Ferritic Malleable Iron Castings.
- P. ASTM A53 - Pipe, Steel, Black and Hot-Dipped Zinc Coated, Welded.

- Q. ASTM A74 - Cast Iron Soil Pipe and Fittings.
- R. ASTM A106 - Carbon Steel Seamless Pipe.
- S. ASTM A234 - Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures.
- T. ASTM A536 – Ductile Iron Castings.
- U. ASTM B32 - Solder Metal.
- V. ASTM B42 - Seamless Copper Pipe.
- W. ASTM B43 - Seamless Red Brass Pipe.
- X. ASTM B75 - Seamless Copper Tube.
- Y. ASTM B88 - Seamless Copper Water Tube.
- Z. ASTM B251 - Wrought Seamless Copper and Copper-Alloy Tube.
- AA. ASTM B302 - Threadless Copper Pipe (TP).
- AB. ASTM B306 - Copper Drainage Tube (DWV).
- AC. ASTM C14 - Concrete Sewer, Storm Drain, and Culvert Pipe.
- AD. ASTM C425 - Compression Joints for Vitrified Clay Pipe and Fittings.
- AE. ASTM C443 - Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets.
- AF. ASTM C564 - Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
- AG. ASTM C700 - Vitrified Clay Pipe, Extra Strength, Standard Strength, and Perforated.
- AH. ASTM D1785 - Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
- AI. ASTM D2235 - Solvent Cement for Acrylonitrile - Butadiene - Styrene (ABS) Plastic Pipe and Fittings.
- AJ. ASTM D2241 - Poly (Vinyl Chloride) (PVC) Plastic Pipe (SDR-PR).
- AK. ASTM D2466 - Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
- AL. ASTM D2513 - Thermoplastic Gas Pressure Pipe, Tubing and Fittings.
- AM. ASTM D2564 - Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings.

- AN. ASTM D2680 - Acrylonitrile-Butadiene-Styrene (ABS) Composite-Sewer Piping.
- AO. ASTM D2683 - Socket-Type Polyethylene Fillings for Outside Diameter-Controlled Polyethylene Pipe.
- AP. ASTM D2729 - Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
- AQ. ASTM D2751 - Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings.
- AR. ASTM D2846 - Chlorinated Polyvinyl Chloride (CPVC) Pipe, Fittings, Solvent Cements and Adhesives for Potable Hot Water Systems.
- AS. ASTM D2855 - Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.
- AT. ASTM D3033 - Type PSP Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
- AU. ASTM D3034 - Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
- AV. ASTM D3309 - Polybutylene (PB) Plastic Hot Water Distribution System.
- AW. ASTM F477 - Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
- AX. ASTM F493 - Solvent Cements for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe and Fittings.
- AY. ASTM F891, Schedule 40 Cellular Core PVC-DWV Pipe.
- AZ. AWS A5.8 - Brazing Filler Metal.
- BA. AWWA C105 - Polyethylene Encasement for Ductile Iron Piping for Water and Other Liquids.
- BB. AWWA C110 - Ductile - Iron and Gray - Iron Fittings 3 in. through 48 in., for Water and Other Liquids.
- BC. AWWA C111- Rubber-Gasket Joints for Ductile Iron and Gray-Iron Pressure Pipe and Fittings.
- BD. AWWA C151 - Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water or Other Liquids.
- BE. AWWA C606 – Grooved and Shouldered Joints.
- BF. AWWA C651 - Disinfecting Water Mains.
- BG. CISPI 301 - Cast Iron Soil Pipe and Fittings for Hubless Cast Iron Sanitary Systems.
- BH. CISPI 310 - Joints for Hubless Cast Iron Sanitary Systems.

BI. CAN-3 B281 - Aluminum Drain, Waste, and Vent Pipe and Components.

BJ. NCPWB - Procedure Specifications for Pipe Welding.

BK. NFPA 54 - National Fuel Gas Code.

BL. NFPA 58 - Storage and Handling of Liquefied Petroleum Gases.

1.3 QUALITY ASSURANCE

A. Valves: Manufacturer's name and pressure rating marked on valve body.

B. Welding Materials and Procedures: Conform to ASME Code and applicable state labor regulations.

C. Welders Certification: In accordance with ASME Sec 9.

D. All grooved joint couplings, fittings, valves, and specialties shall be the products of a single manufacturer. Grooving tools shall be of the same manufacturer as the grooved components.

E. All castings used for coupling housings, fittings, valve bodies, etc. shall be date stamped for quality assurance and traceability.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site.

B. Accept valves on site in shipping containers with labeling in place. Inspect for damage.

C. Provide temporary protective coating on cast iron and steel valves.

F. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

G. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

PART 2 PRODUCTS

2.1 SANITARY, STORM AND VENT PIPING, ABOVE GRADE (Must be approved by governing authorities)

A. Gravity Cast Iron Pipe: ASTM A74, service weight.

1. Fittings: Cast iron.

2. Joints: ASTM C564, hub and spigot, neoprene gasket system.

B. Gravity Cast Iron Pipe: CISPI 301, hubless, service weight.

1. Fittings: Cast iron.

2. Joints: Neoprene gaskets and stainless steel clamp-and-shield assemblies.
- C. Gravity Steel Pipe: ASTM A53 Schedule 40, galvanized.
1. Cast Iron Fittings: ASME B16.1, flanges and fittings; ASME B16.4, screwed fittings.
 2. Malleable Iron Fittings: ASME B16.3, screwed type. ASTM A47.
 3. Ductile Iron Fittings: Grooved end, ASTM A536.
 4. Mechanical Grooved Couplings: Ductile iron, galvanized. (as specified for Forced Drains)
- D. PVC Pipe: ASTM D2729 (when approved by the Architect/Engineer).
1. Fittings: PVC.
 2. Joints: ASTM D2855, solvent weld with ASTM D2564 solvent cement.
- E. CPVC Pipe: ASTM D2846 (When approved by the Architect/Engineer).
1. Fittings: ASTM D2846, CPVC
 2. Joints: ASTM D2846, solvent weld with ASTM F493 solvent cement.
- F. Forced larger than 3" : Steel Pipe: ASTM A53, Schedule 40 , galvanized.
1. Fittings: Galvanized steel.
 2. Joints: Grooved mechanical couplings.
 3. IPS Grooved Piping System.
 - a. Victaulic mechanical pipe couplings, fitting, valves and other grooved components may be used as an option to welding, threading or flanged methods. All grooved components shall be of one manufacturer and shall conform to local code approval and/or as listed by ANSI B31.1, B31.9, ASME UL/FM IAPMO or BOC. Grooved end product manufacturer to be ISO-9001 certified.
 - b. Roll or cut grooved ends as appropriate to pipe material, wall thickness, pressures, size and method of joining. Pipe ends shall be grooved in accordance with manufacturers current listed standards conforming to ANSI/AWWA C-606.
 - c. Mechanical couplings shall be Victaulic style 107H "Installation-Ready" or approved manufacturer, rigid coupling. Victaulic style 177 "Installation-Ready", and style 77 or 75 or equal coupling shall be used where system flexibility is desired at pumps and other mechanical equipment to reduce noise and vibration. Noise and vibration reduction is achieved by installing (3) style 77 or 75 or equal flexible couplings near the vibration source. Couplings shall be of cast ductile iron conforming to ASTM A536, grade 65-45-12.
- 2.2 SANITARY, STORM AND VENT SEWER PIPING, BURIED WITHIN 5 FEET OF BUILDING (Must be approved by governing authorities)

- A. Gravity Cast Iron Pipe: ASTM A74 service weight.
1. Fittings: Cast iron.

2. Joints: Hub-and-spigot, CISPI HSN compression type with ASTM C564 neoprene gaskets.
- B. Gravity Cast Iron Pipe: CISPI 301, hubless, service weight
 1. Fittings: Cast iron.
 2. Joints: ASTM C564, neoprene gasket system.
 - C. Gravity Schedule 40 PVC Pipe: ASTM D2729 and ASTM F891 DWV non-pressure cellular core.
 1. Fittings: PVC.
 2. Joints: ASTM D2855, solvent weld with ASTM D2564 solvent cement.
- 2.3 DOMESTIC WATER PIPING, BURIED WITHIN 5 FEET OF BUILDING (Must be approved by governing authorities)
- A. Ductile Iron Pipe: ANSI/AWWA C151/A21.51 rated 350 psi. with Class 350 fittings.
 1. ANSI thickness Class 50 minimum, nominal pipe wall thickness .27" minimum, rated 350 psi at laying condition Type 1.
 2. Cement lined as per AWWA C104 (ANSI A21.4)
 3. Pipe Joints: Push on, ANSI/AWWA C1533/A21.53, with Tyton gaskets.
 4. Fitting Joints: Mechanical, compact, ANSI/AWWA C153/A21.53, with stainless steel or Corten anti-rotation bolts and sacrificial zinc anode cap on each bolt.
 5. Coating: Exterior of pipe and fittings, asphaltic coating as per ANSI/AWWA.
 6. Polyethylene encasement as per ANSI/AWWA C105/A21.5.
 7. Concrete thrust blocks, installation, etc. as per published engineering and construction standards of Michigan Department of Transportation and local codes.
 8. All material and installation shall be in accordance with manufacturers recommendations.
 - B. Copper Tubing: 2" and smaller - ASTM B88, Type K, soft temper.
 1. Fittings: ASME B16.18 cast bronze or ASME B16.22 wrought copper and bronze.
 2. Joints: AWS A5.8, BCuP silver braze.
 3. No joints shall be located under floor unless standard pipe lengths are not long enough for the entire length of bury, then joints shall be kept to a minimum.
 - C. PVC Pipe
 1. 3" - ASTM D2241, SDR 21- Class 200 AWWA C900.
 2. 4" thru 12" - ASTM D2241, DR18 - Class 150, DR18 - AWWA C900.
 3. Fittings ASTM D2466, PVC.
 4. Joints: ASTM D2855, solvent weld with ASTM D2564 solvent cement.
- 2.4 DOMESTIC WATER PIPING, ABOVE GRADE INSIDE BUILDING (Must be approved by governing authorities)
- A. Domestic water piping 6" and smaller shall be: Copper tubing: ASTM B88, Type L, hard drawn, seamless.

1. Fittings: ASME B16.18 cast bronze tee tap or ASME B16.22 wrought copper and bronze.
2. Fittings 1-1/2" and smaller: ASME B16.18 cast bronze or ASME B16.22 wrought copper, with 301 stainless steel internal components, EPDM seals, and push-to-connect ends. Victaulic Permalynx.
3. Joints: ASTM B32, solder, Lead free Grade 95-A tin - antimony or tin and silver with melting range 430 to 535 degrees F or AWS A5BcuP silver braze.

2.5 PIPE HANGERS AND SUPPORTS

- A. Refer to Section 22 05 00.

2.6 FLANGES, UNIONS, AND COUPLINGS

- A. Pipe Size 2 Inches and Under:
 1. Ferrous pipe: 150 psig malleable iron threaded unions.
 2. Copper tube and pipe: 150 psig bronze unions with soldered joints. (Solder shall be lead free.)
- B. Pipe Size Over 2 Inches:
 1. Ferrous pipe: 150 psig forged steel slip-on flanges; 1/16 inch thick preformed neoprene gaskets.
 2. Copper tube and pipe: 150 psig slip-on bronze flanges; 1/16 inch thick preformed neoprene gaskets.
- C. Dielectric Connections: Dielectric nipples shall be non-conducting for connection of dissimilar materials. Dielectric nipples shall be similar to Victaulic Style 647 or Style 47. A brass adapter dielectric union is not acceptable.

2.7 BALL VALVES

- A. Up to and including 3 Inches:
 1. Bronze one piece body, stainless steel ball, Teflon seats and stuffing box ring, lever handle and balancing stops, solder or threaded ends with union.
 2. Brass two piece body, chrome plated brass ball and stem, PTFE seats and seals, lever handle, and Vic-Press ends. Victaulic Series P589.
- B. Over 1-1/2 Inches: Cast ductile iron steel body, chrome plated steel ball, teflon seat and stuffing box seals, lever handle, or gear drive handwheel for sizes 10 inches and over, flanged or grooved ends. Basis of Design: Victaulic Series 726.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that excavations are to required grade, dry, and not over-excavated.

3.2 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel or groove plain end ferrous pipe.
- B. Remove scale and dirt, on inside and outside, before assembly.
- C. Prepare piping connections to equipment with flanges or unions.
- D. Unions and flanges for servicing and disconnect are not required in installations using grooved joint couplings. (The couplings shall serve as disconnect points.)

3.3 PLUMBING PIPING INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Dielectric nipples for connection of dissimilar materials. A brass adaptor dielectric union is not acceptable.
- C. Route piping in orderly manner and maintain gradient.
- D. Install piping to conserve building space and not interfere with use of space.
- E. Group piping whenever practical at common elevations.
- F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
 - 1. For water systems, use adequate numbers of Victaulic Style 77 flexible couplings in header piping to accommodate thermal growth and contraction, and for the elimination of expansion loops. (In accordance with Victaulic instructions and as approved by the engineer). Where expansion loops are required, use Victaulic Style 77 couplings on the loops.
- G. Provide clearance for installation of insulation and access to valves and fittings.
- H. Provide access where valves and fittings are not exposed. Coordinate size and location of access doors.
- I. Establish elevations of buried piping outside the building to ensure not less than 4'-0" of cover for sewers and not less than 5'-6" of cover for domestic water piping.
- J. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to weld.
- K. Provide support for utility meters in accordance with requirements of utility companies.
- L. Prepare pipe, fittings, supports, and accessories not prefinished, ready for finish painting.

- M. Underground sewers shall be a minimum of 3" in diameter. Sewers located within building shall have a minimum slope of 1/4" per foot for piping 3" and smaller and a minimum slope of 1/8" per foot for piping 4" and larger.
- N. All junctions of drainage piping shall be made with combination "Y" and 1/8 bend fittings.
- O. Install bell and spigot pipe with bell end upstream.
- P. Terminate plumbing vents 12" minimum above roof. Furnish and install weather cap on top of all vent pipes.
- Q. Install valves with stems upright or horizontal, not inverted.
- R. Solder or "sweat" joints shall be used for all copper and brass fittings, valves and tubing, using the soldering flux and methods recommended by the manufacturer of the tubing and fittings. Solder shall be silver solder for buried piping. No lead solder shall be used on any potable water piping.
- S. Pipe vents from gas pressure reducing valves to outdoors and terminate in weather proof hood.
- T. Equipment using gas and related piping shall be installed in compliance with NFPA 54 and 58, as applicable.
- U. Install ductile iron pipe and fittings in accordance with AWWA C600 and manufacturer's instructions.
- V. Steel Rods, Bolt, Lugs, and Brackets: Coat buried steel with one coat of coal tar coating before backfilling.
- W. Maintain minimum 10-foot horizontal separation and 18 inch vertical separation of water main from sewer piping or as required by local code.

3.4 PLUMBING PIPING APPLICATION

- A. Use grooved mechanical couplings and fasteners in accessible locations, risers and pipe chases with Architect/Engineer's approval.
 - 1. Grooved joints shall be installed in accordance with the manufacturer's latest published installation instructions. Grooved ends shall be clean and free from indentations, projections, and roll marks in the area from pipe end to groove. Gaskets shall be of an elastomer grade suitable for the intended service, and shall be molded and produced by the coupling manufacturer. The grooved coupling manufacturer's factory trained representative shall provide on-site training for contractor's field personnel in the use of grooving tools and installation of grooved joint products. The representative shall periodically visit the jobsite and review contractor is following best recommended practices in grooved product installation. (A distributor's representative is not considered qualified to conduct the training or jobsite visit(s).)

- B. Install unions downstream of valves and at equipment or apparatus connections. Unions are not required in installations using grooved mechanical joint couplings. (The couplings shall serve as unions and disconnect points).
- C. Install brass male adapters each side of valves in copper piped system. Sweat solder adapters to pipe.
- D. Install gate, ball, or butterfly valves for shut-off and to isolate equipment, part of systems, or vertical risers. All branch piping take-offs from mains, risers, or branch piping shall have valves installed to allow isolation of branch piping.
- E. Install globe, ball, or butterfly valves for throttling, bypass, or manual flow control services.
- F. Provide spring loaded check valves on discharge of water pumps.
- G. Provide plug valves in gas systems for shut-off service. Provide removable or fixed handle for each plug valve.
- H. Provide flow controls in water recirculating systems where indicated.

3.5 PIPE HANGERS AND SUPPORTS

- A. Support horizontal piping as scheduled.
- B. Install hangers to provide minimum ½ inch space between finished covering and adjacent work.
- C. Place hangers within 12 inches of each horizontal elbow.
- D. Use hangers with 1½ inch minimum vertical adjustment.
- E. Support horizontal cast iron pipe adjacent to each hub, with 5 feet maximum spacing between hangers.
- F. Support vertical piping at every floor. Support vertical cast iron pipe at each floor at hub.
- G. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
- H. Support riser piping independently of connected horizontal piping.
- I. Provide copper plated hangers and supports for copper piping.
- J. Design hangers for pipe movement without disengagement of supported pipe.
- K. Prime coat and finish paint exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed. Hangers and supports located in mechanical spaces are considered exposed.

3.6 ERECTION TOLERANCES

- A. Establish invert elevations, slopes for drainage to minimum 1/8 inch per foot for piping 4" and larger, 1/4" per foot for piping 3" and smaller. Maintain gradients.
- B. Slope water piping and arrange to drain at low points.

END OF SECTION

MAI 2014-9007

SECTION 23 05 00

HVAC REQUIREMENTS

PART 1 GENERAL

1.1 RELATED SPECIFICATIONS AND DOCUMENTS

- A. Drawings and related specifications for this project including General and Supplementary Conditions, Division 1, General Requirements, Instructions to Bidders, Addenda's, etc. apply to and are considered a part of Division 23 - Mechanical Work.
- B. Information in this division is intended to clarify or make additions to the requirements set forth in the General Conditions, Supplementary Conditions, and Division I of these specifications. Any conflict between this Division 23 and other sections or divisions of the specifications or drawings shall be brought to the attention of the Architect/Engineer in writing as a request for addendum prior to the bid opening.
- C. Furnish all equipment, materials, articles, items, operations or methods listed, mentioned or scheduled on drawings, these specifications, manufacturer's installation instructions and include all labor, materials, equipment and incidentals necessary for their complete installation and operation.
- D. All information contained in this section applies to all sections within Division 23 as if it was part of each section.

1.2 DRAWINGS AND SPECIFICATIONS

- A. The drawings and these specifications are intended to supplement each other and any material or labor called for in one shall be furnished even if not specifically mentioned in both. Any material or labor which is neither shown on the drawings nor listed in this specification, but is normally incurred or required for completion of work shall be furnished. If there is a discrepancy between the drawings and specifications, the more stringent of the two shall be followed.
- B. Drawings are diagrammatic and are intended to show approximate location and general arrangement of systems and equipment. No attempt has been made to show every ell, tee, etc. Drawings shall not be scaled for location of systems, equipment, etc. All dimensions whether given on drawings or scaled shall be verified in field and coordinated with all other trades and existing field conditions. Some ductwork, piping, equipment, etc. locations may require changes in location due to field conditions and coordination with other trades will be made with no additional cost to the Owner. Failure to check will be no reason for additional compensation.
- C. These drawings and the associated specifications are intended to provide complete furnishing, installation and operational HVAC systems as specified. If these drawings and associated specifications have information omitted that would not allow a completely operational system as is the intent of the Engineer, the bidder shall notify the Engineer a minimum one week prior to the bid date to allow for addenda. Once bids have been received, the Contractor shall be responsible for material, labor, etc., to furnish and install a completely operational mechanical system as is the intent of these drawings and associated specification.

- D. The installation of all systems, equipment, etc., is subject to clarification with submitted shop drawings and field coordination requirements. Equipment outlines shown on drawings or dimensioned on drawings are limiting dimensions. Any equipment that reduces the indicated clearances or exceeds specified or scheduled equipment dimensions shall not be used.
- E. The Architect/Engineer and Owner reserve the right to make minor changes in the location of equipment, piping, ductwork, etc. at the time of rough-in without additional cost to the Owner.
- F. The Mechanical Trades Contractor shall have completed for his portion of work, at least one installation of size and type comparable to this project and has been in satisfactory operation for at least two complete years. The Mechanical Trades Contractor shall also have a developed service department capable of negotiating service contracts with the Owner for systems herein specified.

1.3 AUTOCAD BACKGROUND FILES

- A. The Contractor shall include in their bid any cost for requesting AutoCAD backgrounds for their use from the Architect or Engineer. The cost will be \$100.00 for the first plan, and \$50.00 for each additional plan that may be requested for AutoCAD use. A waiver of responsibility for the Architect and Engineer related to Contractor use of the CAD files shall be signed by the Contractor.

1.4 MANUFACTURER'S SPECIFICATIONS AND CAPACITIES

- A. Some equipment, materials, etc. that are scheduled on the drawings or listed in any addenda may not be specified in this specification. The manufacturer's specification and capacities shall be considered included and part of this specification whether it is specified in this specification or noted or scheduled on the drawings. The contractor shall remove and replace any "substituted" equipment or material, that has been installed or is on site, which in the opinion of the Architect/Engineer does not meet the scheduled equipment or materials manufacturer's capacities or specification at no additional cost to the Owner.

1.5 DEFINITIONS

- A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
- D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.

- E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

1.6 LOCAL CONDITIONS

- A. Before submitting proposals, each contractor shall examine these specifications and associated drawings, addenda, etc. and shall examine the site of the project. The bidder shall fully investigate the site of this project, investigate coordination of his work with all other trades and existing conditions and completely satisfy himself as to the conditions to which the work is to be performed before submitting his/her bid. No allowances or considerations will be given at a later date for alleged misunderstanding as to the requirements of the work, materials to be furnished, or conditions required by the nature of this project site and coordination by the neglect on the bidder's part to make such an examination and coordination.
- B. Drawings show approximate location of existing services. The mechanical and electrical trades shall check with local utility companies or municipal agencies for exact location of services which they expect to encounter. The Mechanical Trades Contractor shall be responsible for hiring a company such as "Miss Dig" to stake out and locate all utilities in areas of excavation before commencing any work. The Mechanical Trades Contractor shall verify all elevations and locations of existing underground lines which are to be connected into or routed over or under. This verification shall be done prior to beginning work at this project.

1.7 QUALITY ASSURANCE

- A. All work shall be performed in accordance with all local and state codes, laws and regulations applicable to the work for this project. The contractor shall be responsible for all permits and costs for inspections, etc., and for checking with each utility company supplying service to this project and shall determine from them all, any changes in boxes, meters, valves, service, etc., and shall include all cost for inspections, revisions to services, etc. in his bid as required by local agencies, utilities, etc. No extra payment will be made for such items after the contractor submits his bid.
- B. In addition to all applicable Federal, State and local codes, the standards and codes listed below shall apply to all mechanical work. The reference to codes and standards shall be referenced to the latest edition or revision.
 - 1. Air Diffusion Council (ADC)
 - 2. Air Moving and Conditioning Assoc., Inc. (AMCA)
 - 3. American Boiler Manufacturer's Association (ABMA)
 - 4. American Gas Association (AGA)
 - 5. American National Standard Institute (ANSI)
 - 6. American Refrigeration Institute (ARI)
 - 7. American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE)
 - 8. American Society of Mechanical Engineers (ASME)
 - 9. American Society for Testing materials (ASTM)
 - 10. American Welding Society
 - 11. ANSI code of Pressure Piping and Unified Pressure Vessels

12. ASME Boiler and Pressure Vessel Code
13. Institute of Boiler and Radiator Manuf. (IBR)
14. National Electrical Manufacturer's Association (NEMA)
15. Sheet Metal & Air Conditioning contractors National Association (SMACNA)
16. Standards of the Hydraulic Institute
17. Underwriters' Laboratories (UL)
18. Williams-Steiger Occupational Safety & Health Act (OSHA)

- C. In the event of conflict between drawings, codes, standards or specifications, the most stringent requirement shall apply

1.8 SUBMITTALS AND SHOP DRAWINGS

- A. Submit electronic shop drawings for all mechanical equipment and materials associated with Division 23 and associated drawings to the Architect/Engineer for review before fabrication of work or ordering of equipment. Shop drawings shall be submitted at the earliest possible time.
- B. Shop drawings shall be first reviewed by the contractor. Inaccurate shop drawings shall be corrected by the contractor to meet specifications and schedules for this project. The contractor shall then initial the shop drawings as having been reviewed before submitting to the Architect/Engineer. Shop drawings shall have, in addition to the mechanical information, the electrical requirements for minimum circuit amperes and maximum fuse size ratings of the equipment.
- C. Drawings which are rejected must be corrected and returned for Architect/Engineer review before ordering.
- D. Furnish to the job site copies or prints of shop drawings that have been reviewed by the Engineer as soon as possible.
- E. Include a copy of each shop drawing in the Operation and Maintenance Manual.
- F. The checking and reviewing of shop drawings by the Architect/Engineer shall be construed as assisting the contractor and the Architect/Engineer's action does not relieve the contractor from the responsibility for errors or omissions which may exist thereon. The contractor shall be held responsible for errors or omissions that are discovered after approval process and must be made good by the contractor.
- G. The Sheet Metal Contractor, etc. shall include in their bid any cost for requesting AutoCAD backgrounds for their use from the Architect or Engineer at a minimum \$100.00 for the first file, and \$50.00 for each additional file that may be requested for AutoCAD use.

1.9 PERMITS, INSPECTIONS AND TESTS

- A. The Mechanical Trades Contractor shall take out all permits and arrange for necessary inspections and shall pay all assessments, fees and costs, etc., and make all tests as required by applicable codes. At the completion of the project, the Mechanical Trades Contractor shall furnish certificates of inspection and approval and secure final

occupancy permit. Record copies shall be included in the Operation and Maintenance manuals.

1.10 RECORD DRAWINGS

- A. Maintain an up-to-date set of "record" drawings showing actual equipment, piping, duct, etc. installation locations. Exact dimensions from column lines for all concealed work and tie-ins with elevations noted shall be included.
- B. Include a set of reproducible drawings and a set of prints in each Operation and Maintenance Manual.
- C. The Engineer reserves the right to request and be furnished any additional information he deems necessary to be shown on the record drawings.

1.11 OWNER'S INSTRUCTIONS

- A. Upon completion of the project, the contractor shall be responsible for instructing the Owner's operating staff, in the presence of the Architect/Engineer's representative, in the proper operation and maintenance of the mechanical systems and equipment. Include a statement signed by the Owner that instructions have been given for proper operation and maintenance of the mechanical systems and equipment.

1.12 GUARANTEES

- A. Furnish a written guarantee, to the Architect/Engineer, that will make the contractor responsible at his own expense for any imperfections in material and/or workmanship which may develop under ordinary use within a period of one (1) year from final Owner's acceptance of the work.
- B. Furnish all written guarantees from equipment and/or material manufacturers which shall include the operating and performance conditions and capabilities upon which they are based.
- C. Permanent equipment that is used for temporary heat or cooling shall be guaranteed for one (1) year from the date of final acceptance of the project.

1.13 PORTABLE AND DETACHABLE PARTS

- A. Retain all portable and detachable parts of installation such as keys, spare accessories, operating manuals, etc. include in the Operation and Maintenance Manual.

1.14 OPERATION AND MAINTENANCE MANUALS

- A. Furnish to the Architect/Engineer two (2) copies of an approved bound (3 ring binder) book with tabs for sections covering each item of equipment. These notebooks shall include shop drawings, maintenance manuals, operating manuals and parts lists to instruct the Owner on proper operation and use as well as maintenance for each piece of equipment. These books shall also include contractors', subcontractors' and manufacturers' names, telephone numbers and addresses.

- B. Manuals shall also include sequence of operation, control equipment literature, wiring and control diagrams, certificates of guarantees, certificates of inspection, mechanical system test and balancing reports. The contractor shall accumulate and summarize the control and maintenance sequence in a typewritten sheet to be included in the report.
- C. The manuals must be approved by the Architect/Engineer before final payment to the contractor. The Engineer reserves the right to request and be furnished any additional information that he deems necessary to be included in the manuals.

1.15 RESPONSIBILITIES FOR USE OF SUBSTITUTE MATERIALS

- A. Contractor shall notify Architect/Engineer in writing at least ten (10) calendar days before bids are due for approval to use materials and/or equipment other than that which has been specified or scheduled. If substitute materials and/or equipment are approved and used, it will be this contractor's responsibility to guarantee that the items will function as the specified equipment or materials, will in no way alter the design of the structure or system, and will not require any additional mechanical work such as piping, ductwork, etc. Any additional cost required by substitute materials will be the responsibility of the contractor.
- B. It will be the contractor's responsibility, at his own expense, to remove or replace any non-approved equipment or material or any approved equipment or materials not originally specified or scheduled if equipment and materials do not meet with the satisfaction of the Architect/Engineer.
- C. It shall be the Contractor's (Mechanical Trades) responsibility to coordinate and pay for any Electrical Contractor costs due to any changes in substitute materials and/or equipment's power requirements, which differ from that shown on the design documents.
- D. No consideration will be given to requests for substitute materials because of delivery problems unless the contractor can prove that orders were placed as soon as possible after contract was awarded and that delays were not caused by submittal of unscheduled or unspecified (substituted) materials to the Architect/Engineer.

1.16 COST BREAKDOWN AND EQUIPMENT LIST

- A. The successful bidder shall be responsible for submitting a cost breakdown to the Architect/Engineer and Owner within ten (10) calendar days after date of request of the breakdown. During progress of the work, if changes occur which cause additional cost, the price on such items shall be broken down in accordance with the items listed in the breakdown.
- B. The bidders shall be responsible for submitting a complete list of all equipment manufacturers, makes, models, etc. that will be used for this project with their proposal. The equipment list shall be typed on the contractors letterhead and shall be signed by the authorized officer.

1.17 MATERIALS AND EQUIPMENT

- A. Materials and equipment furnished under this project shall have a minimum warrantee of one (1) year. All materials and equipment shall be new, of first class quality and shall be

furnished, delivered, erected, installed and finished in every detail and shall be so selected and arranged as to fit into the building space. All material or equipment that is not specified but necessary for this project shall be subject to the approval of the Architect/Engineer.

- B. Any materials or equipment not specified or scheduled but similar to that which has had prior approval shall be listed as a substitution and noted on the proposal form as such.
- C. The contractor shall include all miscellaneous materials and labor required to completely install and operate the mechanical systems as is intended by these drawings and specification.

1.18 TEMPORARY HEATING OR COOLING OF SPACE/BUILDING DURING CONSTRUCTION

- A. It is not recommended to use HVAC equipment being furnished for the project for temporary heating and cooling of the space/building during construction. If it is necessary to utilize the HVAC equipment for tempering air, filters shall be placed at face of each return diffuser or grille. Mechanical Contractor shall be responsible for removing temporary; filters at each return diffuser, cleaning return air ductwork and installing new filters within the HVAC equipment before space/building is turned over to the Owner.

1.19 SCHEDULE, COORDINATION AND INSTALLATION OF WORK

- A. The contractor shall carry on work in such a manner as to meet the dates as scheduled by the General Contractor and shall work overtime at no expense to the Owner as required to comply with the schedule. This contractor shall schedule all work with Owner and Architect/Engineer and schedule shut down of systems with Owner.
- B. Examine the site and all drawings and specifications and coordinate work with all other trades before commencing work for this project. Arrange work essentially as shown with the exact layout to be made on the job to suit actual conditions. Precise locations of equipment and materials shall be coordinated and shall be the responsibility of this contractor. Should any conflicts in location occur, and necessary deviations from drawings are required as determined by the Architect/Engineer, the contractor shall make necessary adjustments without additional cost to the Owner. Any damage to HVAC equipment due to HVAC equipment operation during construction shall be paid for by the Mechanical Contractor.
- C. All equipment, piping, ductwork, etc. shall be located and/or routed to allow for the most convenient access for servicing.
- D. Arrange for necessary access doors, panels, etc. to allow servicing of equipment, piping, valves, fire dampers, etc. Perform any cutting and patching as required, made necessary by failure to make proper arrangements.
- E. Indicated equipment connections, sizes and locations shall be verified and connected according to manufacturer's shop drawings and installation instructions. Thoroughly investigate the space provided for equipment and connections before ordering

equipment. All equipment shall be selected to fit into the space allowed, including connections with adequate space allowed for operation and maintenance.

- F. All work shall be installed in a neat and workmanlike manner, using skilled personnel thoroughly qualified in the trade or duties that they are to perform. Rough work will be rejected.
- G. Coordinate all equipment deliveries and schedules to allow timely installation. Contractor shall separate equipment into sections and reassemble in building if required by the installation at no extra cost to the Owner.
- H. Furnish a superintendent approved by the Architect/Engineer to oversee and coordinate the work to be performed with all other trades.
- I. Coordinate location of pipes, ductwork, etc. with other building components such as structural components (beams, joists, columns, etc.), electrical components (lighting, conduits, etc.) and architectural components (walls, ceilings, floors, pipe chases, roof, etc.).
- J. Before starting work, Contractor shall verify that available space for proposed pipes, ducts, equipment etc. is adequate for the intended purpose and will result in a first class installation. Irregardless of drawings, responsibility for first class operating systems rests with the Contractor.
- K. Arrange for chases, slots, openings, etc. and other building components to allow for mechanical systems installation. Coordinate cutting and patching of these components to accommodate installation. This contractor shall be responsible for accurately locating for the general trades all chases, shafts, etc. and shall be responsible for all cutting and patching if these chases were not accurate or not coordinated in time with the general trades. Coordinate installation of all sleeves in walls, on floors or other structural or architectural components.
- L. Sequence, coordinate and integrate installation of equipment and materials for efficient work flow during the project. Particular attention should be spent on larger pieces of equipment.
- M. Install equipment and materials with provisions for necessary access for service and maintenance. Allow space for removal of all parts that may require replacement or servicing.
- N. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.
- O. Coordinate requirements for access panels and doors for mechanical items requiring access that are concealed behind finished surfaces. When access panels are required, valves and equipment components requiring access shall be located to minimize the number of panels.
- P. Examine the work as it progresses and alert the Architect/Engineer in writing of any instances or obstructions that will prevent this contractor from performing his/her work.

1.20 DELIVERY, STORAGE, AND HANDLING

- A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.
- B. Furnish and maintain a weatherproof storage facility on the site of adequate size to store miscellaneous equipment and/or materials to prevent exposure to the weather. Location of shed shall be determined by the Owner and Architect/Engineer. The Owner reserves the right to deny storage of materials or equipment in any existing or new buildings.

1.21 COOPERATION WITH ARCHITECT/ENGINEER AND OTHERS

- A. Coordinate all aspects of the mechanical system installation with all other trades, existing conditions, etc.
- B. If the bidder believes that changes in design are required to meet intended design capacities and operation or material and/or equipment is obviously omitted from these specifications and drawings, the bidder shall contact the Architect/Engineer in writing at least ten (10) days before bid date. The acceptance of a bid by the Owner shall be binding and shall indicate that the bidder does not require any changes in design nor additional costs in order to meet the design and performance of the mechanical system as indicated in these specifications and drawings.

1.22 WORK INVOLVING OTHER TRADES

- A. Equipment or materials specified in Division 23 may have to be installed by other trades (such as electrical trades or architectural trades) due to code requirements or union jurisdictional requirements. Where this occurs, this contractor shall include all costs required by other trades to complete the work and hire the respective trade to perform this work.

1.23 PERFORMANCE DATA AND ACCESSIBILITY

- A. All performance data specified in this specification or scheduled on drawings shall be considered actual performance of the equipment after installation. The supplier and installer shall be responsible for suitable allowances to adjust equipment to design capacities when actual operating and installation conditions differ from drawings.
- B. All equipment and materials shall be installed to allow access for servicing and maintenance. Coordinate final location of such equipment and materials that are concealed with required access doors on panels. Allow ample space for replacement or servicing. Extend all grease fittings to an accessible location.

1.24 CUTTING AND PATCHING

- A. Unless noted otherwise, the Mechanical Trades shall be responsible for all cutting, patching and associated work required under Division 23. This work shall be performed by trades normally performing this type of work except drilling of holes shall be done by the contractor requiring same. This includes replacing areas of cutting required by this

work with proper reinforcing, termite shielding, materials, finishing, etc. to restore the areas to their original condition, and filling all openings around ducts, piping, etc. with approved fire retardant materials. Regardless, all drilling of holes shall be the responsibility of the Contractor requiring same.

- B. If noted on drawings that the General Trades will be responsible for all cutting and patching, it will be the Mechanical Trades responsibility to notify all General Trades during bidding of all areas requiring cutting and patching. Regardless, all drilling of holes shall be the responsibility of the contractor requiring same.

1.25 WORK IN EXISTING BUILDINGS

- A. Coordinate and schedule all work in existing building with Owner and Architect/Engineer. Systems shall be kept in operation at all times if at all possible. If a system shut-down is required, the contractor shall schedule with the Owner, the time and length of shut-down. A system shall not be shut down without written permission from the Owner.
- B. All existing equipment, piping, ductwork, etc. that is to be removed shall remain the property of the Owner. The contractor shall remove and locate this material that remains the property of the Owner to a location determined by the Owner somewhere on site. If the Owner does not want to maintain possession of the removed material, the contractor shall be responsible for removing material from the site and disposing of this material as necessary to meet all codes and requirements and shall pay all costs as required for any disposal fees, inspections, permits, etc.
- C. All existing piping, equipment, etc. whether shown on drawings or not that is to be removed and/or abandoned and does not remain property of the Owner shall be removed from site.
- D. Any existing piping, valves, mechanical equipment, etc. serving the existing building which are shown or not shown on drawings and are required for systems operation shall remain in use. If these systems require relocation to allow installation of new systems, the contractor shall be responsible for relocating to an Owner and Architect/Engineer approved location. The contractor shall pay all cost for this work and include such cost in his/her bid. (As specified previously, contractor shall be responsible for examining site and include all cost for work required to complete this project.)
- E. When active services, etc. are encountered in this project, the contractor shall furnish and install bracing, support, etc. as required to protect and keep these services active. (As specified previously, these drawings are diagrammatical. The contractor shall be responsible for verification of all existing services, piping, equipment, etc.).

1.26 ACCESS TO EQUIPMENT, HEATING COILS, VALVES, ETC.

- A. Coordinate access panels with type of construction and furnish access panels in areas that are non-accessible. Access panels shall be furnished by this contractor and installed by the General Contractor. The access panels shall be all approved, UL labeled and fire rated and shall be located and sized to allow access to equipment, heating coils, valves, fire dampers, etc.

- B. Where access panels are required, valves, equipment etc. shall be located as to require the least number of access panels.

1.27 EQUIPMENT GUARDS

- A. All rotating or moving parts of equipment that are located so as to be a hazard shall be fully enclosed or properly guarded as to meet or exceed all regulations and OSHA requirements.

1.28 EQUIPMENT CONNECTIONS

- A. Connections to equipment, plumbing fixtures, etc. shall be made in accordance with shop drawings, rough-in dimensions furnished by the manufacturer, codes, etc. and may vary with connections shown on drawings. The contractor shall be responsible for making connections and number of connectors as per shop drawings, codes, etc. at no additional cost to the Owner.

1.29 ELECTRICAL CONNECTIONS

- A. The Electrical Trades shall be responsible for furnishing and installing all electrical equipment, wiring, etc. required for operation of mechanical equipment unless otherwise noted on the drawings. The Mechanical Trades shall furnish detailed information and wiring diagrams to the Electrical Trades for all equipment specified and/or scheduled for this project. In the event that the Mechanical Trades furnishes an "approved equal" or "alternate" that require changes in the original electrical design, the Mechanical Trades shall pay all costs to the Electrical Trades as required to make satisfactory adjustments. All electrical work shall be done in accordance with the latest edition of the National Electric Code.
- B. See the temperature control or building automation system specification (if applicable) for description of electrical contractor work and Division 23 temperature control work.

1.30 MOTORS, MOTOR STARTERS AND DISCONNECTS

- A. Unless otherwise noted on drawings, motors shall be of constant speed 1750 rpm, new NEMA Design B, 40°C rise, horse power rated, open drip-proof except TEFC in dirty atmosphere, induction type motor with service factor of 1.15 and be of sufficient capacity to continuously operate the apparatus to which it is connected under all conditions of operation without exceeding nameplate ratings.
- B. Motors shall be premium efficiency as calculated using IEEE test method 112B.
- C. Motors ½ Hp. or larger shall be three phase; motors under ½ Hp. shall be 115 volt, 60 cycle, single phase. Before ordering the motors, the contractor shall verify correct motor voltage with the Electrical Trades and field conditions.
- D. The Mechanical Trades shall furnish, for equipment under Division 23, all special switches, disconnects, starters, alternators, etc. as specified or scheduled to be factory furnished and/or factory installed with the equipment including wiring diagrams, etc. whether it is to be factory installed or field wired. All other motor starters, disconnects,

etc. not noted as factory furnished shall be furnished and installed by the Electrical Trades.

- E. Starters that are to be factory furnished with equipment shall be of the combination type and shall be as specified under Electrical Trades Division. Furnish overload protection for each phase.
- F. All wiring methods and materials shall meet NEMA, National Electric Code and State of Michigan Code requirements.
- G. All displays on control panels shall be on face of the panels.
- H. Motors having V-belt shall be furnished with base slide rails or other form of adjustment.

1.31 LUBRICATION AND MAINTENANCE

- A. Contractor shall maintain, oil, lubricate, etc. all equipment furnished under Division 23 until final acceptance by the Owner. Protect all bearings and shafts during installation and thoroughly grease the steel shafts to prevent corrosion. The contractor shall be responsible for any and all damage to bearings, shaft, etc. of Division 23 equipment operated or not until final acceptance by the Owner.

1.32 EXCAVATION AND BACKFILLING

- A. Furnish all excavation, backfilling and removal of excess dirt to accomplish installation of Division 23 mechanical work unless otherwise noted on drawings.
- B. All excavation shall be by open cut from the surface. Contractor shall determine whether excavation shall be by machine or by hand except where existing utilities may be located where excavation shall be by hand. Contractor shall be responsible for all damage to existing facilities and services. Excavation shall be to a depth of at least 6" to allow granular bedding below pipe or duct.
- C. If for any reason the work is suspended, the contractor shall properly protect the excavation and leave the areas unobstructed.
- D. Trench width shall allow sufficient width at centerline of pipe to allow at all times a first class construction/installation method but in no case should be less than 12" larger than the nominal pipe or duct size. This shall especially be true in areas that joints must be connected. Joint holes may have to be made with overhanging sides to make installation safe for workmen.
- E. The excavation shall be at all times finished and backfilled to the required grade after completion and approval of work. Not more than 100 feet of trench shall be excavated and open unless written approval is given by the Architect/Engineer.
- F. The subgrade shall be 4" to 6" below the pipe of granular bedding graded and tamped by hand or mechanical means to the exact elevation required at the bottom of the pipe. Granular materials shall be approved fine aggregate meeting MDOT #2NS specifications. This material shall pass a ½" sieve but will be retained on a #4 sieve. If poor soil conditions exist which will not give proper support to the pipe, duct or structure, furnish granular fill as required to remedy this situation and give proper support.

- G. Furnish and install properly sloped sheet piled, shored and braced in areas that the soil requires this to maintain a proper excavation and prevent any movement of earth which could in any way damage the work under construction. When removing the sheeting and bracing, special care should be taken to prevent any caving of the sides of the excavation and injury to the completed work or adjacent property.
- H. Take all necessary action to keep trenches and other excavation areas free from water at all times. Use such methods as pumping, ditching, well pointing, etc. to prevent water in trench or excavation. Dewatering of trench shall have constant supervision.
- I. Backfill excavation and trenches with approved granular material around sides of pipe and at least 12 inches above the top of the pipe laid not more than in 6 inch layers that are thoroughly tamped to 95% of its maximum density. There shall be no backfilling by any mechanical means until the granular material has been firmly tamped around the entire pipe to 12 inches above the pipe. All material used for backfilling shall be approved by the Architect/Engineer. Wherever trenching crosses walks or roadways or isolated inside of building, backfill top 6'-0" of trench with sand or bank run gravel in layers not to exceed 6 inches in depth and carefully compact by hand or machine. Do not backfill with frozen materials.
- J. No piping shall be covered until it has been tested, inspected and approved. Upon completion of backfilling, grade shall be restored in indicated elevation and left in reasonable condition for finish grade by others unless otherwise noted on drawings.
- K. Before final acceptance of work, all disturbed streets, drives, curbs, walks, parking areas, etc. shall be paved, graveled or other to as near their original condition as possible. All unused excavated material shall be removed from site if directed by the Architect/Engineer.

1.33 BASES AND SUPPORTS

- A. This contractor shall be responsible for furnishing all equipment pads and supports for equipment and materials required by Division 23 unless otherwise noted on drawings.
- B. All floor mounted mechanical equipment shall have a reinforced concrete pad furnished unless otherwise noted on drawings. The concrete pads shall be tied to the building floor with expansion bolts located maximum of 4'-0" on centers with a minimum of four (4) bolts, set before pouring and concealed within the pad. The Mechanical Trades shall verify exact pad or support size with the equipment manufacturer and shall size pad with adequate area to allow sufficient room for installation of vibration isolators, equipment mounting hardware, etc. Concrete pads shall have a 45 degree bevel at the top edge. The contractor shall verify exact location of concrete pads.
- C. Furnish all steel, hanging material, rods, etc. for suspending equipment off floor unless otherwise noted on drawings for equipment to be furnished under Division 23. This includes all structural steel for supporting between beams.
- D. All support structure shall be of strength to safely withstand all stresses and loads to which they will be subjected and shall distribute load properly over the building area. Supports shall be designed to avoid undue strain to equipment and to avoid interference with piping, pipe connections, service and maintenance clearances, etc.

- E. Where equipment is to be floor mounted and requires legs, this contractor shall furnish and install structural steel members or steel pipe and fittings for legs. Fasten and brace to equipment and furnish flange at base to allow bolting to floor.
- F. Where equipment is to be ceiling or wall mounted, furnish necessary platform, structural steel, hardware, etc. as is most suitable for support of this equipment.
- G. All supports shall be approved by the Architect/Engineer.
- H. All piping, ductwork, etc. shall be suspended from structural steel members utilizing rods and approved hanger devices. Do not use metal deck for support. Beam clamps such as the Grinnell Fig. 260 or approved equal shall be used. Sheet metal "straps" shall not be used in place of rods.
- I. The mechanical trades shall be responsible for furnishing and setting in place all mechanical equipment, roof curbs and piping/duct roof curbs. The general trade shall be responsible for the roof work and associated flashing. The mechanical trade shall furnish and install treated wood base blocking as required to level curb and to match roof insulation thickness. Curb shall be as specified, or if not specified should be similar to Pate or Thy-curb with heavy gauge galvanized steel, insulated and with wood nailer. Height of curb scheduled or specified shall be height required to top of curb above finished roof. If height is not specified or noted, a minimum 12" high above finished roof will be required. (pipe support units shall be at height required). Rooftop units will be shipped knocked down with the mechanical trade responsible for assembly on site. Roof curb shall mate with unit and provide support and a watertight installation.

1.34 SLEEVES, PLATES AND COLLARS

- A. Furnish all sleeves, plates and collars for piping, ductwork, etc. passing through walls, floor ceilings, foundations, etc. Coordinate with the General Contractor the exact location and size of required openings. No pipe or duct shall pass through a wall, floor ceiling, etc. without a sleeve. This contractor shall be responsible for sleeve locations and securing sleeves before concrete is formed.
- B. Sleeves for steel pipe shall be standard weight black steel pipe. For walls, foundations and ceilings, sleeve shall be kept flush with finished surfaces. For floors, the sleeve shall be set flush with bottom of concrete construction and be extended up 1/4" above concrete floor. Sleeves shall be set in place before construction of walls, floors, ceilings, etc.
- C. Sleeves for copper pipe shall be type "M" hard copper tubing installed typical to that of steel pipe sleeves.
- D. Sleeves for piping shall be sized to allow insulation to run continuous through sleeve whenever possible and to allow not less than 1/4" all around bare pipe or insulation.
- E. Sleeves for ducts passing through floors shall be 14 gauge black steel for ducts up to 24" maximum dimension, and 12 gauge black steel for ducts 25" and over maximum dimension. Sleeves shall be kept flush with the finished wall surface.

- F. Where insulated piping passes through walls or floor sleeves, furnish 22 gauge galvanized band around insulation of same length as the sleeve length. Band shall fit snugly over insulation and be held in place by steel metal collars all around insulation to cover openings.
- G. All penetration voids shall be sealed smoke tight with non-combustible materials similar to 3M or Hilti firestop systems to maintain the integrity of the fire rated structure. In a non-fire rated assembly, seal all voids with non-hardening sealant.
- H. Where bare piping 2" and smaller pass through wall or floors, furnish polished chrome plated brass escutcheons, split type. Bare piping 2½" and larger that pass through walls or floor, furnish 22 gauge galvanized steel metal collars so as to cover opening.
- I. Where piping penetrates an outside wall, below grade, utilize a mechanical sleeve, similar to link-seal, with stainless steel nuts and bolts on fasteners.

1.35 RIGGING AND HOISTING

- A. Perform all required rigging, hoisting, transportation, moving, etc. of all equipment, materials, etc. to be furnished and/or installed under Division 23 whether furnished by this contractor or by the Owner or other trades.

1.36 STORAGE FACILITY

- A. Furnish and maintain a weatherproof storage facility on the site of adequate size to store miscellaneous equipment and/or materials to prevent exposure to the weather. Location of shed shall be determined by the Owner and Architect/Engineer. The Owner reserves the right to deny storage of materials or equipment in any existing or new buildings.

1.37 PROTECTION FROM DAMAGE

- A. The contractor shall be responsible for all materials, equipment, etc. and all work installed by himself and shall protect it from damage until final acceptance of this project by the Owner.
- B. Furnish all coverings and protection from dirt, dust, rain, storm, heat, traffic, wear, etc. and all possible injury including that by other workmen. Any equipment, workmanship, materials, etc. damaged prior to final acceptance by the Owner of this project shall be properly repaired at no expense to the Owner.
- C. Protect all plumbing fixtures and other equipment from damage by covering or coating. Any dented, scratched, rusted or marred surface finishes will not be accepted.
- D. Protect all equipment, materials, etc. from freezing.

1.38 COMMON PIPE MATERIALS AND INSTALLATION INSTRUCTIONS

- A. Refer to individual Division 23 piping Sections for pipe, tube, and fitting materials and joining methods.
- B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

- C. Refer to individual Division 23 piping Sections for special joining materials not listed below.
1. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
 - a. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch (3.2-mm) maximum thickness unless thickness or specific material is indicated.
 1. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
 2. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
 2. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.
 3. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.
 4. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.
 5. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAg1, silver alloy for refrigerant piping, unless otherwise indicated.
 6. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
 7. Solvent Cements for Joining Plastic Piping:
 - a. ABS Piping: ASTM D 2235.
 - b. CPVC Piping: ASTM F 493.
 - c. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.
 - d. PVC to ABS Piping Transition: ASTM D 3138.
 8. Fiberglass Pipe Adhesive: As furnished or recommended by pipe manufacturer.

1.39 PIPE HANGERS AND SUPPORTS

- A. Hangers and saddles shall be Modern Pipe Support Corp., Grinnel/Anvil, Autogrip, or M-CO. Inserts shall be of the type to receive a machine bolt head or nut after installation, permit horizontal adjustment, and shall be flush with the surface. For copper pipe with steel hangers, clean and wrap pipe with two layers of plastic insulating tape at point of contact. Roller supports shall be adjustable type with insulated standoff. Rods shall be used for suspended installation. Sheet metal "straps" shall not be used in place of rods.
- B. Hangers for piping with vapor barrier sealed insulation shall be multipurpose pipe saddles fitting over the insulation. Wire or perforated strap iron will not be permitted for pipe supports. Do not support hangers from roof deck. Furnish and install all support steel as required to suspend from structural steel joist or beams. Hangers shall be clevis or split ring type with vertical adjustment and beam clamp similar to Grinnell/Anvil Fig. 260, with maximum spacing per ASHRAE Standards:

Pipe Size	Steel Pipe	Copper Pipe	PVC Pipe	Rod Size
½ to ¾ inch	6 feet	5 feet	4 feet	3/8"
1 inch	7 feet	5 feet	4 feet	3/8"
1 ¼ inch	7 feet	7 feet	4 feet	3/8"
1½ inch	7 feet	7 feet	4 feet	1/2"
2 inch	10 feet	8 feet	4 feet	1/2"
2½ inch	11 feet	9 feet	4 feet	5/8"
3 inch	11 feet	9 feet	4 feet	5/8"
3 ½ inch	13 feet	11 feet	4 feet	5/8"
4 inch	14 feet	12 feet	4 feet	3/4"
5 inch	14 feet	12 feet	4 feet	3/4"
6 inch	14 feet	--	4 feet	3/4"

- C. Conform to ASME B31.9, ASTM F708, MSS SP58, MSS SP69 and MSS SP89.
- D. Hangers for Pipe Sizes ½ to 1½ Inch : Malleable iron, adjustable swivel, split ring.
- E. Hangers for Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
- F. Hangers for Hot Pipe Sizes thru 4 Inches: Carbon steel, adjustable, clevis.
- G. Hangers for Hot Pipe Sizes 5 Inches and Over: Adjustable steel yoke, cast iron roll, double hanger.
- H. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
- I. Multiple or Trapeze Hangers for Hot Pipe Sizes 6 Inches and Over: Steel channels with welded spacers and hanger rods, cast iron roll.
- J. Wall Support for Pipe Sizes up thru 3 Inches: Cast iron hook.
- K. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp.
- L. Wall Support for Hot Pipe Sizes 6 Inches and Over: Welded steel bracket and wrought steel clamp with adjustable steel yoke and cast iron roll.
- M. Vertical Support: Steel riser unistrut clamps at high, mid, and low locations.
- N. Floor Support for Cold Pipe all sizes and Hot Pipe Sizes up thru 4 Inches: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
- O. Floor Support for Hot Pipe Sizes 5 Inches and Over: Adjustable cast iron roll and stand, steel screws, and concrete pier or steel support.
- P. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
- Q. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.

- R. Inserts: Malleable iron case of steel shell and expander plug for threaded connection with lateral adjustments, top slot for reinforcing rods, lugs for attaching to forms, size inserts to suit threaded hanger rods.

1.40 PIPING, DUCTWORK AND EQUIPMENT SUPPORT

- A. Attachments of mechanical equipment to structural members are the responsibility of the installing trade. Structural members shall not be field cut, welded or otherwise modified without approval of the Architect/Engineer. Attachment to steel joist shall be made at panel points whenever possible. Steel joist shall be reinforced for non-panel point concentrated loads in accordance with the structural details; this work shall be performed by certified welders and is the responsibility of the trade installing the subject load. Structural members shall not be overloaded as a result of attachments. Attachment/equipment loading for all trades resulting in total load greater than an equivalent uniform 5 psf for any member shall be submitted to the Architect/Engineer for review. Mechanical Trades may contact the project Structural Engineer as required for panel point location assistance and welder certification requirements. Electrical Trades are still responsible for design, layout, and fabrication and installation of electrical supports and support attachment methods. Mechanical Trades shall submit attachment methods to the Structural Engineer for review.
- B. Install products in accordance with manufacturer's instructions.
- C. Do not fasten supports to pipes, ducts, mechanical equipment, and conduit.
- D. Do not use spring steel clips and clamps.
- E. Do not use powder-actuated anchors.
- F. Do not drill or cut structural members without permission from Architect/Engineer.
- G. Fabricate supports from structural steel or steel channel. Rigidly weld members or use hexagon head bolts to present neat appearance with adequate strength and rigidity. Use spring lock washers under all nuts.

1.41 PIPING SYSTEMS SHUT OFF VALVES

- A. Shut off valves shall be installed at all branch lines off main piping, or where mains divide/separate to serve different areas, to allow isolation of all branch piping and systems they serve such as air handling units, areas or wings of the building, etc.

1.42 CLEANING AND FINISHING

- A. During construction period, remove all debris, rubbish, tools, equipment, unused materials, etc. as required or requested by the Architect/Engineer. All cost for cleanup and removal will be the responsibility of the contractor.
- B. Upon completion of the project and before final acceptance by the Owner, the entire installation shall be thoroughly cleaned, all rubbish and unused material removed to the satisfaction of the Architect/Engineer. All dust and dirt shall be removed from all equipment, piping, ductwork, etc.

- C. Thoroughly clean all heating units, fans and fan wheels, diffusers and grilles, air handler plenums and air filter frames, etc. using compressed air if necessary.
- D. Finish paint all equipment, materials, piping, etc. as noted on drawings or listed in this specification. Match Owner's existing color scheme. Any Division 23 equipment which has been scratched or damaged shall be finished equal to the original finish.

1.43 DUCTWORK MANUAL BALANCING DAMPERS

- A. All duct branch take off's to diffusers, grilles, regulators, etc. shall have manual balancing dampers installed to allow balancing of outlets.

1.44 EQUIPMENT/SYSTEMS START-UP

- A. Furnish and schedule manufacturer's start-up service for all equipment and systems. These start-up services shall be performed in the presence of, and to the satisfaction of the Owner and Architect/Engineer.

1.45 EQUIPMENT/SYSTEMS SIGN-OFF

- A. The Mechanical Trades shall furnish written sign-offs on all systems stating that the equipment and systems have been checked, tested, started and that their operation has been verified correct through the entire range of operation that can be expected through the seasons.

1.46 SUBSTANTIAL COMPLETION

- A. Contractor shall submit a letter to the Architect/Engineer advising that all work has been completed in accordance with plans and specifications and the project is ready for a final walk-thru.

END OF SECTION

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SECTION 23 05 93

TESTING, ADJUSTING, AND BALANCING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Testing, adjustment, and balancing of air systems.
- B. Testing, adjustment, and balancing of hydronic systems.
- C. Measurement of final operating condition of HVAC systems.

1.2 RELATED SECTIONS AND DRAWINGS

- A. All drawings and specification sections apply to work in this section. Furnish all items, articles, materials, equipment, operations or methods that are mentioned, listed or scheduled on drawings or are in this specification including all labor, equipment, materials and miscellaneous incidentals necessary and/or required for the completion of this project. The work covered under this section of the specifications is in no way complete within itself but is supplementary to the entire specification and drawings.

1.3 REFERENCES: Material and/or equipment specified in this section shall meet or exceed one or more of the property requirements or installation requirements of the following specifications/publications as applicable to the specific product or end use:

- A. AABC - National Standards for Total System Balance.
- B. ADC - Test Code for Grilles, Registers, and Diffusers.
- C. ASHRAE 111 - Practices for Measurement, Testing, Adjusting, and Balancing of Building Heating, Ventilation, Air-conditioning, and Refrigeration Systems.
- D. NEBB - Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems.
- E. SMACNA - HVAC Systems Testing, Adjusting, and Balancing.

1.4 SUBMITTALS

- A. Submit electronic draft copies of report for review prior to final acceptance of Project. Provide electronic final copies for Architect/Engineer review and for inclusion in operating and maintenance manuals.
- B. Provide reports in 3-ring binder manuals, complete with index page and indexing tabs, with cover identification at front and side. Include set of reduced drawings with air outlets and equipment identified to correspond with data sheets, and indicating thermostat locations. Binder shall be high quality hard cover type.
- C. Include detailed procedures, agenda, sample report forms and copy of AABC National Project Performance Guaranty prior to commencing system balance.

- D. Test Reports: Indicate data on NEBB Procedure Standards for Testing, Adjusting and Balancing of Environmental Systems, AABC National Standards for Total System Balance forms or forms approved in writing by Architect/Engineer.

1.5 PROJECT RECORD DOCUMENTS

- A. Record actual locations of flow measuring stations and/or balancing valves and rough setting.

1.6 QUALITY ASSURANCE

- A. Perform total system balance in accordance with AABC National Standards for Field Measurement and Instrumentation, Total System Balance.
- B. Maintain one copy of each document on site.
- C. The final air balance report shall be approved by the Architect/Engineer prior to final payment to the Contractor. The Engineer reserves the right to ask for and be furnished any additional information he deems necessary to be shown on air/water balance report.

1.7 QUALIFICATIONS

- A. Agency: Independent company (not associated with the systems installing contractor) specializing in the testing, adjusting, and balancing of systems specified in this Section with minimum three years experience and NEBB certified. The test and balance agency selected by the Contractor shall be approved by the Engineer. The Mechanical Trades shall be responsible for any cost differences between the test and balance agency selected by the Contractor and the test and balance agency approved by the Engineer.

1.8 SEQUENCING AND SCHEDULING

- A. Sequence work to commence after completion of systems and schedule completion of work before Substantial Completion of Project. Coordinate project schedule with contractor. The Mechanical Trades shall coordinate and schedule the on-site balancing with the Engineer to allow the Engineer the ability to be at the project site during the time of the balancing. If the Engineer is not scheduled to oversee the balance of systems, the Mechanical Trades shall be responsible for rebalancing the system in the presence of the Engineer and be responsible for all costs for such.
- B. Pre-Demolition Scope of Work shall be as follows:

Pre-demolition reading shall be taken before any work is commenced. Pitot/traverse exhaust main duct at exhaust each fan, for ability to determine total airflow for all exhaust fans shown on drawings in "C" wing.

Provide pre-demolition readings on (2) exhaust grilles within toilet room of Area "B" and pitot/traverse exhaust duct at exhaust fan for Area "B".
- C. Final Air Balance Scope of Work shall be as follows:

Balance all new and existing exhaust fans and exhaust grilles associated with toilet room and grilles outside toilet rooms as shown on drawings. Air balance the exhaust grilles located outside of toilet rooms as shown in the "A" wing and "C" wing.

Water balance all radiant panels and convectors to water flow rate as shown on drawings.

Coordinate exact location of all exhaust grilles in the field. All exhaust grilles shown on drawings shall be air balanced.

Pitot/traverse exhaust main duct at exhaust each fan, existing and new, for ability to determine possible duct leakage. A duct traverse shall be completed for all exhaust fans as shown on drawings in the "A" and "C" wings.

Provide air balance for (2) exhaust grilles associated with Area "B" toilet room. Pitot/traverse exhaust duct at exhaust fan for Area "B".

- D. Acceptable Test and Balance Contractors.
1. HiTech Test and Balance (Freeland, MI)
 2. Absolute Balance Company (South Lyon, MI)
 3. Enviro-Aire/Total Balance Company (St Clair Shores, MI)
 4. Ener-Tech Testing (Holly, MI)
 5. International Test & Balance (Southfield, MI)

PART 2 PRODUCTS

Not used

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:
1. Systems are started and operating in a safe and normal condition.
 2. Temperature control systems are installed complete and operable.
 3. Proper thermal overload protection is in place for electrical equipment.
 4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
 5. Duct systems are clean of debris.
 6. Fans are rotating correctly.
 7. Fire and volume dampers are in place and open.
 8. Air coil fins are cleaned and combed.
 9. Access doors are closed and duct end caps are in place.
 10. Air outlets are installed and connected.
 11. Duct system leakage is minimized.
 12. Hydronic systems are flushed, filled, and vented.
 13. Pumps are rotating correctly.
 14. Proper strainer baskets are clean and in place.
 15. Service and balance valves are open.

- B. Submit field reports. Report defects and deficiencies noted during performance of services which prevent system balance.
- C. Beginning of work means acceptance of existing conditions.

3.2 PREPARATION

- A. Provide a review of proposed design drawings and advise appropriate trades about additional balancing devices required to attain design conditions.
- B. Advise Engineer about additional balancing devices required to attain design conditions.
- C. Provide instruments required for testing, adjusting, and balancing operations. Make instruments available to Architect/Engineer to facilitate spot checks during testing.

3.3 INSTALLATION TOLERANCES

- A. Air Handling Systems: Adjust to within plus or minus 10 percent of design for supply, return and exhaust systems.
- B. Air Outlets and Inlets: Adjust to within plus 10 percent and minus 5 percent of design and to Owner's satisfaction. Respond to Owner complaints of unsatisfactory room temperatures by adjusting outlets and/or inlets to more or less air as required.
- C. Hydronic Systems: Adjust to within plus or minus 10 percent of design.

3.4 ADJUSTING

- A. Ensure recorded data represents actual measured or observed conditions.
- B. Permanently mark settings of adjustment devices allowing settings to be restored. Set and lock memory stops.
- C. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.
- D. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.
- E. At final inspection, recheck random selections of data recorded in report. Recheck points or areas as selected and witnessed by the Owner.
- F. Check and adjust systems approximately six months after final acceptance and submit report.

3.5 AIR SYSTEM PROCEDURE

- A. Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities. The air balance agency shall be responsible for removing all adjustable motor pulleys and replacing them with fixed motor pulleys after air balancing the system. Include costs for all air systems to be readjusted to required air volumes.

Pitot duct mains at supply air and return air ducts at air handling systems and exhaust fans to verify air quantity at units vs. at diffusers and grilles.

- B. Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.
- C. Measure air quantities at air inlets and outlets.
- D. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.
- E. Use volume control devices at outlets to regulate air quantities so that outlets do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers in ducts.
- F. Vary total system air quantities by adjustment of fan speeds. Provide drive changes required. Vary branch air quantities by damper regulation.
- G. Provide system schematic with required and actual air quantities recorded at each outlet or inlet.
- H. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters.
- I. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.
- J. Measure temperature conditions across outside air, return air, and exhaust dampers to check leakage.
- K. Where modulating dampers are provided, take measurements and balance at extreme conditions. Balance variable volume systems at maximum air flow rate, full cooling, and at minimum air flow rate, full heating.
- L. Measure building static pressure and adjust supply, return, and exhaust air systems to provide required relationship between each to maintain approximately 0.05 inches positive static pressure near the building entries.
- M. Check units for motorized damper leakage. Adjust air quantities with mixing dampers set first for cooling, then heating, then modulating.
- N. Advise Mechanical Contractor about additional balancing devices required to attain design conditions.
- O. Adjust adjustable pitch sheaves to setting as required by actual conditions. If sheave size or type changes are recommended, include the recommendation in the draft copy of the report to allow the Owner to be informed of, and be responsible for, the recommendation for the change.

3.6 SCHEDULES

- A. Equipment Requiring Testing, Adjusting, and Balancing shall include but not be limited to: Air moving equipment such as exhaust fans, air handlers, return fans, etc.; terminal devices such as grilles and diffusers, variable air volume boxes, etc.; all hydronic systems such as pumps, chillers, flow control valves, coils, etc. See drawings for equipment utilized for this project and submit applicable report forms for this project air and/or water system(s).
- B. Report Forms
 - 1. Title Page:
 - a. Name of Testing, Adjusting, and Balancing Agency
 - b. Address of Testing, Adjusting, and Balancing Agency
 - c. Telephone number of Testing, Adjusting, and Balancing Agency
 - d. Project name
 - e. Project location
 - f. Project Architect
 - g. Project Engineer
 - h. Project Contractor
 - i. Project altitude
 - j. Report date
 - 2. Summary Comments:
 - a. Design versus final performance
 - b. Notable characteristics of system
 - c. Description of systems operation sequence
 - d. Summary of outdoor and exhaust flows to indicate amount of building pressurization
 - e. Nomenclature used throughout report
 - f. Test conditions
 - 3. Instrument List:
 - a. Instrument
 - b. Manufacturer
 - c. Model number
 - d. Serial number
 - e. Range
 - f. Calibration date
 - 4. Electric Motors:
 - a. Manufacturer
 - b. Model/Frame
 - c. HP/BHP
 - d. Phase, voltage, amperage; nameplate, actual, no load
 - e. RPM
 - f. Service factor
 - g. Starter size, rating, heater elements
 - h. Sheave Make/Size/Bore
 - 5. Exhaust Fan Data:
 - a. Location
 - b. Manufacturer
 - c. Model number
 - d. Serial number

- e. Air flow, specified and actual per pitot readings at exhaust fan and per totaled exhaust grilles or duct inlets.
- f. Static pressure, specified and actual
- g. Inlet pressure
- h. Discharge pressure
- i. Sheave Make/Size/Bore
- j. Number of Belts/Make/Size
- k. Fan RPM

END OF SECTION

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SECTION 23 07 19

HVAC PIPE SYSTEM INSULATION

PART 1 GENERAL

1.1 SECTION INCLUDES PIPE INSULATION FOR:

- A. Heating hot water supply and return piping system.
- B. Valves and fittings.
- C. Miscellaneous tanks, valves, chilled water pump impellor housings, piping, etc.

1.2 RELATED SECTIONS

- A. All drawings and specification sections apply to work in this section. Furnish all items, articles, materials, equipment, operations or methods that are mentioned, listed or scheduled on drawings or are in this specification, including all labor, equipment, materials and miscellaneous incidentals necessary and/or required for the completion of this project. The work covered under this section of the specifications is in no way complete within itself, but is supplementary to the entire specification and drawings.

1.3 REFERENCES

- A. Thermal insulation materials shall meet the property requirements of the following specifications as applicable to the specific product or end use:
- B. American Society for Testing of Materials Specifications:
 - 1. ASTM C547, "Standard Specification for Mineral Fiber Preformed Pipe Insulation"
 - 2. ASTM C533, "Standard Specification for Calcium Silicate Pipe & Block Insulation"
 - 3. ASTM C585, "Recommended Practice for Inner and Outer Diameters of Rigid Pipe Insulation for Nominal Sizes of Pipe and Tubing (NPS System)"
 - 4. ASTM C1136, "Standard Specification for Barrier Material, Vapor," Type 1 or 2 (jacket only)
- C. Insulation materials, including all water and vapor barrier materials, closures, hangers, supports, fitting covers, and other accessories, shall be furnished and installed in strict accordance with project drawings, plans, and specifications.

1.4 SCOPE

- A. The work covered by this specification consists of furnishing all labor, equipment, materials and accessories, and performing all operations required, for the correct fabrication and installation of thermal insulation applied to the following commercial piping systems, in accordance with the applicable project specifications and drawings, subject to the terms and conditions of the contract:
 - 1. Hot Piping – Fluid temperature 105°F and up.
 - 2. Cold Piping – Fluid temperature below 105°F.

- B. Insulation, vapor barriers, jacketing, hangers, supports, accessory materials, etc. shall be installed according to manufacturers recommendations.

1.5 DEFINITIONS

- A. The term "mineral fiber" as defined by the above specifications includes fibers manufactured of glass, rock, or slag processed from a molten state, with or without binder.

1.6 SYSTEM PERFORMANCE

- A. Insulation material furnished and installed hereunder shall meet the minimum thickness requirements of Standard 90.1 (2007), "Energy Efficient Design of new Buildings" of the American Society of Heating, Refrigeration, and Air-Conditioning Engineers (ASHRAE) except minimum thickness shall be 1". However, if other factors such as condensation control or personnel protection are to be considered, the selection of the thickness of insulation should satisfy the controlling factor.
- B. Insulation materials furnished and installed hereunder shall be Class A maximum of 25 flame spread, 35 fuel contributed and 50 smoke developed rating and shall meet the fire hazard requirements of each of the following specifications:
 - 1. American Society for Testing of Materials ASTM E84
 - 2. Underwriters' Laboratories, Inc. UL 723
 - 3. National Fire Protection Associations NFPA 255
- C. Calcium silicate products shall include a visual identification system to permit positive field determination of their asbestos-free characteristic.

1.7 QUALITY ASSURANCE

- A. The contractor shall use whatever means are necessary to protect the insulation materials and accessories before, during and after installation. No insulation material shall be installed that has become damaged in any way. The contractor shall also use all means necessary to protect work and materials installed by other trades.
- B. If any insulation material has become wet because of transit or job site exposure to moisture or water, the contractor shall not install such material, and shall remove it from the job site. An exception may be allowed in cases where the contractor is able to demonstrate that wet insulation when fully dried out (either before installation, or afterward following exposure to system operating temperatures) will provide installed performance that is equivalent in all respects to new, completely dry insulation. In such cases, consult the insulation manufacturer for technical assistance.

PART 2 PRODUCTS

2.1 PIPE INSULATION ON INDOOR SYSTEMS

- A. Molded pipe insulation shall be manufactured to meet ASTM C585 for sizes required in the particular system.

- B. Molded fibrous glass pipe insulation shall comply with the requirements of ASTM C547. Heavy density Fiberglas pipe insulation with factory applied all-service jacket (ASJ) and Doublesure* two-component adhesive closure system, or Fiberglas Pipe and Tank Insulation, heavy density fiberglass insulation with end grain adhered to ASJ all service jacket. Joints shall be sealed by butt strips having a two-component sealing system or by applying staples and pressure sensitive tape. When self-sealing lap systems are used, sufficient thickness of insulation shall be used to maintain the outer surface temperature of the operating system below +150°F. Manufacturer's data regarding thickness constraints in relation to operating temperature shall be followed. When multiple layers are required, all inner layer(s) shall be unjacketed.
- C. Fittings and valves shall be insulated with preformed fiberglass fittings, fabricated sections of fiberglass pipe insulation, fiberglass pipe and tank insulation, fiberglass blanket insulation, or insulating cement. Thickness shall be equal to adjacent pipe insulation. Finish shall match that used on straight sections.
- D. Flanges, couplings, chilled water pump impeller housings, valve bonnets etc, shall be covered with an oversized pipe insulation section sized to provide the same insulation thickness as on the main pipe section. An oversized insulation section shall be used to form a collar between the two insulation sections with sections of insulation being used to fill gaps. Jacketing shall match that used on straight pipe sections. Rough cut ends shall be coated with a suitable vapor resistant mastic.
- E. On cold systems, vapor barrier performance is extremely important. Particular care must be given to vapor sealing the fitting cover or finish to the pipe insulation vapor barrier. Valve stems shall be sealed with caulking to allow free movement of the stem but provide a seal against moisture incursion. All penetrations of the ASJ and exposed ends of insulation shall be sealed with vapor barrier mastic.
- F. On hot systems where fittings are to be left exposed, insulation ends should be beveled away from bolts for easy access.
- G. All insulated, exposed piping inside the building andnforced, self adhesive insulation cladding material with a vapor barrier and a thickness of 0.015". Jacketing system shall be Venture Clad Plus #1579CW-E or equal.

2.2 SUPPORT FOR PIPE WITH INSULATION

- A. All piping shall be supported in such a manner that neither the insulation or the vapor/weather barrier is compromised by the hanger or the effects of the hanger. In all cases, hanger spacing shall be such that butt joints may be made outside the hanger.
 - 1. On all size piping of cold systems, the pipe hanger saddles shall be separated away from the pipe by utilizing inserts. The vapor barrier shall be continuous, including material covered by the hanger saddle.
 - 2. On warm water piping systems 3" in diameter or less, insulated with Fiberglas insulation, may be supported by placing saddles of the proper length and spacing, as designated in Owens-Corning Pub. 1-IN-12534, under the insulation.

3. For hot or cold piping systems larger than 3" in diameter, Owens-Corning Calcium Silicate pipe insulation shall be used for high density inserts. Piping saddles for piping larger than 3" shall not be in contact with the piping.
4. Owens-Corning Calcium Silicate pipe insulation may be used to support the entire weight of the piping system provided the hanger saddle is designed so the maximum compressive load does not exceed 100 psi.
5. Where pipe shoes and roller supports are required, insulation shall be inserted in the pipe shoe to minimize pipe heat loss. Where possible, the pipe shoe shall be sized to be flush with the outer pipe insulation diameter.
6. Thermal expansion and contraction of the piping and insulation system can generally be taken care of by utilizing double layers of insulation and staggering both longitudinal and circumferential joints. Where long runs are encountered, expansion joints may be required where single layers of the insulation are being used.
7. On vertical runs, insulation support rings shall be used.

2.3 ACCESSORY MATERIALS

- A. Accessory materials installed as part of insulation work under this section shall include (but not be limited to):
 1. Closure Materials - Butt strips, bands, wires, staples, mastics, adhesives; pressure-sensitive tapes.
 2. Field-applied jacketing materials - Sheet metal, plastic, canvas, fiberglass cloth, insulating cement; PVC fitting covers.
 3. Support materials - Hanger straps, hanger rods, saddles.
- B. All accessory materials shall be installed in accordance with project drawings and specifications, manufacturer's instructions, and/or in conformance with the current edition of the Midwest Insulation Contractors Association (MICA) "Commercial & Industrial Insulation Standards".

2.4 INSULATION THICKNESSES

- A. Fittings, including valves, flanges, unions, etc. shall be insulated with the same thickness as the required pipe insulation and covered with PVC fitting cover as specified.
- B. Fiberglass insulation thickness shall be as follows:

<u>Piping System</u>	<u>Pipe Size</u>	<u>Insulation Thickness</u>	<u>Insulation Conductivity BTU in H-Ft2-F</u>
Heating hot water and air separator tank (200°F and below)	Up thru 3" 4" and larger	1" 1½"	0.29

- C. Elastomeric thermal insulation thickness shall be equivalent to fiberglass insulation thickness as indicated above or as indicated on drawing.

PART 3 EXECUTION

3.1 SITE INSPECTION

- A. Before starting work under this section, carefully inspect the site and installed work of other trades and verify that such work is complete to the point where installation of materials and accessories under this section can begin.
- B. Verify that all materials and accessories can be installed in accordance with project drawings and specifications and material manufacturers' recommendations.
- C. Verify by inspecting product labeling, submittal data, and/or certifications which may accompany the shipments that all materials and accessories to be installed on the project may comply with applicable specifications and standards and meet specified thermal and physical properties.

3.2 PREPARATION

- A. Ensure that all pipe and fitting surfaces over which insulation is to be installed are clean and dry.
- B. Ensure that insulation is clean, dry, and in good mechanical condition with all factory-applied vapor or weather barriers intact and undamaged. Wet, dirty, or damaged insulation shall not be acceptable for installation. All damaged insulation installed will be removed and replaced by the Contractor at no extra cost to the Owner.
- C. Ensure that pressure testing of piping and fittings has been completed prior to installing insulation.

3.3 INSTALLATION

- A. General
 - 1. Install all insulation materials and accessories in accordance with manufacturer's published instructions and recognized industry practices to ensure that it will serve its intended purpose.
 - 2. Install insulation on piping subsequent to installation of heat tracing, painting, testing, and acceptance tests.
 - 3. Install insulation materials with smooth and even surfaces. Insulate each continuous run of piping with full-length units of insulation, with single cut piece to complete run. Do not use cut pieces or scraps abutting each other. Butt insulation joints firmly to ensure complete, tight fit overall piping surfaces.
 - 4. Maintain the integrity of factory-applied vapor barrier jacketing on all pipe insulation, protecting it against puncture, tears or other damage. All staples

used on cold pipe insulation shall be coated with suitable sealant to maintain vapor barrier integrity.

B. Fittings

1. Cover valves, fittings, and similar items in each piping system using one of the following:
 - a. Mitered sections of insulation equivalent in thickness and composition to that installed on straight pipe runs.
 - b. Insulation cement equal in thickness to the adjoining insulation.
 - c. PVC fitting covers insulated with material equal in thickness and composition to adjoining insulation.

C. Penetrations

1. Extend piping insulation without interruption through walls, floors, and similar piping penetrations, except where otherwise specified.

D. Joints

1. Butt pipe insulation against hanger inserts. For hot pipes, apply 3" wide vapor barrier tape or band over butt joints. For cold piping apply wet coat of vapor barrier lap cement on butt joints, and seal joints with 3" wide vapor barrier tape or band.
2. All pipe insulation ends shall be tapered and sealed, regardless of service.

3.4 FIELD QUALITY ASSURANCE

- A. Upon completion of all insulation work covered by this specification, visually inspect the work and verify that it has been correctly installed. This may be done while work is in progress, to assure compliance with requirements herein to cover and protect insulation materials during installation.

3.5 PROTECTION

- A. Replace damaged insulation which cannot be satisfactorily repaired, including insulation with vapor barrier damage and moisture-saturated insulation.
- B. The insulation contractor shall advise the general and/or the mechanical contractor as to requirements for protection of the insulation work during the remainder of the construction period, to avoid damage and deterioration of the finished insulation work.

3.6 SAFETY PRECAUTIONS

- A. Insulation contractor's employees shall be properly protected during installation of all insulation. Protection shall include proper attire when handling and applying insulation materials, and shall include (but not be limited to) disposable dust respirators, gloves, hard hats, and eye protection.
- B. The insulation contractor shall conduct all job site operations in compliance with applicable provisions of the Occupational Safety and Health Act, as well as with all state and/or local safety and health codes and regulations that may apply to the work.

3.7 ASBESTOS INSULATION

- A. Any existing asbestos insulation on existing piping, valves, equipment, etc. where tie-ins are required, shall be removed by the Owner at Owner's expense. The contractor and Architect/Engineer shall not be responsible for any cost or work involved with removal or encapsulation of asbestos insulation.

END OF SECTION

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SECTION 23 21 00

HYDRONIC PIPING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Pipe and pipe fittings.
- B. Valves.
- C. Heating hot water piping system.

1.2 REFERENCES: Material and/or equipment specified in this section shall meet or exceed one or more of the property requirements or installation requirements of the following specifications/publications as applicable to the specific product or end use.

- A. ASME - Boiler and Pressure Vessel Codes, SEC 9 - Qualification Standard for Welding and Brazing Procedures, Welders, Brazers, and Welding and Brazing Operators.
- B. ASME B16.3 - Malleable Iron Threaded Fittings Class 150 and 300.
- C. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings.
- D. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
- E. ASME B31.5 - Refrigeration Piping.
- F. ASME B31.9 - Building Services Piping.
- G. ASTM A53 - Pipe, Steel, Black and Hot-Dipped, Zinc Coated Welded and Seamless.
- H. ASTM A234 - Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures.
- I. ASTM A312 - Seamless and Welded Austenitic Stainless Steel Pipe.
- J. ASTM A395 - Ferritic Ductile Iron Pressure-Retaining Castings.
- K. ASTM A536 - Ductile Iron Castings.
- L. ASTM B32 - Solder Metal.
- M. ASTM B88 - Seamless Copper Water Tube.
- N. ASTM D3309 - Polybutylene (PB) Plastic Hot-and Cold-Water Distribution Systems.
- O. ASTM F708 - Design and Installation of Rigid Pipe Hangers.

- P. ASTM F1476 - Standard Specification for the Performance of Gasketed Mechanical Couplings for Use in Piping Applications.
- Q. AWS A5.8 - Brazing Filler Metal.
- R. AWS D1.1 - Structural Welding Code.
- S. MSS SP58 - Pipe Hangers and Supports - Materials, Design and Manufacture.
- T. MSS SP69 - Pipe Hangers and Supports - Selection and Application.
- U. MSS SP89 - Pipe Hangers and Supports - Fabrication and Installation Practices.
- V. ANSI/AWWA C606 - Grooved and Shouldered Joints.

PART 2 PRODUCTS

2.1 HEATING HOT WATER PIPING up to 230°F, ABOVE GRADE

- A. Heating hot water piping 3" and smaller shall be:
 - 1. Copper tubing: ASTM B88, Type L hard drawn.
 - a. Fittings: ASME B16.18 cast bronze, tee tap or ASME B16.22 solder wrought copper.
 - b. Joints: 95-5 tin-antimony or tin and silver with melting range 430 to 535 degrees F.

2.2 PIPE HANGERS AND SUPPORTS

- A. Refer to Section 23 05 00.

2.3 UNIONS, FLANGES, AND COUPLINGS

- A. Unions for Pipe 3 Inches and Under:
 - 1. Copper Pipe: Bronze, soldered joints.
 - 2. Stainless Steel Pipe: Type 304/304L stainless steel, threaded-type, with Vic Press 304™ ends. Victaulic Style P584.
 - 3. On piping systems where grooved joint mechanical couplings are used, unions are not required. (Couplings shall serve as unions).
- B. Flanges for Pipe 4 Inches and Larger:
 - 1. Ferrous Piping: 150 psig forged steel, slip-on.
 - 2. Gaskets: 1/16 inch thick preformed neoprene.
- C. Flange Adapters for Grooved Pipe and Fittings 2 ½ Inches and Larger:
 - 1. Ferrous Piping: Class 125/150 for use with grooved end pipe and fittings. Victaulic Style 741/W741.
- D. Grooved and Shouldered Pipe End Couplings when approved by Architect/Engineer:
 - 1. Housing Clamps: Two ductile iron to engage and lock, designed to permit some angular deflection, contraction, and expansion where required.

2. Sealing Gasket: C-shape elastomer composition for operating temperature range from -30 degrees F to 230 degrees F for EPDM Grade E gaskets, and EPDM-HP for operating temperature range from -30 degrees F to 250 degrees F.
3. Accessories: Electroplated steel bolts, nuts, and washers conforming with ASTM A449.
4. Basis of Design: Victaulic Style 47.

E. Dielectric Connections

1. Dielectric nipples shall be non-conducting for connection of dissimilar piping materials. Dielectric nipples shall be similar to Victaulic Style 647 or Style 47. A brass adaptor dielectric union is not acceptable.

2.4 GATE VALVES

A. Up To and Including 3 Inches:

1. Bronze body, bronze trim, screwed bonnet, rising stem, handwheel, inside screw with backseating stem, solid wedge disc, alloy seat rings, solder ends.

B. Over 3 Inches:

1. Iron body, bronze trim, bolted bonnet, rising stem, handwheel, outside screw and yoke, solid wedge disc with bronze seat rings, flanged or grooved ends. (Grooved ends only if approved by Architect/Engineer.) Basis of Design: Victaulic Series 771V.

2.5 GLOBE OR ANGLE VALVES

A. Up To and Including 3 Inches:

1. Bronze body, bronze trim, screwed bonnet, rising stem and handwheel, inside screw with backseating stem, renewable composition disc and bronze seat solder ends.

B. Over 3 Inches:

1. Iron body, bronze trim, bolted bonnet, rising stem, handwheel, outside screw and yoke, rotating plug-type disc with renewable seat ring and disc, flanged ends.

2.6 BALL VALVES

A. Up To and Including 2 Inches:

1. Bronze one piece body, stainless steel ball, teflon seats and stuffing box ring, lever handle with balancing stops, solder ends.
2. Forged brass, two piece body, chrome plated brass ball and stem, PTFE seats and stem washer, lever handle, Vic Press 304™ ends. Victaulic Series P589.

B. Over 2½ Inches:

1. Cast steel body, chrome plated steel ball, teflon seat and stuffing box seals, lever handle, or gear drive handwheel for sizes 10 inches and over, flanged.
2. Ductile iron body, chrome plated carbon steel ball and stem, TFE seats, lever handle or gear operator, grooved ends. Victaulic Series 726.

2.7 PLUG VALVES

- A. Up To and Including 3 Inches:
 - 1. Bronze body, bronze tapered plug, full port opening, non-lubricated, teflon packing, threaded ends.
 - 2. Operator: One plug valve wrench for every ten plug valves minimum of one.
- B. Over 3 Inches:
 - 1. Cast iron body and plug, full port opening, pressure lubricated, teflon packing, flanged ends or grooved ends if Victaulic grooved end fittings are used.
 - 2. Ductile iron body and plug, standard port opening, non-lubricated eccentric-type, welded-in nickel seat, grooved ends. Victaulic Series 377.
 - 3. Operator: Each plug valve shall have a wrench handle with set screw.

2.8 BUTTERFLY VALVES

- A. Body: PPS (Polypphenylene Sulfide) or enamel coated cast or ductile iron with resilient replaceable pressure responsive EPDM seat or disc mounted seal, wafer or lug ends or grooved ends if Victaulic grooved end fittings are used. Stem shall be offset from the disc centerline to provide full 360 degree circumferential seating.
- B. Disc: Aluminum bronze, electroless-nickel or PPS coated ductile iron or stainless steel.
- C. Operator: 10 position lever handle up to 4". Larger than 4" shall have gear drive handwheel.
- D. Basis of Design: Victaulic MasterSeal™ or AGS-Vic300.

2.9 SWING CHECK VALVES

- A. Up To and Including 3 Inches:
 - 1. Bronze body, bronze trim, bronze rotating swing disc, with composition disc, solder ends.
- B. Over 3 Inches:
 - 1. Iron body, bronze trim, bronze or bronze faced rotating swing disc, renewable disc and seat, flanged ends or grooved ends if Victaulic grooved end fittings are used.

2.10 SPRING LOADED CHECK VALVES

- A. Iron body, bronze trim, split plate, hinged with stainless steel spring, resilient seal bonded to body, wafer or threaded lug ends.
- B. Ductile iron body, stainless steel spring and shaft, aluminum-bronze disc with elastomer seal or elastomer coated ductile iron disc with welded-in nickel seat, grooved ends. Basis of Design: Victaulic Series 716.
- C. 14" through 24" Sizes: Ductile iron body, stainless steel spring, shaft, and dual disc(s), with EPDM seat, and AGS grooved ends. Victaulic Series W715.

PART 3 EXECUTION

3.1 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel or groove plain end ferrous pipe.
- B. Remove scale and dirt on inside and outside before assembly.
- C. Prepare piping connections to equipment with flanges, grooved joint couplings, or unions.
- D. Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.

3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install piping to ASME B31.5 and B31.9.
- C. Route piping in orderly manner, parallel to building structure, and maintain gradient.
- D. Install piping to conserve building space, and not interfere with use of space.
- E. Group piping whenever practical at common elevations.
- F. Sleeve pipe passing through partitions, walls and floors.
- G. Slope piping and arrange to drain at low points. Use eccentric reducers to maintain top of pipe level.
- H. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
 - 1. For water systems, use adequate numbers of Victaulic Style 77 flexible couplings in header piping to accommodate thermal growth and contraction, and for the elimination of expansion loops. (In accordance with Victaulic instructions and as approved by the engineer). Where expansion loops are required, use Victaulic Style 77 couplings on the loops.
- I. Where more than one piping system material is specified, ensure system components are compatible and joined to ensure the integrity of the system is not jeopardized. Provide necessary joining fittings. Ensure flanges, union and couplings for servicing are consistently provided.
- J. Grooved ends shall be clean and free from indentations, projections, and roll marks in the area from pipe end to groove.
- K. The grooved coupling manufacturer's factory trained representative shall provide on-site training for contractor's field personnel in the use of grooving tools and installation of grooved joint products. The representative shall periodically visit the jobsite and review contractor is following best recommended practices in grooved product installation. (A

distributor's representative is not considered qualified to conduct the training or jobsite visit(s)).

- L. Use grooved mechanical couplings and fasteners as approved by the Architect/Engineer.
- M. Use unions, flanges, and couplings downstream of valves and at equipment or apparatus connections. Do not use direct welded or threaded connections to valves, equipment or other apparatus.
- N. Use non-conducting dielectric nipples or couplings, whenever joining dissimilar metals.
- O. Provide pipe hangers and supports in accordance with ASTM B31.9 unless indicated otherwise.
- P. Use gate, ball or butterfly valves for shut-off and to isolate equipment, part of systems, or vertical risers. All branch piping take-offs from mains, risers or branch piping shall have valves installed to allow isolation of branch piping and equipment/areas being served.
- Q. Use globe, ball or butterfly valves for throttling, bypass, or manual flow control services.
- R. Use butterfly valves interchangeably with gate and globe valves.
- S. Use only butterfly valves in chilled and condenser water systems for throttling and isolation service.
- T. Use lug or grooved end butterfly valves to isolate equipment.
- U. Use check valves or triple duty valves on discharge of pumps where shown on drawings.
- V. Use plug cocks for throttling service. Use non-lubricated plug cocks only when shut-off or isolating valves are also provided.
- W. Use $\frac{3}{4}$ inch ball valves with cap for drains at main shut-off valves, low points of piping, bases of vertical risers, and at equipment. Pipe to nearest floor drain.
- X. Inserts:
 - 1. Provide inserts for placement in concrete formwork.
 - 2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
 - 3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.
 - 4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
 - 5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut flush with top of slab.
- Y. Pipe Hangers and Supports:
 - 1. Install in accordance with ASTM B31.9, ASTM F708 and MSS SP89.
 - 2. Support horizontal piping as scheduled.

3. Install hangers to provide minimum ½ inch space between finished covering and adjacent work.
 4. Place hangers within 12 inches of each horizontal elbow.
 5. Use hangers with 1½ inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
 6. Support vertical piping at every floor. Support riser piping independently of connected horizontal piping.
 7. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
 8. Provide copper plated hangers and supports for copper piping.
 9. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.
- Z. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.
- AA. Provide access where valves and fittings are not exposed. Coordinate size and location of access doors.
- BB. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welds.
- CC. Apply one coat of primer and one coat of paint to all unfinished exposed pipe, fittings, supports and accessories. For example, unfinished piping exposed within a mechanical room, outdoors, within any room shall be primed and painted.
- DD. Install valves with stems upright or horizontal, not inverted.
- EE. Provide balancing devices where indicated on drawings, as required to attain design quantities, and as recommended by balancing agency.
- FF. After filling system, check for leaks and repair to leak-tight condition.
- GG. After completion, clean strainers, flush and fill systems and test system to be sure all air is eliminated from piping, coils, etc.

3.3 TESTING

- A. Hydrostatically test at 100 psi in excess of the working pressure for four (4) hours. This pressure to be on piping only, not on equipment.

END OF SECTION

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SECTION 23 21 16

HYDRONIC SPECIALTIES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Manual flow limiting valve.

1.2 REFERENCES: Material and/or equipment specified in this section shall meet or exceed one or more of the property requirements or installation requirements of the following specifications/publications as applicable to the specific product or end use.

- A. ASME - Boilers and Pressure Vessel Codes, SEC 8-D-Rules for Construction of Pressure Vessels.

PART 2 PRODUCTS

2.1 BALANCE VALVES AND ACCESSORIES

A. Calibrated Manual Flow Limiting Valves

1. Are only required on all heating hot water equipment.
2. Furnish and install as shown on plans with manufacturers recommendations model CB calibrated balance valves as manufactured by Bell & Gossett. Other acceptable manufacturers: Victaulic/TA Hydronics, Griswold Controls, Preso Meters.
3. Pre-Set Balance Procedure – Valves to be designed to allow installing contractor to pre-set balance points for proportional system balance prior to start-up in accordance with pre-set balance schedule.
4. Valve Design Construction – All valves ½” to 2” pipe size to be of lead free brass body stainless steel construction with glass and fiber TFE seat rings. Valves to have differential pressure read out ports across valve seat area. Read out ports to be fitted with internal EPT inserts and check valves. Valve bodies to have ¼” NPT tapped drain/purge port. Valves to have memory stop feature to allow valve to be closed for service and then reopened to set point without disturbing balance position. All valves to have calibrated nameplates to assure specific valve settings. Valves shall be designed for positive shutoff. Basis of Design: Victaulic Series 786 and 787 and 788 and 789.
5. Valves shall be designed for positive shutoff.
6. Design Pressure Temperature – All ½” – 3” NPT connection valves are rated for 400 psig at 230 degrees F. All ½” – 2” Sweat connection valves are rated for 200 psig at 250 degrees F.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install specialties in accordance with manufacturer's instructions.
- B. Grooved end installations
 - 1. All grooved couplings, fittings, valves, and specialties shall be the products of a single manufacturer. Grooving tools shall be of the same manufacturer as the grooved components.
 - 2. All castings used for coupling housings, fittings, valve bodies, etc. shall be date stamped for quality assurance and traceability.
 - 3. Grooved ends shall be clean and free from indentations, projections, and roll marks in the area from pipe end to groove.
- C. Where large air quantities can accumulate, provide enlarged air collection standpipes.
- D. Provide manual air vents at system high points that could "trap" air in piping system and as indicated.
- E. For automatic air vents in ceiling spaces or other concealed locations, provide vent tubing to nearest drain.
- F. Provide air separator on suction side of system circulation pump and connect to expansion tank.
- G. Provide valved drain and hose connection on strainer blow down connection.
- H. Provide pump suction fitting on suction side of base mounted centrifugal pumps where indicated. Remove temporary strainers after cleaning systems.
- I. Provide combination pump discharge valve on discharge side of base mounted centrifugal pumps where indicated.
- J. Support pump fittings with floor mounted pipe and flange supports.
- K. Provide relief valves on pressure tanks, low pressure side of reducing valves, heat exchangers, and expansion tanks.
- L. Select system relief valve capacity so that it is greater than make-up pressure reducing valve capacity. Select equipment relief valve capacity to exceed rating of connected equipment.
- M. Where one line vents several relief valves, make cross sectional area equal to sum of individual vent areas.
- N. After completion, clean strainers, flush and fill systems.

3.2 TESTING

- A. Hydrostatically test piping at 100 psi for four (4) hours. This pressure to be on piping only, not on equipment.

END OF SECTION

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SECTION 23 30 00

AIR DISTRIBUTION

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Metal ductwork
- B. Nonmetal ductwork.
- C. Casing and plenums.
- D. Single wall spiral duct and fittings
- E. Dampers.
- F. Duct cleaning.
- G. Roof hoods, exhaust fans, grilles and louvers.

1.2 REFERENCES: Material and/or equipment specified in this section shall meet or exceed one or more of the property requirements or installation requirements of the following specifications/publications as applicable to the specific product or end use:

- A. ASTM A36 - Structural Steel.
- B. ASTM A90 - Weight of Coating on Zinc-Coated (Galvanized) Iron or Steel Articles.
- C. ASTM A167 - Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
- D. ASTM A366 - Steel, Sheet, Carbon, Cold Rolled, Commercial Quality.
- E. ASTM A480 - General Requirements for Flat-Rolled Stainless and Heat Resisting Steel Plate, Sheet, and Strip.
- F. ASTM A525 - General Requirements for Steel Sheet.
- G. ASTM A527 - Steel Sheet, Zinc Coated (Galvanized) by Hot Dip Process, Lock Forming Quality.
- H. ASTM A568 - Steel, Sheet, Carbon, and High-Strength, Low Alloy, Hot-Rolled and Cold-Rolled.
- I. ASTM A569 - Steel, Carbon (0.15 Maximum, Percent), Hot-Rolled Sheet and Strip, Commercial Quality.
- J. ASTM B209 - Aluminum and Aluminum-Alloy Sheet and Plate.

- K. AWS D9.1 - Welding of Sheet Metal.
- L. NBS PS 15 - Voluntary Product Standard for Custom Contact-Molded Reinforced-Polyester Chemical Resistant Process Equipment.
- M. NFPA 54 - National Fuel Gas Code.
- N. NFPA 70 - National Electric Code.
- O. NFPA 90A - Installation of Air Conditioning and Ventilating Systems.
- P. NFPA 90B - Installation of Warm Air Heating and Air Conditioning Systems.
- Q. NFPA 91 - Installation of Blower and Exhaust Systems for Dust, Stock and Vapor Removal or Conveying.
- R. NFPA 96 - Installation of Equipment for the Removal of Smoke and Grease-Laden Vapors from Commercial Cooking Equipment.
- S. SMACNA - HVAC Air Duct Leakage Test Manual.
- T. SMACNA - HVAC Duct Construction Standards - Metal and Flexible.
- U. SMACNA - Fibrous Glass Duct Construction Standards.
- V. UL 33 - Heat Responsive Links for Fire Protection Systems.
- W. UL 181 - Factory-Made Air Ducts and Connectors.
- X. UL 555 - Fire Dampers and Ceiling Dampers.

1.3 SCOPE

- A. The work covered by this specification consists of furnishing all labor, equipment, materials and performing all operations required, for the correct and complete fabrication and installation of ductwork in accordance with the applicable project specifications, drawings, codes, regulations and standards.

1.4 PERFORMANCE REQUIREMENTS

- A. No variation of duct configuration or sizes will be permitted except by written permission from the Engineer. Size round ducts installed in place of rectangular ducts in accordance with ASHRAE table of equivalent rectangular and round ducts.

1.5 QUALITY ASSURANCE

- A. Perform Work in accordance with SMACNA - HVAC Duct Construction Standards - Metal and Flexible as a minimum. Where requirements are specified in this specification, or noted on drawings above the minimum SMACNA Standards, the more stringent specified and noted requirements and practices shall be followed.

- B. Maintain one copy of document on site.

1.6 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years experience.
- B. Installer: Company specializing in performing the work of this section with minimum five years experience.

1.7 REGULATORY REQUIREMENTS

- A. Construct ductwork to NFPA 90A and SMACNA standards, latest edition.

1.8 ENVIRONMENTAL REQUIREMENTS

- A. Do not install duct sealants when temperatures are less than those recommended by sealant manufacturers.
- B. Maintain temperatures during and after installation of duct sealants.

1.10 SPECIAL INSPECTION FOR SMOKE CONTROL (per Michigan Building Code 1704.14)

- A. Special Inspection for Smoke Control: Smoke control systems shall be tested by a special inspector.
- B. Testing scope: The test scope shall be as follows:
 - 1. During erection of ductwork and prior to concealment for the purposes of leakage testing and recording of device location.
 - 2. Prior to occupancy and after sufficient completion for the purposes of pressure difference testing, flow measurements, and detection and control verification.
- C. Qualifications: Special inspection agencies for smoke control shall have expertise in fire protection engineering, mechanical engineering and certification as air balancers.

PART 2 PRODUCTS

2.1 DUCT - SHEET METAL HVAC DUCTWORK

- A. Galvanized Steel Ducts: ASTM A525 and ASTM A527 galvanized steel sheet, lock-forming quality, having G60 zinc coating of in conformance with ASTM A90.
- B. Fasteners: Rivets, bolts, or sheet metal screws.
- C. Sealant:

1. Non-hardening, water resistant, fire resistive, compatible with mating materials; liquid used alone or with tape, or heavy mastic. All ductwork joints, connections, etc. shall be sealed.
- D. Duct Hangers: Rod and trapeze duct support shall be used for all ductwork with one dimension 18" or larger. Smaller duct may be installed with strap hanger system using SMACNA Standard as minimum.
1. Hanger Rod: ASTM A36; steel; threaded both ends, threaded one end, or continuously threaded, with steel angle trapeze and non-eccentric beam clamps.
 2. Hanger rods, angles trapeze sizing and spacing shall meet SMACNA standards, and local and state building codes for duct sizes being supported.
 3. Straps and hanger attachment system sizing, spacing, and installation shall meet SMANCA Standards, local and state building codes, etc. for duct size and supports.
 4. Duct hangers shall not be supported from metal deck. Furnish and install all support steel as required to suspend with beam clamps similar to Grinnell Fig. 260 from structural steel joists or beams.

2.2 DUCTWORK FABRICATION

- A. Fabricate and support in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible as a minimum. Where requirements are specified in this specification, or noted on drawings above the minimum SMACNA Standards, the more stringent specified and noted requirements and practices shall be followed. Provide duct material, gages, reinforcing, and sealing for operating pressures not less than 6" w.c. on upstream side (higher pressure side) of variable air volume boxes. Return air duct, exhaust air duct and downstream side of variable air volume boxes (low pressure side) shall be constructed to not less than 2" w.c.
- B. Construct T's, bends, and elbows with radius of not less than 1½ times width of duct on centerline. Where not possible, and engineer's written approval is obtained, rectangular elbows may be used, provided turning vanes are utilized. Where acoustical lining is indicated, provide turning vanes of perforated metal with glass fiber insulation.
- C. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.
- D. Fabricate continuously welded round and oval duct fittings two gages heavier than duct gages indicated in SMACNA Standard. Joints shall be minimum 4 inch cemented slip joint, brazed or electric welded. Prime coat welded joints.
- E. Provide standard 45 degree lateral wye takeoffs unless otherwise indicated where 90 degree conical tee connections may be used.

F. Duct Sealant

- a. All ductwork including supply air, outside air, return air, exhaust air and relief air ductwork shall have joints sealed.
- b. Ductwork designed at SMACNA 6" pressure shall meet SMACNA Class "A" seal requirements.
- c. Ductwork designed at SMACNA 2" pressure shall meet SMACNA Class "C" seal requirements.

2.3 CASINGS

- A. Fabricate casings in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible as a minimum. Where requirements are specified in this specification, or noted on drawings above the minimum SMACNA Standards, the more stringent specified and noted requirements and practices shall be followed. Construct for not less than 6" w.c. unless otherwise noted on drawings.
- G. Mount floor mounted casings on concrete curbs. At floor, rivet panels on 8 inch centers to angles. Where floors are acoustically insulated, provide liner of 18 gage galvanized expanded metal mesh supported at 12 inch centers, turned up 12 inches at sides with sheet metal shields.
- H. Reinforce door frames with steel angles tied to horizontal and vertical plenum supporting angles. Install hinged access doors where indicated or required for access to equipment for cleaning and inspection.
- I. Fabricate acoustic casings with reinforcing turned inward. Provide 16 gage back facing and 22 gage perforated front facing with 3/32 inch diameter holes on 5/32 inch centers. Construct panels 3 inches thick packed with 4.5 lb/cu ft minimum glass fiber media, on inverted channels of 16 gage.

2.4 DUCT TEST HOLES

- A. Temporary Test Holes: Cut or drill in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.
- B. Permanent Test Holes: Factory fabricated, air tight flanged fittings with screw cap. Provide extended neck fittings to clear insulation.

2.5 EQUIPMENT FLEXIBLE DUCT CONNECTIONS (To air moving equipment.)

- A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible as a minimum. Where requirements are specified in this specification, or noted on drawings above the minimum SMACNA Standards, the more stringent specified and noted requirements and practices shall be followed.
- B. Connector: Fabric crimped into metal edging strip.
 - 1. Fabric: UL listed fire-retardant neoprene coated woven glass fiber fabric to NFPA 90A, minimum density 30 oz per sq yd.

2. Net Fabric Width: Approximately 3 inches wide.
3. Metal: 3 inch wide 24 gage galvanized steel.

2.6 FLEXIBLE INSULATED DUCTS

- A. All flexible ducts used to connect diffuser, grilles, etc. shall be similar to Flexmaster USA, Inc.; Type #3. Flex duct shall be insulated type consisting of a factory fabricated assembly of a trilaminate of aluminum foil, fiberglass and polyester. It shall be mechanically locked without adhesive into a formed aluminum helix on the ducts outside surface and shall withstand a minimum 6" w.c. operating pressure. The duct material shall be factory wrapped in a thick blanket of fiberglass insulation with a "C" factor of .25 or less. The insulation shall be encased in a fire retardant polyethylene protective vapor barrier with a perm rating of not over 0.1 grains per square foot per hour per inch of mercury. The flexible duct shall be constructed in accordance with and be listed as UL 181 Class I air duct and comply with NFPA 90A and 90B and have a flame spread of not over 25 and a smoke developed of not over 50. The flexible duct shall have a minimum pressure rating of 12" w.c. through a temperature range of -20°F to 250°F. Flexible duct shall be UL rated.
- B. Maximum length of flexible duct shall be 5'-0" to each outlet unless indicated otherwise on drawing.
- C. Flexible duct shall be installed without bends unless so indicated on drawing.

2.7 DUCT SPIN-IN FITTINGS

- A. Low pressure spin-in fittings (take-offs from main duct to flexible duct) shall be similar to Flexmaster USA, Inc. Model CB-D conical bellmouth fitting with damper and positive locking wing nut. Edges of the take-off opening in the duct shall be sealed with fire retardant duct sealer.

2.8 BACKDRAFT DAMPERS.

- A. Gravity Backdraft Dampers, Size 18 x 18 inches or Smaller, Furnished with Air Moving Equipment: Air moving equipment manufacturers standard construction.
- B. Multi-Blade, Parallel Action Gravity Balanced Backdraft Dampers: 16 gage thick galvanized steel with center pivoted blades of maximum 6 inch width, with felt or flexible vinyl sealed edges, linked together in rattle-free manner with 90 degree stop, steel ball bearings, and plated steel pivot pin; adjustment device to permit setting for varying differential static pressure.

2.9 VOLUME CONTROL DAMPERS.

- A. Provide balancing dampers on all duct take-offs to diffusers, grilles and registers; at points on supply, return and exhaust systems where branches take off from larger ducts, as required for air balancing (install damper a minimum of 2 duct widths from take-off; as required by balancing agency; and where indicated on drawings. Where access to dampers cannot be achieved, access panels shall be installed. If access panels are not preferred, remote dampers shall be installed. Fabricate in accordance

with SMACNA HVAC Duct Construction Standards - Metal and Flexible as a minimum. Where requirements are specified in this specification, or noted on drawings above the minimum SMACNA Standards, the more stringent specified and noted requirements and practices shall be followed. All dampers shall have a locking device per SMACNA Standards, to hold the damper in a fixed position without vibrating.

- B. Splitter Dampers:
 - 1. Material: Same gage as duct to 24 inches size in either direction, and two gages heavier for sizes over 24 inches.
 - 2. Blade: Fabricate of single thickness sheet metal to streamline shape, secured with continuous hinge or rod.
 - 3. Operator: Minimum ¼ inch diameter rod in self aligning, universal joint action, flanged bushing with set screw.
- C. Single Blade Dampers: Fabricate for duct sizes up to 6 x 30 inch.
- D. Multi-Blade Damper: Fabricate of opposed blade pattern with maximum blade sizes 8 x 72 inch. Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.
- E. End Bearings: Except in round ductwork 12 inches and smaller, provide end bearings. On multiple blade dampers, provide oil-impregnated nylon or sintered bronze bearings.
- F. Quadrants:
 - 1. Provide locking, indicating quadrant regulators on single and multi-blade dampers.
 - 2. On insulated ducts mount quadrant regulators on stand-off mounting brackets, bases, or adapters.
 - 3. Where rod lengths exceed 30 inches provide regulator at both ends.

2.10 ROOF CURBS

- A. The mechanical trades shall be responsible for furnishing and setting in place all mechanical equipment, roof curbs and piping/duct roof curbs. The general trade shall be responsible for the roof work and associated flashing. The mechanical trade shall furnish and install treated wood base blocking as required to level curb and to match roof insulation thickness. Curb shall be as specified, or if not specified should be similar to Pate or Thy-curb with heavy gauge galvanized steel, insulated and with wood nailer. Height of curb scheduled or specified shall be height required to top of curb above finished roof. If height is not specified or noted, a minimum 12" high above finished roof will be required. (pipe support units shall be at height required). Rooftop units will be shipped knocked down with the mechanical trade responsible for assembly on site. Roof curb shall mate with unit and provide support and a watertight installation.

2.11 EXHAUST FANS

- A. See schedules on drawings and furnish all.

2.12 DIFFUSERS AND GRILLES

- A. See schedules on drawings and furnish all.

2.13 LOUVERS

- A. See schedule on drawings and furnish all.

PART 3 EXECUTION

3.1 DUCT INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install and seal ducts in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible as a minimum. Where requirements are specified in this specification, or noted on drawings above the minimum SMACNA Standards, the more stringent specified and noted requirements and practices shall be followed. Note: All ductwork joints, fittings, etc. shall be sealed.
- C. Duct Sizes are inside clear dimensions. For lined ducts, maintain sizes inside lining.
- D. Provide openings in ductwork for pitot tube where required for testing of systems, complete with metal can with spring device or screw to ensure against air leakage. Where openings are provided in insulated ductwork, install insulation material inside a metal ring.
- E. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.
- F. Use crimp joints with bead for joining round duct sizes 8 inch and smaller with crimp in direction of air flow.
- G. Use double nuts and lock washers on threaded rod supports.
- H. Slope underground ducts to plenums or low pump out points at 1/8" per foot. Provide access doors for inspection.
- I. Tape joints of PVC coated metal ductwork with PVC tape.
- J. Insulate buried supply duct runs with two inch thick insulation styrofoam covered with plastic vapor barrier.
- K. Connect flexible ducts to metal ducts mechanically without adhesives. Connect outlets to low pressure ducts with flexible duct held in place with strap or clamp.
- L. Coordinate duct locations with available space, route ducts around obstructions as required, and review duct changes with Engineer, all before starting construction.
- M. Set plenum doors 6 to 12 inches above floor. Arrange door swings so that fan static pressure holds door in closed position.

- N. Provide residue traps in kitchen hood exhaust ducts at base of vertical risers with provisions for clean out. Use stainless steel for ductwork exposed to view and stainless steel or carbon steel for ducts where concealed.
- O. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.
- P. Install manual balancing dampers in ductwork at all branch take-offs, all diffuser and grille take offs, etc.
- Q. Install roof exhaust fans on minimum 18" high roof curbs but not less than 12" higher than parapet walls within 10'-0" of fan.

3.2 DUCT CLEANING

- A. Clean duct system and force air at high velocity through duct to remove accumulated dust. To obtain sufficient air, clean half the system at a time. Protect equipment which may be harmed by excessive dirt with temporary filters, or bypass during cleaning.

3.3 DIFFUSER AND GRILLE INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Check location of outlets and inlets and make necessary adjustments in position to conform with architectural features, symmetry, and lighting arrangement.
- C. Install diffusers to ductwork with air tight connection.
- D. Provide balancing dampers on duct take-off to diffusers, grilles and registers, whether dampers are specified as part of the diffuser, grille or register assembly.
- E. Paint ductwork visible behind air outlets and inlets matte black.
- F. Diffuser/grille color shall be selected from the full range of manufacturer available colors and finishes.

END OF SECTION

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SECTION 26 01 00

BASIC ELECTRICAL REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Basic electrical Requirements specifically applicable to Division 26, 27 & 28 Sections, in addition to Division 1 - General Requirements.
- B. Information in this section is intended to clarify or make additions to the requirements set forth in the General Conditions, Supplementary Conditions and Division 1 of these specifications. Any conflict between Division 26, 27 & 28 and those in the General Conditions or within the Division 26 drawings, Supplementary Conditions and Division 1 shall be brought to the attention of the Architect/Engineer in writing as a request for addendum prior to the bid opening.
- C. Furnish all equipment, materials, articles, items, operations or methods listed, mentioned or scheduled on drawings, these specifications, manufacturer's installation instructions and include all labor materials, equipment and incidentals necessary for complete installation and operation.
- D. All information contained in this section applies to all sections within Division 26 as it was part of each section.
- E. Final walk-thru. Electrical Contractor shall submit in writing to the Architect's office or the Construction Manager advising that all of the Division 26, 27 & 28 work has been completed in accordance with the plans and specifications. The intent is to acknowledge the Contractor is ready for a walk-thru. Open items that are part of the required construction work should be completed prior to the final walk-thru to avoid developing a so called construction completion list. The engineer reserves the right to reschedule the final walk-thru as determined accordingly.
- F. Pre-bid questions. All pre-bid questions, clarifications, etc. must be submitted in writing to the Architect Office or the Construction Manager. All phone calls, faxes or e-mails from bidders and manufacturers, etc. directly received by the Engineers office during the bidding phase will be deferred back to the Architect Office or the Construction Manager.
- G. Electrical Contractor shall review all of the project plans and specifications and not rely solely on the electrical drawings to establish a project bid. Refer to the structural and mechanical drawings for final mechanical equipment locations. Mechanical drawings shall govern over the electrical drawing locations.
- H. The new electrical distribution shall be Series Rated to comply with 2011 NEC and the specifications sections. Contractor shall be responsible to obtain assistance from the manufacturer to provide Series Rated electrical distribution.
- I. Unit Pricing: Contractor shall furnish pricing as listed in the Bid Proposal Forms.

- J. The Contractor shall include in their bid any cost for requesting AutoCAD backgrounds for their use from the Architect or Engineer. The cost will be \$150.00 for the first plan, and \$50.00 for each additional plan that may be requested for AutoCAD use. A waiver of responsibility for the Architect and Engineer related to Contractor use of the CAD files shall be signed by the Contractor.

1.2 LAYOUT OF THE WORK

- A. Examine the site and all the drawings before proceeding with the layout and installation of this work. Verify all door swings and clearances to cabinets, etc., before locating switch and outlet boxes. Locate conduit, boxes, etc., essentially as shown on the drawings but in exact layout determined on the job to suit actual conditions. Confer and cooperate with the other trades on the job so all parts will be installed in proper relationship. Precise locations of parts to coordinate with other work is the responsibility of the Contractor.
- B. The Electrical Trades shall complete all cutting and patching for the electrical work, unless noted or specified otherwise. Division 26, 27 & 28 Contractor shall be responsible to coordinate with the site Restoration Contractor for the new underground electrical work.
- C. Arrange exposed work as closely as practicable to wall or ceiling surfaces in an accurate alignment. Locate concealed work so fittings, connectors and other projections will clear surfaces. Exposed work is defined as non-finished spaces, such as mechanical / electrical rooms or as indicated on architectural room schedules. All finished spaces, installation shall be concealed. Refer to Architectural drawing for room finish schedules.
- D. During the bidding phase, if any design or discrepancy issues are discovered between the electrical drawings, specifications and other project plans, the contractor shall notify the Architect/Engineer. The intent is to resolve any issues during the bidding phase. For pertinent issues, addendums will be issued accordingly. After entering into a contract, it shall be considered there are no identified conflicts.
- E. No drilling of existing laminated beams for new work is permitted without review with the project Structural Engineer

1.3 INTERFERENCES

- A. The Electrical Contractor shall examine the plans of mechanical trades, the architectural and structural drawings and shall notify the Architect/ Engineer to resolve such interference or discrepancy. The Electrical Contractor bid shall not be based solely on the Electrical Plans and Specifications. Contractor shall obtain and review all project documents. The Contractor, when directed, shall make such changes or off-sets as required so that the work shall be properly located and coordinated with the other trades. Failure to comply with the foregoing will not relieve contractor's responsibilities of making such changes. Such changes shall be completed at no additional cost to the Owner.

- B. All changes in location of equipment, fixtures, distribution equipment, receptacles, etc., from those shown on plans, shall be made without charge when directed by the Architect/Engineer before installation. At this time, an agreement shall be made if such a change is an additional cost to the owner.
- C. The Electrical Contractor shall confer with other trades regarding location and size of pipes, equipment, fixtures, conduit, duct openings, switches, outlets, etc., in order that there may be no interference in the installation of the work of any trades or delay in the progress of any work.
- D. The Electrical Contractor shall be responsible for confirming final receptacle, data, and switch heights at countertop and casework locations with the architectural details. Architectural details shall govern final locations and mounting heights. Failure to coordinate will not relieve the contractor of making changes as required, at no cost to the owner.
- E. Any changes made, necessary through failure to make proper arrangement to avoid interference, shall not be considered as extra.
- F. The Electrical Contractor shall cooperate with those performing work under other divisions in his preparation of interference drawings, to the extent that the location of plumbing piping, heating piping, and/or ventilation ducts, with respect to the installation of other trades, shall be mutually agreed on by those performing work under other divisions.
- G. In the event the described work on the drawings doesn't match requirements described in the specification, the more stringent shall be provided.
- H. Electrical Contractor shall review the Architectural work station, casework details and section drawings that show raceway details. Furnish the raceway as detailed.
- I. Contractor shall carefully review the code sections pertaining to safe working clearances to avoid piping, ducts interferences and other equipment. Install the electrical equipment to meet Code requirements. Adjust the locations shown as required.

1.4 TRENCHING AND RELATED UNDERGROUND WORK

- A. The Electrical Contractor shall contact "811" 72 hours prior to any excavation to locate existing underground utilities. Pay all costs to obtain the services of a specialty utility service company to locate all private utilities as required.
- B. Prior to any actual trenching, Electrical Contractor shall review the utility maps; shall visually observe and review the intended routing for above and below ground obstruction; shall confer with the appointed field representative, and shall establish preliminary location for trenching.
- C. After this routing is established, Contractor shall hand dig in areas of obstructions where powered equipment is non-accessible.

1.5 MATERIALS AND WORKMANSHIP

- A. All materials and equipment furnished for installation on this project shall be new and in strict accordance with this specification. All packaged materials shall be delivered in the original containers which show the manufacturer's name and the identifying designations as to size, quality, etc. Materials delivered to the job in unmarked or mutilated packages will be ordered to be removed from the site at once. Materials or equipment judged as "damaged" by the Architect or Engineer shall be removed from the job. All electrical equipment shall bear the Underwriter's Label.
- B. All work shall be performed in a professional manner under the supervision of a Contractor's manager. The project manager shall be considered the main point of contact for the Architect/Owner's daily communication.
- C. Should any dispute arise as to the quality or fitness of the materials or workmanship, Architect, Owner, Engineer and Electrical Contractor shall mutually agree work is non-acceptable and shall be reworked at no additional cost to the Owner.
- D. Division 26, 27 & 28 equipment schedule descriptions shall govern if it is found that the manufacturer's catalog numbering shown on the drawing is not current, or changed by the manufacturer without notification. Division 26, 27 & 28 Contractor shall notify the Architect/Engineer with any conflicts during the bidding phase to get clarifications. After entering into a Contract, it shall be considered the equipment schedules provide the information to meet the intended specifications for quality and performance.

1.6 GUARANTEES

- A. All equipment and work performed under Division 26, 27 & 28 shall be guaranteed for one (1) year from time of substantial completion of project, unless directed otherwise in Division 1.

1.7 VOLUNTARY ALTERNATES

- A. The Architect/Engineer will only accept voluntary alternate as a bid deduct. Alternate must maintain the same level of quality to meet the design intent. Voluntary alternates must be submitted with the bid for review by the Owner. Failure to comply will be no reason to accept any voluntary alternates after entering into a contract.

1.8 OWNERS ACCEPTANCE OF EQUIPMENT

- A. Refer to Division 1.
- B. Upon the Owner's written acceptance, the Electrical Contractor's guarantee period shall begin and the Owner shall accept the responsibility for operation and maintenance and the Contractor's liability shall be limited to the conditions covered in the guarantee as described in these specifications.

1.9 REFERENCES

- A. Conform to requirements of 2012 Michigan Building Code, 2011 Electrical Code Rules Part 8, 2003 ICC/ANSI 117.1 and local code requirements.

1.10 SUBMITTALS

- A. Submit shop drawings via e-mail.
- B. Proposed Products List: Include Products specified in the following Sections:
 - 1. Section 26 24 76 - Enclosed Switches
 - 2. Section 26 51 00 - Interior Luminaires
 - 3. Section 28 31 00 - Fire Alarm
- C. Submit shop drawings and product data grouped to include complete submittals of related systems, products, and accessories in single submittals.
- D. Mark dimensions and values in units to match those specified.
- E. Shop drawings shall be reviewed and checked by the Electrical Contractor for specification compliance prior to release for the Engineer's review. Failure to comply will be no cause or reason for additional costs to the Owner with project delays.
- F. Electrical distribution submittal shall include cut sheets for each piece of equipment. Written description is not acceptable.
- G. Bill of materials shall be submitted as part of O&M Manual. Bill of Materials is not considered a shop drawing.

1.11 REGULATORY REQUIREMENTS

- A. Conform to applicable Building Code.
- B. Conform to requirements of 2012 Michigan Building Code, 2011 National Electrical Code, 2011 State of Michigan Code Rules Part 8, 2003 ICC/ANSI 117.1 and local code requirements.
- C. Equipment: U.L. tested and approved for its purpose.
- D. The Electrical Contractor shall obtain and pay for all permits and inspection fees. Copies of the Certificate of Inspection are to be provided to the Owner after final inspection and approval from authorities having jurisdiction.
- E. State of Michigan, Bureau of Fire Services.
- F. Equipment: Conform to requirements of 2012 Michigan Building Code, 2011 National Electrical Code, 2011 State of Michigan Code Rules Part 8, 2003 ICC/ANSI 117.1 and local code requirements.
- G. Life Safety NFPA 101 – The State of Michigan current adopted edition.

H. Fire Alarm Code NFPA 72 – The State of Michigan current adopted edition.

I. State of Michigan Uniform Energy Code.

J. ASHRAE 90.1 2007 Edition

1.12 PROJECT/SITE CONDITIONS

A. Install Work in locations shown on drawings, unless prevented by project conditions.

B. All bidders shall personally inspect the site and acquaint themselves with all existing conditions involved in execution of this contract, and make all necessary measurements. No “extra” will be considered for additional work required because of bidder’s failure to do so.

1.13 TEMPORARY SERVICES

A. Division 26 Trades shall provide and maintain wiring for all interior construction lighting and power to meet OSHA Standards. Division 26 Trade shall provide and maintain all required lamps and guards. Contractor’s power tools, cords, etc shall be in strict accordance with National Electrical Code 2011, Article 590.

B. Electrical Contractor shall pay for all temporary telephone costs for their office and or construction trailer.

C. Electrical Contractor shall be responsible to review Division 1 requirements to provide project temporary lighting and power requirements for the construction and demolition phases.

1.14 RECORD DRAWINGS

A. The Electrical Contractor shall furnish as-constructed drawings, including all Addendums, Bulletins and associated Field Directed Changes included as part of the record drawings.

1.15 OPERATION AND MAINTENANCE MANUALS

A. Verbal instruction and written operational instructions are to be given on all equipment and systems under this contract. A time is to be scheduled with the Architect/Engineer and Owner for these instructions and a time submitted in writing for instructions at the facility.

B. Two (2) bound sets of Operating and Maintenance Manuals are to be submitted to the Architect/Engineer for approval. Manuals are to include complete parts list and maintenance procedures as well as operating instructions on all equipment supplied under Division 26, 27 & 28.

END OF SECTION

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SECTION 26 02 00

MINOR ELECTRICAL DEMOLITION FOR REMODELING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Electrical demolition per plans and specifications.
- B. Conduit supports.

1.2 RELATED SECTIONS

- A. All drawings and specification sections apply to work in this section. Furnish all items, articles, materials, equipment, operations or methods that are mentioned, listed or scheduled on drawings or are in this specification including all labor, equipment, materials and miscellaneous incidentals necessary and/or required for the completion of this project. The work covered under this section of the specifications is in no way complete within itself but is supplementary to the entire specification and drawings.

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

- A. Materials and equipment for patching and extending work: As specified in individual Sections.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Electrical Contractor shall examine the project documents and visit the site as they deem necessary prior to submitting a bid. Do not rely solely on the Electrical Plans for all demolition requirements. Review all Project Documents prior to submitting a bid.
- B. The demolition information is provided to assist with labor costs associated with the electrical systems removal. The Electrical Contractor shall be responsible to confirm all quantities and the information provided.
- C. Upon removal of the existing ceiling, the Electrical Trades shall immediately notify the construction manager, Architect and Engineer in writing regarding existing conduits scheduled to remain that are not properly supported. Conduit evaluation shall be conducted with the Owner, Architect and Engineer. Failure for the Electrical Trades to submit a written conduit support condition will obligate the trade to support the conduits to meet current Code methods at no additional cost to the Owner.

3.2 PREPARATION

- A. Confirm with the Architect's Office and/or Construction Manager Project Schedules and review the Architectural, Structural and Mechanical drawings prior to commencing demolition.

3.3 DEMOLITION

- A. Remove the electrical distribution equipment, lighting, receptacles, switching, associated conduit, surface raceway, interior building cable TV distribution, voice and data from only each station side outlet back to the existing technology distribution frame. Remove the fire alarm system, 120 volt clocks, wiring, PA speakers and the PA front end unit as noted or shown or shown on the drawings. Remove surface mounted conduit, boxes, and non-metallic raceway, from the existing walls in offices, classrooms, etc. Use care during the demolition phase to avoid damage or any glazed block, tile or brick veneered walls. Electrical Contractors are responsible to confirm all quantities and information provided.
- B. Mechanical trades or BAS Contractor shall remove all associated temperature components, and associated conduit and wiring.
- C. Electrical Trades shall remove all existing fire alarm devices and associated conduits and surface mounted raceways. Patch to match.
- D. Electrical Trades shall transport all of the electrical salvaged materials to the Owner and include all transportation costs.
- E. Remove all of the existing non-metallic type surface raceway or surface metal conduits noted or specified to be removed. Contractor shall also be responsible to review the architectural, structural and mechanical demolition drawings for associated electrical demolition work. Do not rely solely on the electrical drawings for bid submitted.
- F. Remove all unused conduits and wiring serving lighting and power being removed from the finished ceiling space. Remove all abandoned low voltage cables from accessible portions in accordance with NEC Sections 760.3(A), 640(A), 645.3(A), 725.3(B), 770.3(A), 800.3(C), 820.3(A) and 830.3(A).
- G. Electrical Contractors are responsible to confirm all demolition quantities. Make pre-bid site visit arrangements as deemed necessary.

END OF SECTION

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SECTION 26 05 26
GROUNDING AND BONDING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Grounding electrodes and conductors.
- B. Equipment grounding conductors.
- C. Bonding.

1.2 RELATED SECTIONS

- A. All drawings and specification sections apply to work in this section. Furnish all items, articles, materials, equipment, operations or methods that are mentioned, listed or scheduled on drawings or are in this specification including all labor, equipment, materials and miscellaneous incidentals necessary and/or required for the completion of this project. The work covered under this section of the specifications is in no way complete within itself but is supplementary to the entire specification and drawings.

1.3 REFERENCES

- A. Conform to requirements of 2012 Michigan Building Code, 2011 National Electrical Code, 2011 State of Michigan Code Rules Part 8, 2003 ICC/ANSI 117.1 and local code requirements.

1.4 PERFORMANCE REQUIREMENTS

- A. Resistance: Meet the NEC Code requirements.

1.5 PROJECT RECORD DOCUMENTS

- A. Accurately record actual locations of grounding electrodes.

1.6 REGULATORY REQUIREMENTS

- A. Conform to requirements of 2012 Michigan Building Code, 2011 National Electrical Code, 2011 State of Michigan Code Rules Part 8, 2003 ICC/ANSI 117.1 and local code requirements.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and indicated.

PART 2 PRODUCTS

2.1 ROD ELECTRODE

- A. Material: Copper-clad steel or copper-weld type.

B. Diameter: as scheduled on the drawings.

C. Length: as scheduled on the drawings.

2.2 MECHANICAL CONNECTORS

A. As scheduled on the drawings.

2.3 EXOTHERMIC CONNECTIONS

A. As scheduled on the drawings.

2.4 WIRE

A. Material: As scheduled on the drawings.

B. Foundation Electrodes: Size to meet NFPA 70 requirements.

C. Grounding Electrode Conductor: Size to meet NFPA 70 requirements.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify site soil conditions before driving rod electrodes.

3.2 INSTALLATION

A. Install Products in accordance with manufacturer's instructions.

B. Provide bonding to meet Regulatory Requirements.

C. Equipment Grounding Conductor: Provide a separate grounding conductor for lighting and power circuits as noted or specified on the drawings.

3.3 FIELD QUALITY CONTROL

A. Inspect grounding and bonding system conductors and connections for tightness and proper installation.

B. Use suitable test instrument to measure resistance to ground of system. Perform testing in accordance with test instrument manufacturer's recommendations using the fall-of-potential method.

END OF SECTION

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SECTION 26 05 29
SUPPORTING DEVICES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Conduit and equipment supports.
- B. Anchors and fasteners.

1.2 RELATED SECTIONS

- A. All drawings and specification sections apply to work in this section. Furnish all items, articles, materials, equipment, operations or methods that are mentioned, listed or scheduled on drawings or are in this specification including all labor, equipment, materials and miscellaneous incidentals necessary and/or required for the completion of this project. The work covered under this section of the specifications is in no way complete within itself but is supplementary to the entire specification and drawings.

1.3 REFERENCES

- A. Conform to requirements of 2012 Michigan Building Code, 2011 National Electrical Code, 2011 State of Michigan Code Rules Part 8, 2003 ICC/ANSI 117.1 and local code requirements.

1.4 REGULATORY REQUIREMENTS

- A. Conform to requirements of 2012 Michigan Building Code, 2011 National Electrical Code, 2011 State of Michigan Code Rules Part 8, 2003 ICC/ANSI 117.1 and local code requirements.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and indicated.

PART 2 PRODUCTS

2.1 PRODUCT REQUIREMENTS

- A. Materials and Finishes: Provide adequate corrosion resistance.
- B. Provide materials, sizes, and types of anchors, fasteners and supports to carry the loads of equipment and conduit. Consider weight of wire in conduit when selecting products.
- C. Anchors and Fasteners:
 - 1. Concrete Structural Elements: Use expansion anchors.
 - 2. Steel Structural Elements: Use beam clamps.
 - 3. Concrete Surfaces: Use self-drilling anchors and expansion anchors.
 - 4. Hollow Masonry, Plaster, and Gypsum Board Partitions: Use toggle bolts and hollow wall fasteners.

5. Solid Masonry Walls: Use expansion anchors.
6. Sheet Metal: Use sheet metal screws.
7. Wood Elements: Use wood screws.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Attachments of electrical equipment to structural members are the responsibility of the installing trade. Structural members shall not be field cut, welded or otherwise modified without approval of the Architect/Engineer. Attachment to steel joist shall be made at panel points whenever possible. Structural members shall not be overloaded as a result of attachments. Attachment/equipment loading for all trades resulting in total load greater than an equivalent uniform 5 psf for any member shall be submitted to the Architect/Engineer for review. Electrical Trades are still responsible for design, layout, and fabrication and installation of electrical supports and support attachment methods. Electrical Trades shall submit attachment methods to the Structural Engineer for review.
- B. Install products in accordance with manufacturer's instructions.
- C. Do not fasten supports to pipes, ducts, mechanical equipment, and conduit.
- D. Do not use spring steel clips and clamps.
- E. Do not use powder-actuated anchors.
- F. Do not drill or cut structural members without permission from Architect/Engineer.
- G. Fabricate supports from structural steel or steel channel. Rigidly weld members or use hexagon head bolts to present neat appearance with adequate strength and rigidity. Use spring lock washers under all nuts.
- H. Install surface-mounted cabinets and panelboards with minimum of four anchors.
- I. Use sheet metal channel to bridge studs above and below cabinets and panelboards recessed in hollow partitions.
- J. Construct generator and transformer concrete pad as detailed on the drawings.
- K. No drilling of laminated wood beams without structural engineer review.

END OF SECTION

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SECTION 26 05 33.13

CONDUIT

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Metal conduit.
- B. Flexible metal conduit.
- C. Liquidtight flexible non-metallic conduit.
- D. Electrical metallic tubing.
- E. Nonmetal conduit.
- F. Electrical nonmetallic tubing.
- G. Flexible nonmetallic conduit.
- H. Fittings and conduit bodies.
- I. Surface raceway assembly.
- J. MC Cable.
- K. Flexible metal conduit.

1.2 REGULATORY REQUIREMENTS

- A. Conform to requirements of 2012 Michigan Building Code, 2011 National Electrical Code, 2011 State of Michigan Code Rules Part 8, 2003 ICC/ANSI 117.1 and local code requirements.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and indicated.

1.3 RELATED SECTIONS

- A. All drawings and specification sections apply to work in this section. Furnish all items, articles, materials, equipment, operations or methods that are mentioned, listed or scheduled on drawings or are in this specification including all labor, equipment, materials and miscellaneous incidentals necessary and/or required for the completion of this project. The work covered under this section of the specifications is in no way complete within itself but is supplementary to the entire specification and drawings.

1.4 REFERENCES

- A. ANSI C80.1 - Rigid Steel Conduit, Zinc Coated.
- B. ANSI C80.3 - Electrical Metallic Tubing, Zinc Coated.
- C. ANSI C80.3 - Rigid Aluminum Conduit.
- D. ANSI/NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.
- E. Conform to requirements of 2012 Michigan Building Code, 2011 National Electrical Code, 2011 State of Michigan Code Rules Part 8, 2003 ICC/ANSI 117.1 and local code requirements.
- F. NEMA RN 1 - Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit.
- G. NEMA TC 2 - Electrical Plastic Tubing (EPT) and Conduit (EPC-40 and EPC-80).
- H. NEMA TC 3 - PVC Fittings for Use with Rigid PVC Conduit and Tubing.

1.5 DESIGN REQUIREMENTS

- A. Conduit Size: ANSI/NFPA 70.

1.6 PROJECT RECORD DOCUMENTS

- A. Submit under provisions of Division 1.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect, and handle Products to site.
- B. Accept conduit on site. Inspect for damage.
- C. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.
- D. Protect PVC conduit from sunlight.

1.8 PROJECT CONDITIONS

- A. Verify that field measurements are as shown on Drawings.
- B. Verify routing and termination locations of conduit prior to rough-in.
- C. Conduit routing shown is diagrammatic, field route conduit to avoid interferences.

1.9 REGULATORY REQUIREMENTS

- A. Conform to requirements of 2012 Michigan Building Code, 2011 National Electrical Code Rules Part 8, 2003 ICC/ANSI 117.1 and local code requirements.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and indicated.

PART 2 PRODUCTS

2.1 CONDUIT REQUIREMENTS

- A. Minimum Size: $\frac{3}{4}$ inch unless otherwise specified.
- B. Underground Installations:
 - 1. Use Schedule 40 PVC conduit for general underground installation.
- C. Outdoor Locations, Above Grade: Use rigid steel conduit.
- D. Wet and Damp Locations: Use rigid conduit or liquid-tight non-metallic flexible conduit.
- E. Dry Locations:
 - 1. Concealed: Use electrical metallic tubing.
 - 2. Exposed: Use electrical metallic tubing.
 - 3. Use minimum $\frac{3}{4}$ " conduit for TV outlet and fire alarm drops.
 - 4. Use flexible metal conduit for final wiring connections to motors, VFD units, light fixtures in accessible ceiling and interior transformers.
 - 5. Use minimum 1" conduit for Cat 6 voice/data wiring.
 - 6. Use minimum 1" conduit for Cat 5E voice/data wiring.

2.2 METAL CONDUIT

- A. Rigid Steel Conduit: ANSI C80.1.
- B. Fittings and Conduit Bodies: ANSI C80.5.
- C. Intermediate Metal Conduit (IMC): Rigid Steel.
- D. Fittings and Conduit Bodies: ANSI/NEMA FB 1; material to match conduit.

2.3 FLEXIBLE METAL CONDUIT

- A. Description: Interlocked steel construction.
- B. Fittings: ANSI/NEMA FB 1.

2.4 LIQUID-TIGHT NON-METALLIC FLEXIBLE METAL CONDUIT

- A. Description: Type NM. Manufacturer with a spiral of rigid PVC embedded reinforcement with a flexible PVC wall.

- B. Compatible fittings.
- C. Use for wet or exterior location as final wiring connections to motors or electrical equipment, etc.

2.5 ELECTRICAL METALLIC TUBING (EMT)

- A. Description: ANSI C80.3; galvanized tubing.
- B. Fittings and Conduit Bodies: ANSI/NEMA FB 1; set screw type.

2.6 NONMETALLIC CONDUIT

- A. Description: NEMA TC 2; Schedule 40 PVC.
- B. Fittings and Conduit Bodies: NEMA TC 3.

2.7 SURFACE RACEWAY ASSEMBLY

- A. One steel raceway as scheduled or noted on the drawings.
- B. Divided non-metallic raceway basic components
 - 1. Base cover
 - 2. Flat elbow
 - 3. Divided entrance fitting
 - 4. Blank end fitting
 - 5. Dividers
 - 6. Fill-in covers
 - 7. 2 gang horizontal device bracket

2.8 FIRE RATED WIREWAY

- A. As scheduled on the drawings.
- B. Wireway sizes and quantities shall be based on the cable counts as determined by the Contractor.

2.9 MC CABLE

- A. Corrugated steel tubing with integral conductors.
- B. Use MC cable as noted on the drawings or listed in wiring methods.
- C. MC cable is not permitted for homeruns or feeders.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install nonmetallic conduit in accordance with manufacturer's instructions.

- B. Arrange supports to prevent misalignment during wiring installation.
- C. Support conduit using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.
- D. Group related conduits; support using conduit rack. Construct rack using steel channel; provide space on each for 25 percent additional conduits.
- E. Fasten conduit supports to building structure and surfaces under provisions of Section 26 05 29.
- F. Do not support conduit with wire or perforated pipe straps. Remove wire used for temporary supports.
- G. Do not attach conduit to ceiling support wires.
- H. Arrange conduit to maintain headroom and present neat appearance.
- I. Route conduit parallel and perpendicular to walls or building centerlines.
- J. Route conduit installed above accessible ceilings parallel and perpendicular to walls. Install metal conduit sleeves or fire rated assembly in all fire rated wall as identified on the electrical or architectural life safety plans.
- K. Route conduit in and under slab from point-to-point.
- L. Do not cross conduits in slab.
- M. Maintain adequate clearance between conduit and piping.
- N. Maintain 12 inch clearance between conduit and surfaces with temperatures exceeding 104 degrees F.
- O. Cut conduit square using saw or pipecutter; de-burr cut ends.
- P. Bring conduit to shoulder of fittings; fasten securely.
- Q. Join nonmetallic conduit using cement as recommended by manufacturer. Wipe nonmetallic conduit dry and clean before joining. Apply full even coat of cement to entire area inserted in fitting. Allow joint to cure for 20 minutes, minimum.
- R. Use conduit hubs or sealing locknuts to fasten conduit to sheet metal boxes in damp and wet locations and to cast boxes.
- S. Install no more than equivalent of three 90-degree bends between boxes. Use conduit bodies to make sharp changes in direction, as around beams.
- T. Provide suitable fittings to accommodate expansion and deflection where conduit crosses, control and expansion joints. Use a UL listed expansion joint. If expansion length exceeds the manufactured expansion fitting, the use of PVC coated metallic flexible conduit is an acceptable method.

- U. Provide suitable pull wire in each empty conduit except sleeves and nipples.
- V. Use suitable caps to protect installed conduit against entrance of dirt and moisture.
- W. Ground and bond conduit under provisions of Section 26 05 26.
- X. Identify conduit under provisions of Section 26 05 53.
- Y. Provide conduit sleeves in walls to meet the project requirements for power and low voltage cable installation. Provide additional conduit sleeves above those specifically shown for a complete installation. Firestop the conduits passing thru fire rated walls. In-line conduit fire stop devices are another acceptable method in coordination with NEC Article 300.21. Electrical Contractor shall be responsible to review the Architectural Life Safety drawings for fire rated wall locations.
- Z. The control system contractor shall be responsible to adhere to the mechanical plans and/or temperature control system drawings to establish conduit routes.
- AA. Electrical Contractor shall be required to install new flush mounted backboxes and conduit (concealed) in all finished areas for the following, but not limited to: exit lights, clocks, light fixtures, receptacles, sensors, switching, fire alarm manual pull stations, horn/strobe unit and strobe units, etc. Saw cut, channel and patch the walls. Neatly saw cut all existing brick veneer, glazed block or tiled areas to complete the new work. Firestop all conduits passing through fire rated walls, floors or separation barriers. Take the necessary steps to prevent chipping during the saw cutting and or wall channeling operation in the brick veneer, glazed tile or block areas. It shall be acceptable to install conduit from the opposite wall side to minimize brick veneer, glaze block or tile work. In non-finished spaces such as janitor closets, mechanical rooms, hub rooms, electrical rooms and storage rooms, conduit can be surface mounted. Provide flush mounted device boxes in all new wall construction as shown on the architectural drawings. Conduit drops or MC cable shall be concealed in the new walls and as noted and specified on the drawings.

3.2 INTERFACE WITH OTHER PRODUCTS

- A. Install conduit to preserve fire resistance rating of partitions and other elements, using materials and methods consistent with facility standards or this project specification. Contractor is responsible to review the Architectural drawings to determine fire rated locations.
- B. Route conduit through roof openings for piping and ductwork or through suitable roof jack with pitch pocket or detail to match roof type specified.

END OF SECTION

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SECTION 26 05 33.16

BOXES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Wall and ceiling outlet boxes.
- B. Pull and junction boxes.
- C. Fire alarm device boxes.

1.2 RELATED SECTIONS

- A. All drawings and specification sections apply to work in this section. Furnish all items, articles, materials, equipment, operations or methods that are mentioned, listed or scheduled on drawings or are in this specification including all labor, equipment, materials and miscellaneous incidentals necessary and/or required for the completion of this project. The work covered under this section of the specifications is in no way complete within itself but is supplementary to the entire specification and drawings.

1.3 REFERENCES

- A. NEMA FB 1 - Fittings and Supports for Conduit and Cable Assemblies.
- B. NEMA OS 1 - Sheet-steel Outlet Boxes, Device Boxes, Covers, and Box Supports.
- C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
- D. Conform to requirements of 2012 Michigan Building Code, 2011 National Electrical Code, 2011 State of Michigan Code Rules Part 8, 2003 ICC/ANSI 117.1 and local code requirements.

1.4 SUBMITTALS FOR REVIEW

- A. Provide submittal as listed in Section 26 01 00.

1.5 REGULATORY REQUIREMENTS

- A. Conform to requirements of 2012 Michigan Building Code, 2011 National Electrical Code, 2011 State of Michigan Code Rules Part 8, 2003 ICC/ANSI 117.1 and local code requirements.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and indicated.

PART 2 PRODUCTS

2.1 BRANCH DEVICE BOXES

- A. Sheet Metal Outlet Boxes: 4" square stamped steel box with single gang device ring.
- B. Nonmetallic Outlet Boxes: NEMA OS 2.
- C. Cast Aluminum Boxes: for exterior location use a single gang shallow box with thread hub connection. Provide gasketed cover by box manufacturer.
- D. Use masonry box in masonry walls.
- E. Use 4" octagon box for ceiling smoke detectors.
- F. Use in line non-metallic type box in non-metal surface raceway assembly as scheduled and detailed on the drawings.
- G. Non-metallic branch device are not permitted for this project unless noted otherwise.

2.2 FLOOR BOXES

- A. As scheduled on the drawing.

2.3 PULL AND JUNCTION BOXES

- A. Sheet Metal Boxes
 - 1. NEMA enclosure for interior location.
 - 2. NEMA 3R or 4X for exterior location.
 - 4. Non-metallic pull and junction boxes are not permitted for this project unless noted otherwise.

2.4 OCCUPANCY SENSORS

- A. Refer to the manufacturer for box requirements.

2.5 PUBLIC ADDRESS AND TELEVISION DISTRIBUTION SYSTEM

- A. Refer to Sections 26 06 50 and 27 13 33.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install in locations as shown on Drawings, and as required for wire pulling, equipment connections and compliance with regulatory requirements.
- B. Set wall mounted boxes at elevations to accommodate mounting heights indicated.
- C. Electrical boxes are shown on Drawings in approximate locations unless dimensioned.
- D. Orient boxes to accommodate wiring devices oriented as specified in Section 26 27 26.
- E. Maintain headroom and present neat mechanical appearance.

- F. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only.
- G. Inaccessible Ceiling Areas: Install outlet and junction boxes no more than 6 inches from ceiling access panel or from removable recessed luminaire.
- H. Install boxes to preserve fire resistance rating of partitions and other elements.
- I. Coordinate mounting heights and locations of outlets for counters, backsplashes, benches in casework and workstations.
- J. Locate outlet boxes to allow luminaires positioned as shown.
- K. Align adjacent wall mounted outlet boxes for switches, etc.
- L. Use flush mounting outlet box in finished areas. Surface mounted boxes are acceptable for non-finished spaces.
- M. Locate flush mounting box in masonry wall to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat opening.
- N. Do not install flush mounting box back-to-back in walls; provide minimum 6 inches separation. Provide minimum 24 inches separation in acoustic rated walls.
- O. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness.
- P. Use stamped steel bridges to fasten flush mounting outlet box between studs.
- Q. Install flush mounting box without damaging wall insulation or reducing its effectiveness.
- R. Use adjustable steel channel fasteners for hung ceiling outlet box.
- S. Do not fasten boxes to ceiling support wires.
- T. Support boxes independently of conduit.
- U. Use gang box where more than one device is mounted together. Do not use sectional box.
- V. Use gang box with plaster ring for single device outlets.
- W. Use cast floor boxes for installations in slab on grade; formed steel boxes are acceptable for other installations. Set floor boxes level.
- X. Install in line boxes in the surface mounted raceway system as shown on the drawing.
- Y. Large Pull Boxes: Provide screwed cover or hinged enclosure in interior dry locations as noted or specified on the drawing.

3.2 INTERFACE WITH OTHER PRODUCTS

- A. Coordinate installation of outlet box for equipment connected under other sections.
- B. Refer to Section 28 31 00 for fire alarm mounting height.

3.3 ADJUSTING

- A. Adjust flush-mounting outlets to make front flush with finished wall material.
- B. Install knockout closures in unused box openings.

END OF SECTION

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SECTION 26 05 53
ELECTRICAL IDENTIFICATION

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Nameplates and labels.
- B. Wire and cable markers.
- C. Conduit markers.
- D. Labeling methods and standards.
- E. Conductor color coding and identification.
- F. Panelboard directory.

1.2 RELATED SECTIONS

- A. All drawings and specification sections apply to work in this section. Furnish all items, articles, materials, equipment, operations or methods that are mentioned, listed or scheduled on drawings or are in this specification including all labor, equipment, materials and miscellaneous incidentals necessary and/or required for the completion of this project. The work covered under this section of the specifications is in no way complete within itself but is supplementary to the entire specification and drawings.

1.3 REFERENCES

- A. Conform to requirements of 2012 Michigan Building Code, 2011 National Electrical Code, 2011 State of Michigan Code Rules Part 8, 2003 ICC/ANSI 117.1 and local code requirements.

1.4 REGULATORY REQUIREMENTS

- A. Conform to requirements of 2012 Michigan Building Code, 2011 National Electrical Code, 2011 State of Michigan Code Rules Part 8, 2003 ICC/ANSI 117.1 and local code requirements.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

1.5 FACILITY STANDARDS

- A. Refer also to specific labeling and identification requirements on the drawings in addition to these specifications.
- B. Inspect labeling standards to confirm facility standards.

PART 2 PRODUCTS

2.1 NAMEPLATES AND LABELS

A. Nameplates:

1. Engraved three-layer laminated plastic, black letters on white background for normal power to match facility standard. Refer to labeling methods and standards for sizes.

B. Locations:

1. Each electrical distribution panelboard, switchboard and power panel.
2. Each starter.
3. Each disconnect.

C. Nameplate size minimum 1"x3" or match existing.

1. Match facility standards.

2.2 WIRE MARKERS

A. Manufacturers:

1. Brady or equal.

B. Description: Tape type wire markers.

C. Locations: Each conductor at panelboard gutters, pull boxes, outlet and junction boxes, and each load connection.

D. Legend:

1. Power and Lighting Circuits: Branch circuit or feeder number indicated on drawings.
2. Control Circuits: Control wire numbers.

2.3 CONDUIT MARKERS

A. Legend:

1. Normal Power Supply Panel Feeder: Indicate panel being fed and from where. (LPM fed from DP4)

2.4 LABELING METHODS AND STANDARDS

A. Engraved Labels

1. All electrical panels, starters, disconnect switches, terminal cabinets, fire alarm panel. These labels shall be secured with double face type or mechanically fastened in applications where the tape may have a tendency to fail.
2. Normal power fed systems shall have white labels with black lettering.

3. Lettering sizes may vary due to space constraints or to distinguish between main versus branch systems. Sizes should be consistent throughout the project, use the following guidelines:

Switchboard or Panelboard Main Label:	1" high minimum
Switchboard or Panelboard Branches	1/2" high minimum
Starters, Disconnects	1/2" high minimum
Manual Motor Starters	1/4" high minimum

4. All labels shall identify where panel or equipment is fed from. Ex (panel A fed from MDP)

B. Adhesive Tape Labels

1. All switches, receptacles, small manual motor starters or toggle switches shall have the circuit number identified on the device cover plate using clear adhesive tape labels with 1/4" high printed block characters in black. No handwritten or printed labeling will be accepted as final record, machine lettered adhesive tape labels shall be used upon project completion.
2. Provide circuit identification on junction or pull box covers for all circuits within.
3. Conductors in branch circuit panelboards shall have phase conductors, neutrals and grounds identified with adhesive labels within the panel at junction or pull boxes and at the device outlet box. Refer also to conductor color coding with respect to operating voltage.

2.5 CONDUCTOR COLOR CODING AND IDENTIFICATION

1. Feeder phase conductors shall be identified as to phase and operating voltage using colored tape as follows:

	<u>480 Volt</u>	<u>120/208 Volt</u>
Phase A	yellow	black
Phase B	brown	red
Phase C	orange	blue
Neutral	gray	white
Ground	green	green

2. Conductors from #18 up through #10 shall have colored insulating jackets to match the color code and phasing scheme as described above for feeders. Receptacle and lighting circuit conductors shall be #12 minimum for 15 or 20 amp circuits. Conductors #18 through #14 shall only be used for control circuits with colored jackets and wire numbers correlated to each system accordingly.

3. Spare conductors shall be clearly identified as such through color, labels, tags, etc.

PART 3 EXECUTION

3.1 PREPARATION

- A. Degrease and clean surfaces to receive nameplates and labels.

3.2 APPLICATION

- A. Install nameplate and label parallel to equipment lines.
- B. Secure nameplate to equipment front using adhesive.
- C. Secure nameplate to inside surface of door on panelboard that is recessed in finished locations.
- D. Contractor shall review the drawings to confirm all label schemes or ID requirements listed or noted on the drawings. Review mechanical drawings for equipment ID designation to provide a ID tag that corresponds to the mechanical equipment.
- E. Panelboard, switchboards, transformers, etc. shall include their source of power included in nameplate label. (i.e. LPA feed from PP2)

END OF SECTION

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SECTION 26 05 83
EQUIPMENT CONNECTIONS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Mechanical equipment.

1.2 RELATED SECTIONS

- A. All drawings and specification sections apply to work in this section. Furnish all items, articles, materials, equipment, operations or methods that are mentioned, listed or scheduled on drawings or are in this specification including all labor, equipment, materials and miscellaneous incidentals necessary and/or required for the completion of this project. The work covered under this section of the specifications is in no way complete within itself but is supplementary to the entire specification and drawings.

1.3 REFERENCES

- A. NEMA WD 1 - General Purpose Wiring Devices.
- B. NEMA WD 6 - Wiring Device Configurations.
- C. Conform to requirements of 2012 Michigan Building Code, 2011 National Electrical Code, 2011 State of Michigan Code Rules Part 8, 2003 ICC/ANSI 117.1 and local code requirements.

1.4 COORDINATION

- A. Coordinate work under provisions of Division 1.
- B. Obtain and review shop drawings, product data, and manufacturer's instructions for equipment furnished under other sections.
- C. Determine connection locations and requirements.
- D. Sequence rough-in of electrical connections to coordinate with installation schedule for equipment.
- E. Sequence electrical connections to coordinate with start-up schedule for equipment.
- F. Mechanical Trades shall be responsible to furnish and install all temperature control components, associated conduit, wiring and 120 volt power supplies. Electrical Trades shall reserve 120 volt circuit breaker as scheduled in the panels for this purpose.
- G. All VFD programming shall be completed as part of the Mechanical Trades work.

1.5 REGULATORY REQUIREMENTS

- A. Conform to requirements of 2012 Michigan Building Code, 2011 National Electrical Code, 2011 State of Michigan Code Rules Part 8, 2003 ICC/ANSI 117.1 and local code requirements.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and indicated.

PART 2 PRODUCTS

2.1 CORDS AND CAPS

- A. Manufacturers:
 - 1. Hubbell, Pass & Seymour, Leviton or equal.
- B. Attachment Plug Construction: Conform to NEMA WD 1.
- C. Configuration: NEMA WD 6; match receptacle configuration at outlet provided for equipment.
- D. Cord Construction: ANSI/NFPA 70, Type SO multi-conductor flexible cord with identified equipment grounding conductor, suitable for use in damp locations.
- E. Size: Suitable for connected load of equipment, length of cord, and rating of branch circuit over current protection.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify conditions under provisions of Division 1.
- B. Verify that equipment is ready for electrical connection, wiring, and energization.

3.2 ELECTRICAL CONNECTIONS

- A. Make electrical connections in accordance with equipment manufacturer's instructions.
- B. Make conduit connections to equipment using metallic flexible conduit for all dry interior locations. Use liquid tight non-metallic flexible conduit with watertight connectors in damp or wet locations and kitchen areas.
- C. Make wiring connections using wire and cable with insulation suitable for temperatures encountered in heat producing equipment.
- D. Provide the NEMA configuration that matches receptacle.
- E. Provide suitable strain-relief clamps and fittings for cord connections at outlet boxes and equipment connection boxes.

- F. Install disconnect switches, power relays, motor starters and as noted on the drawings.
- G. Provide and install fuses in mechanical trades furnished fused disconnects and combination starters per manufacturer's requirements.
- H. Electrical Contractor shall complete all main power wiring to the mechanical equipment shown and noted.
- I. VFD control wiring and programming shall be completed as part of the Mechanical Trades bid. VFD shall be factory installed with the equipment unless noted or specified otherwise.

END OF SECTION

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SECTION 26 27 26

WIRING DEVICES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Wall switches.
- B. Wall dimmers.
- C. Receptacles.
- D. Device plates.

1.2 RELATED SECTIONS

- A. All drawings and specification sections apply to work in this section. Furnish all items, articles, materials, equipment, operations or methods that are mentioned, listed or scheduled on drawings or are in this specification including all labor, equipment, materials and miscellaneous incidentals necessary and/or required for the completion of this project. The work covered under this section of the specifications is in no way complete within itself but is supplementary to the entire specification and drawings.

1.3 REFERENCES

- A. NEMA WD 1 - General Requirements for Wiring Devices.
- B. NEMA WD 6 - Wiring Device -- Dimensional Requirements.
- C. Conform to requirements of 2012 Michigan Building Code, 2011 National Electrical Code, 2011 State of Michigan Code Rules Part 8, 2003 ICC/ANSI 117.1 and local code requirements.
- D. ADA - Americans with Disabilities Act - As amended.

1.4 REGULATORY REQUIREMENTS

- A. Conform to requirements of 2012 Michigan Building Code, 2011 National Electrical Code, 2011 State of Michigan Code Rules Part 8, 2003 ICC/ANSI 117.1 and local code requirements.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and indicated.

PART 2 PRODUCTS

2.1 WALL SWITCHES

- A. Manufacturers:

1. Pass & Seymore, Hubbell, Leviton or equal.
 - B. Description: NEMA WD 1, Heavy-Duty, AC only general-use snap switch.
 - C. Body and Handle: Color shall be white, ivory, brown or gray as advised by the Architect.
 - D. Ratings:
 1. Voltage: 120/277 volts, AC.
 2. Current: 20 amperes.
- 2.2 WALL DIMMERS
- A. Manufacturers:
 1. Lutron, Leviton, Hubbell, or equal.
 - B. Description: NEMA WD 1; dimmer type as indicated on drawings or in schedule.
 - C. Provide 0-10 volt electronic dimmers for dimming LED light fixtures.
- 2.3 RECEPTACLES
- A. Manufacturers:
 1. Hubbell, Pass & Seymore, Leviton, or equal
 - B. Description: NEMA WD 1, Heavy-duty specification grade duplex receptacle.
 - C. Device Body: Color shall be ivory, white, brown or gray as advised by the Architect.
 - D. Configuration: NEMA WD 6, type as specified and indicated.
 - E. Convenience Receptacle: Type 5-20.
 - F. GFCI Receptacle: Convenience duplex receptacle with integral ground fault circuit interrupter to meet regulatory requirements.
- 2.4 WALL PLATES
- A. Decorative Cover Plate: Smooth nylon. Color shall be white, ivory, brown, gray or stainless steel as advised by the Architect.
 - B. Use die cast metal "in use" weather proof rated covers at exterior locations as indicated on the drawings to meet 2011 NEC Section 406.
 - C. Provide blank metal cover plates on abandoned boxes.
 - D. Provide stamped metal cover plate for unfinished spaces.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that outlet boxes are installed at proper height.
- B. Verify that wall openings are neatly cut and will be completely covered by wall plates.
- C. Verify that floor boxes are adjusted properly.
- D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.

3.2 PREPARATION

- A. Provide extension rings to bring outlet boxes flush with finished surface.
- B. Clean debris from outlet boxes.

3.3 INSTALLATION

- A. Install devices plumb and level.
- B. Install switches with OFF position down.
- C. Install wall dimmers to achieve full rating specified and indicated after derating for ganging as instructed by manufacturer.
- D. Do not share neutral conductor on load side of dimmers.
- E. Install receptacles with grounding pole on bottom.
- F. Connect wiring device grounding terminal to outlet box with bonding jumper or branch circuit equipment grounding conductor where specified.
- G. Install plates on switch, receptacle, and blank outlets in finished areas.
- H. Connect wiring devices by wrapping conductor around screw terminal.
- I. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface mounted outlets.
- J. Install protective rings on active flush cover service fittings.

3.4 INTERFACE WITH OTHER PRODUCTS

- A. Confirm with architectural drawings for counter casework, etc. details for wiring devices mounting heights.
- B. Install wall switch 48 inches to top of box above finished floor.
- C. Install convenience receptacle 16 inches to bottom of box above finished floor.

- D. Install convenience receptacle 6 inches above backsplash of counter.
- E. Install dimmer 48 inches to top of box above finished floor.
- F. Electrical Contractor shall obtain a copy of the latest accepted Michigan Barrier Free Design Manual for additional mounting requirements.
- G. Refer to all other sections of the specification, drawings, and Architectural drawing for specific mounting requirements for clocks, receptacles shown in counters, work stations. Do not rely solely on the electrical drawings for this information. Division 26, 27 & 28 Contractor shall be responsible to review all project documentation and obtain all required information from the district.
- H. Refer to section 283100 and drawing notes for fire alarm device mounting heights.
- I. 18" mounting height is lieu of the 16" minimum specified is acceptable pending masonry course lines.

3.5 FIELD QUALITY CONTROL

- A. Inspect each wiring device for defects.
- B. Operate each wall switch with circuit energized and verify proper operation.
- C. Verify that each receptacle device is energized.
- D. Test each receptacle device for proper polarity.
- E. Test each GFCI receptacle device for proper operation.

3.6 ADJUSTING

- A. Adjust devices and wall plates to be flush and level.

END OF SECTION

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SECTION 26 28 13

FUSES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Fuses.

1.2 RELATED SECTIONS

- A. All drawings and specification sections apply to work in this section. Furnish all items, articles, materials, equipment, operations or methods that are mentioned, listed or scheduled on drawings or are in this specification including all labor, equipment, materials and miscellaneous incidentals necessary and/or required for the completion of this project. The work covered under this section of the specifications is in no way complete within itself but is supplementary to the entire specification and drawings.

1.3 REFERENCES

- A. Conform to requirements of 2012 Michigan Building Code, 2011 National Electrical Code, 2011 State of Michigan Code Rules Part 8, 2003 ICC/ANSI 117.1 and local code requirements.
- B. NEMA FU 1 - Low Voltage Cartridge Fuses.

1.4 SUBMITTALS

- A. Provide submittal as listed in Section 26 01 00.
- B. Product Data: Provide data sheets showing electrical characteristics including time-current curves.

1.5 PROJECT RECORD DOCUMENTS

- A. Record actual fuse sizes.

1.6 REGULATORY REQUIREMENTS

- A. Conform to requirements of 2012 Michigan Building Code, 2011 National Electrical Code, 2011 State of Michigan Code Rules Part 8, 2003 ICC/ANSI 117.1 and local code requirements.
- B. Furnish products listed and classified by UL as suitable for purpose specified and indicated.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Bussman or equal.

2.2 FUSE REQUIREMENTS

- A. Dimensions and Performance: NEMA FU 1, Class as specified or indicated.
- B. Voltage: Provide fuses with voltage rating suitable for circuit phase-to-phase voltage.
- C. Main Service Switches Larger than 600 amperes: Class L (time delay).

2.3 CLASS RK1 (TIME DELAY) CURRENT LIMITING FUSES

- A. Manufacturers:
 - 1. Bussman or equal.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install fuses in accordance with manufacturer's instructions.
- B. Install fuse with label oriented such that manufacturer, type, and size are easily read.
- C. Install spare fuse cabinet as shown on the drawing.

END OF SECTION

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SECTION 26 28 16
ENCLOSED SWITCHES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Fusible switches.
- B. Nonfusible switches.
- C. Fuses.

1.2 REFERENCES

- A. NEMA KS 1 - Enclosed Switches.
- B. Conform to requirements of 2012 Michigan Building Code, 2011 National Electrical Code, 2011 State of Michigan Code Rules Part 8, 2003 ICC/ANSI 117.1 and local code requirements.
- C. UL 198C - High-Interrupting Capacity Fuses; Current Limiting Type.
- D. UL 198E - Class R Fuses.

1.3 SUBMITTALS

- A. Provide submittal as listed in Section 26 01 00.
- B. Product Data: Provide switch ratings and enclosure dimensions.
- C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of Product.

1.4 REGULATORY REQUIREMENTS

- A. Conform to requirements of 2012 Michigan Building Code, 2011 National Electrical Code, 2011 State of Michigan Code Rules Part 8, 2003 ICC/ANSI 117.1 and local code requirements.
- B. Furnish products listed and classified by UL as suitable for purpose specified and shown.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. As scheduled on the drawings.

2.2 ENCLOSED SWITCHES

- A. Fusible Switch Assemblies: NEMA KS 1, Type Heavy Duty load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position. Fuse clips: Designed to accommodate Class R fuses.
- B. Nonfusible Switch Assemblies: NEMA KS 1, Type Heavy Duty load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position.
- C. Enclosures: NEMA KS 1.
 - 1. Interior Dry Locations: Type 1.
 - 2. Exterior Locations: Type 3R.
- D. Disconnect switches serving the elevator main power must be a heavy duty type to meet the State of Michigan Elevator Code.

2.3 FUSES

- A. Manufacturers:
 - 1. Bussman or equal.
- B. Description: Dual element, current limiting, time delay, one-time fuse, 600 volt.
- C. Interrupting Rating: 200,000 rms amperes.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install disconnect switches where indicated.
- B. Install fuses in fusible disconnect switches.
- C. Provide adhesive label on inside door of each switch indicating UL fuse class and size for replacement.
- D. Contractor shall confirm final elevator main power requirements to properly size the disconnect switch and fusing.
- E. Electrical Contractor shall be responsible to review the mechanical equipment schedules to determine if any factory installed switches are scheduled and noted as part of the equipment to minimize duplication by electrical trades.
- F. Furnish and install a separate lockable fusible disconnect switch for the elevator car fan and light.
- G. Furnish and install a lockable fusible disconnect switch for each boiler main incoming power disconnecting means to meet the State's Boiler Code Division requirements.

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END OF SECTION

SECTION 26 51 13
INTERIOR LUMINAIRES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Interior luminaires per schedule.

1.2 RELATED SECTIONS

- A. All drawings and specification sections apply to work in this section. Furnish all items, articles, materials, equipment, operations or methods that are mentioned, listed or scheduled on drawings or are in this specification including all labor, equipment, materials and miscellaneous incidentals necessary and/or required for the completion of this project. The work covered under this section of the specifications is in no way complete within itself but is supplementary to the entire specification and drawings.

1.3 REFERENCES

- A. ANSI C78.379 - Electric Lamps - Incandescent and High-Intensity Discharge Reflector Lamps - Classification of Beam Patterns.
- B. ANSI C82.1 - Ballasts for Fluorescent Lamps - Specifications.
- C. ANSI C82.4 - Ballasts for High-Intensity Discharge and Low Pressure Sodium Lamps (Multiple Supply Type).
- D. NEMA WD 6 - Wiring Devices-Dimensional Requirements.
- E. Conform to requirements of 2012 Michigan Building Code, 2011 National Electrical Code, 2011 State of Michigan Code Rules Part 8, 2003 ICC/ANSI 117.1 and local code requirements.
- F. NFPA 101 - Life Safety Code.
- G. Michigan Uniform Energy Code, latest adopted edition.
- H. ASHRAE 90.1 2007 Edition.
- I. LED Standards LM 79 and LM 80.

1.4 SUBMITTALS FOR REVIEW

- A. Provide submittal as listed in Section 26 01 00.
- B. Shop Drawings: Indicate dimensions and components for each luminaire that is not a standard product of the manufacturer.
- C. Product Data: Provide dimensions, ratings, and performance data.

1.5 REGULATORY REQUIREMENTS

- A. Conform to requirements of 2012 Michigan Building Code, 2011 National Electrical Code, 2011 State of Michigan Code Rules Part 8, 2003 ICC/ANSI 117.1 and local code requirements.
- B. Conform to requirements of NFPA 101.
- C. Products: Listed and classified by Underwriters Laboratories, Inc. as suitable for the purpose specified and indicated.
- D. Michigan Uniform Energy Code.

PART 2 PRODUCTS

2.1 LUMINAIRES

- A. Furnish Products as scheduled on the drawings.

2.2 BALLASTS

- A. As scheduled on the drawings.
- B. Ballasts shall include a factory disconnecting means in accordance with 2011 NEC 410-130G.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install suspended luminaires using pendants supported from swivel hangers. Provide pendant length required to suspend luminaire at indicated height.
- B. Support luminaires independent of ceiling framing.
- C. Locate recessed ceiling luminaires as indicated on reflected ceiling plan.
- D. Install surface mounted luminaires and exit signs plumb and adjust to align with building lines and with each other. Secure to prevent movement.
- E. Exposed Grid Ceilings: Provide auxiliary members spanning ceiling grid members to support surface mounted luminaires. Fasten surface mounted luminaires to ceiling grid members using bolts, screws, rivets, or suitable clips at a minimum of (4) points of attachment to prevent movement.
- F. Install recessed luminaires to permit removal from below.
- G. Install recessed luminaires using accessories and firestopping materials to meet regulatory requirements for fire rating.
- H. Install clips to secure recessed grid-supported luminaires in place at a minimum of (4) points of attachment to prevent movement.

- I. Install wall mounted luminaires at height as indicated on Drawings and/or architectural drawings.
- J. Install accessories furnished with each luminaire.
- K. Connect luminaires and exit signs to power station/invertor.
- L. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within luminaire.
- M. Bond products and metal accessories to branch circuit equipment grounding conductor.
- N. Install specified lamps in each luminaire.

3.2 FIELD QUALITY CONTROL

- A. Operate each luminaire after installation and connection. Inspect for proper connection and operation.

3.3 ADJUSTING

- A. Contract Closeout: Division 1: Adjusting installed work.
- B. Aim and adjust luminaires as indicated or as directed.
- C. Position exit sign directional arrows as indicated.

3.4 CLEANING

- A. Contract Closeout: Cleaning installed work.
- B. Clean electrical parts to remove conductive and deleterious materials.
- C. Remove dirt and debris from enclosures.
- D. Clean photometric control surfaces as recommended by manufacturer.
- E. Clean finishes and touch up damage.

3.5 DEMONSTRATION AND INSTRUCTIONS

- A. Contract Closeout: Division 1: Demonstrating installed work.

3.6 PROTECTION OF FINISHED WORK

- A. Contract Closeout: Protecting installed work.
- B. Relamp luminaires that have failed lamps at Substantial Completion.

3.7 SCHEDULES

A. Refer to Drawings.

END OF SECTION

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SECTION 28 31 00

FIRE ALARM SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Modify existing point addressable main fire alarm panel devices.
- B. Fire alarm system shall not be limited to: Manual pull stations, audio/visual devices and visual devices. Include all associated code mandated components, wiring for a complete operating system.
- C. Fire alarm ADA signaling devices.
- D. Fire alarm wiring.
- E. The Fire Alarm vendor shall include in their bid any cost for requesting AutoCAD backgrounds for their use from the Architect or Engineer. The cost will be \$150.00 for the first plan, and \$50.00 for each additional plan that may be requested for AutoCAD use. A waiver of responsibility for the Architect and Engineer related to Contractor use of the CAD files shall be signed by the Fire Alarm vendor.

1.2 RELATED SECTIONS

- A. All drawings and specification sections apply to work in this section. Furnish all items, articles, materials, equipment, operations or methods that are mentioned, listed or scheduled on drawings or are in this specification including all labor, equipment, materials and miscellaneous incidentals necessary and/or required for the completion of this project. The work covered under this section of the specifications is in no way complete within itself but is supplementary to the entire specification and drawings.

1.3 REFERENCES

- A. Conform to requirements of 2012 Michigan Building Code, 2011 National Electrical Code, 2011 State of Michigan Code Rules Part 8, 2003 ICC/ANSI 117.1 and local code requirements.
- B. NFPA 72 - Current adopted code.
- C. NFPA 101 - Life Safety Code, current adopted code.
- D. State of Michigan – Bureau of Fire Services.
- E. State of Michigan, 1999 School Rules.
- F. NFPA 90A Current Adopted Code
- G. NFPA 92A Current Adopted Code

H. NFPA 92B Current Adopted Code

I. UL References:

UL 864
UL268
UL268A
UL 217
UL 521
UL 228
UL 464
UL 38
UL 1481
UL 1711

1.4 SUBMITTALS

- A. Provide submittal as listed in Section 26 01 00. Submittal cut sheets shall be arrowed or marked with catalog numbers. Failure to comply will be cause for returning submittal for corrections at no delays or extra cost to the Owner.
- B. Shop Drawings: Provide control panel layout and system wiring diagram showing each device and wiring connection required.

1.5 PROJECT RECORD DOCUMENTS

- A. Record actual locations for complete fire alarm system.

1.6 OPERATION AND MAINTENANCE DATA

- A. Submit as specified.
- B. Operation Data: Operating instructions.
- C. Maintenance Data: Maintenance and repair procedures.

1.7 REGULATORY REQUIREMENTS

- A. Conform to requirements of 2012 Michigan Building Code, 2011 National Electrical Code, 2011 State of Michigan Code Rules Part 8, 2003 ICC/ANSI 117.1 and local code requirements .
- B. NFPA 72 - Current adopted code.
- C. NFPA 101 - Life Safety Code, current adopted code.
- D. State of Michigan, Bureau of Fire Services.
- E. State of Michigan, 1999 School Rules.
- F. NFPA 90A Current Adopted Code

G. NFPA 92A Current Adopted Code

H. NFPA 92B Current Adopted Code

I. UL References:

UL 864
UL268
UL268A
UL 217
UL 521
UL 228
UL 464
UL 38
UL 1481
UL 1711

1.8 SCOPE OF WORK

A. This bid package shall include modification of the existing fire alarm system.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Existing.

B. U.L. requirements. All devices must be U.L. 864 9th Edition compatible with the control panel.

2.2 OPERATION

A. The operation of any manual pull station, flow switch, smoke detector, duct smoke detector, shall cause the sounding of all alarm horns on a temporal pattern basis, sequential flashing of system strobes, activate common alarm relay contacts on the control panel and indicate on the control panel's LCD display the zone and type of device sounding the alarm.

In addition, the operation of any duct smoke detector shall shut down its associated fan or damper motor. Complete interwiring between detector and mechanical equipment control panel.

Refer to the current adopted NFPA 72 Fire Alarm Code for the allowable detector distance and location from the pair of doors.

B. The operation of the panel mounted alarm silencing switch will turn off all horns but the strobes will continue to flash until the device actuating the alarm is reset to its normal position and the panel mounted system reset button is operated, at which time the system will return to its normal stand by (supervisory) mode.

C. Any system trouble condition such as an open circuit or ground condition will activate a common trouble LED and indicate on the control panel LCD display the exact zone,

circuit or internal panel condition causing the trouble condition. Correction of the trouble source will return the panel to its normal standby mode.

- D. Initiating device circuits shall be two-wire style B, and horn or strobe circuits shall be two-wire style Y utilizing end of line resistors for circuit supervision. All wiring to initiating and signaling devices shall be looped and continuous to the end of line resistor on its respective circuit. T-tapping is not permissible.

2.3 DEVICES (all point addressable type that is compatible to the main panel)

- A. Audio/Visual Units: Provide horn and strobe units with 24VDC horn and ADA approved strobe for mounting to a 4" square box. Refer to the drawings for candela rating.
- B. Visual Units: Provide complete with ADA-approved strobe for mounting to a single gang box. Refer to the drawings for candela rating.
- C. Audio/visual and visual units shown for ceiling installation shall include vertical lettering. Horizontal lettering is not acceptable.

2.5 FIRE ALARM WIRING

- A. Use (1) pair #18/2 twisted shielded for initiating devices unless directed otherwise by the manufacturer.
- B. Use (1) pair #14 for power duct smoke detectors as directed by the manufacturer.
- C. Use (1) pair #14 for horn/strobe circuits as directed by the manufacturer.
- D. Use (2) pair #18 for control to remote alarm and test station with duct smoke detector.
- E. All fire alarm wiring shall be in compliance with NEC Article 760.
- F. Fire alarm supplier to provide circuiting to comply with voltage drop and load calculations per Code requirements.
- G. All wire sizes indicated are minimum.

2.6 NAC PANEL

- A. The fire alarm vendor shall be responsible to complete all engineering and voltage drop calculations to determine the NAC panel location and quantities. Division 28 Contractor shall be responsible to contact the competitive vendors listed for the location and quantities for wiring to and 120 volt power. Include the costs as part of the bid. Wiring to a local general purpose receptacle is an acceptable method. Provide a smoke detector for each NAC panel and wiring to the main fire alarm panel.

2.7 POWER SUPPLIES

- A. Fire alarm vendor shall furnish and install power supplies as required for a complete operating system. Electrical Trades shall field select the location as advised by the fire alarm vendor.

PART 3 EXECUTION

3.1 INSTALLATION

- A. All junction boxes for fire alarm raceway system shall be painted red labeled "FIRE ALARM". Junction boxes installed in theatrical space where the project requires a black room finish scheme, label the junction box "fire alarm".
- B. Provide and install the fire alarm system in strict accordance with the plans and specifications, codes and manufacturer's instructions.
- C. Fully test the fire alarm system in accordance with NFPA 72, Chapter 7.
- D. Division 28 Contractor and the fire alarm vendor shall be responsible for furnishing devices above those shown on the drawings as required to meet the inspector's system walk-thru.
- E. Fire alarm vendor shall be responsible to certify the sound coverage for the entire facility.
- F. Audio/visual and visual units shall be installed in accordance with Michigan Building Code under the fire protection system section or NFPA 72 Fire Alarm Code wall mounted appliance shall be mounted such that the entire lens is not less than 80 inches, and not greater than 96 inches above the finished floor. Ceiling mounted device is an acceptable method. Ceiling mounting devices are designated with a C subscript letter.
- G. Electrical Trade shall complete the entire fire alarm system in accordance with plans and specifications.
- H. All fire alarm wiring installation that may be required to be installed through non-accessible ceiling spaces, and cannot be installed in conduit or cable tray, free air method will be acceptable for those spaces. Open wiring is acceptable method. Properly secure to ceiling structure, use J hooks or D-rings. The cable shall be plenum rated for this application.
- I. Ceiling mounted fire alarm device locations are shown diagrammatic. The design requirement shall be to install the device centered in the classrooms, corridor, offices, etc. Confirm the location with lighting, speaker, HVAC diffusers, to avoid interferences.
- J. NAC panel(s) require a dedicated 120 volt power source. The Contractor shall be responsible for coordinating NAC panel quantities and locations with their fire alarm vendor and include all power circuit costs in the bid.

3.2 MANUFACTURERS FIELD SERVICES

- A. The manufacturer shall provide on-site technical for start-up, commissioning, programming, and trouble shooting.
- B. Provide certification that system operates to meet State requirements.
- C. Sound coverage. Fire alarm vendor shall be responsible for proper audibility levels. Include all costs for additional devices, inspection and testing.

3.3 WARRANTY

- A. Provide a one-year guarantee from date of system acceptance by the Owner.

3.4 CLOSE-OUT

- A. Provide O&M manuals, warranty letter, as-built drawings and inspection sign-off.

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END OF SECTION