

CITY OF DE PERE

PROJECT

25-21

CITY HALL FIRST FLOOR REMODEL

BID DATE:

JULY 31, 2025

@ 1:00 PM

Bid documents, including plans and specifications, are available for download at www.QuestCDN.com. The QuestCDN website can also be accessed through the City website at www.deperewi.gov/projects or by pressing the *Projects* icon at the bottom of any City website page. Download cost is \$22 for each contract. Bidders will be charged an additional fee of \$42 to submit a bid electronically. Bidding documents may be viewed on the QuestCDN website or at the Municipal Service Center, 925 S. Sixth Street, De Pere, WI 54115.

Bid Tabs must be verified by staff prior to posting and will be available for viewing on the website within 7 days following the bid opening. Award information will be pending until approved by the Common Council.

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JULY 11, 2025 – JULY 18, 2025

CITY OF DE PERE

ADVERTISEMENT TO BID

PROJECT 25-21

CITY HALL FIRST FLOOR REMODEL

Online bids will be received and accepted for Project 25-21 City Hall First Floor Remodel via the online electronic bidding service through QuestCDN.com, until 1:00 PM, Thursday, July 31, 2025, at which time they will be publicly accepted, displayed and read aloud.

Project 25-21 for which proposals are being sought includes the following approximate quantities:

- Interior remodel of existing City Hall First Floor

Complete digital project bidding documents are available for viewing and/or downloading at www.QuestCDN.com or may be examined at the office of the Director of Public Works. Digital plan documents may be downloaded for \$22 by inputting Quest project #9408312 on Quest's Project Search page. Project documents must be downloaded from QuestCDN which will add your company to the Planholder List and allow access to vBid online bidding for the submittal of your bid. Bidders will be charged an additional fee of \$42 to submit a bid electronically. The QuestCDN website can also be accessed through the City website at www.deperewi.gov/projects or by pressing the *Projects* icon at the bottom of any City website page. Contact QuestCDN Customer Support at 952-233-1632 or info@questcdn.com for assistance in membership registration, downloading digital project information and vBid online bid submittal questions.

Each proposal shall be accompanied by a bid bond in an amount equal to five percent (5%) of the bid, payable to the City of De Pere, as a guarantee that if the bid is accepted, the bidder will execute a contract and furnish a contract bond as set forth in the General Conditions of the City of De Pere. In case the bidder fails to file such contract and bond, the amount of the bid bond shall be forfeited to the City of De Pere as liquidated damages.

A pre-bid meeting (not mandatory) will be held on Tuesday, July 22, 2025 at 10:00 AM at the De Pere City Hall located at 335 S Broadway Street, De Pere, WI 54115. The meeting will begin at the first floor entryway through the City Hall main entrance.

The letting of the contract is subject to the provisions of the following Wisconsin Statutes:

Section 62.15 regarding Public Works.

Project 25-21
City Hall First Floor Remodel

City of De Pere

Section 66.0901(3) regarding Prequalification of Contractor.

Each bidder shall pre-qualify by submitting proof of responsibility on forms furnished by the Director of Public Works. Such forms shall be filed with the Director of Public Works no later than 4:00 PM, Monday, July 28, 2025. Prospective bidders who have previously submitted such forms subsequent to January 1, 2025 will not be required to separately submit such forms for this project.

The City of De Pere reserves the right to reject any or all bids, to waive any informalities in bidding and to accept any proposal which the Common Council deems most favorable to the interest of the City of De Pere.

Dated this 11th day of July 2025.

Board of Public Works
City of De Pere
Eric Rakers, P.E.
City Engineer

Project 25-21

SECTION 00 21 13

INSTRUCTIONS TO BIDDERS

ARTICLE 1 – DEFINED TERMS

- 1.1 Terms used in these Instructions to Bidders have the meanings indicated in the General Conditions. Additional terms used in these Instructions to Bidders have the meanings indicated below:
- None

ARTICLE 2 – COPIES OF BIDDING DOCUMENTS

- 2.1 Complete sets of the Bidding documents in the number and for the deposit sum, if any, stated in the Advertisement to Bid may be obtained as stated in the Advertisement for bids.
- 2.2 Complete sets of Bidding Documents shall be used in preparing Bids; Owner does not assume any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.
- 2.3 Owner, in providing the Bidding Documents on the terms stated in the Advertisement for Bids, does so only for the purpose of obtaining Bids for the Work and does not confer a license or grant for any other use.

ARTICLE 3 – QUALIFICATIONS OF BIDDERS

- 3.1 In accordance with Section 66.0901(3), each bidder shall pre-qualify by submitting proof of responsibility on forms furnished by the Director of Public Works. Such forms shall be filed with the Director of Public Works as stated in the Advertisement for Bids. Prospective bidders who have previously submitted such forms after January 1st of this year will not be required to separately submit such form for this project.

ARTICLE 4 – EXAMINATION OF BIDDING DOCUMENTS, OTHER RELATED DATA AND SITE

- 4.1 Provisions concerning responsibilities for the adequacy of data furnished to prospective Bidders with Underground Facilities, and possible changes in the Bidding Documents due to differing or unanticipated conditions appear in the General Conditions.
- 4.2 Underground Facilities
- A. Information and data shown or indicated in the Bidding Documents with respect to existing Underground Facilities at or contiguous to the Site is based upon information and data furnished to Owner and Engineer by owners of such Underground Facilities, including Owner, or others.

4.3 Subsurface and Physical Conditions

- A. The technical data includes:
 - 1. Those reports known to Owner of explorations and tests of subsurface conditions at or contiguous to the Site; and
 - 2. Those drawings known to Owner of physical conditions relating to existing surface or subsurface structures at the Site (except underground Facilities).
 - 3. No reports of explorations or tests of subsurface conditions at or contiguous to the Site, or drawings of physical conditions relating to existing surface or subsurface structures at the Site, are known to Owner.
- B. Limited Reliance by Contractor on Technical Data Authorized: Contractor may rely upon the accuracy of the “technical data” contained in such reports and drawings, but such reports and drawings are not Contract Documents. Contractor may not rely upon or make any claim against Owner, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors with respect to:
 - 1. the completeness of such reports and drawings for Contractor’s purposes, including but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, and safety precautions and programs incident thereto; or
 - 2. Other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings; or
 - 3. Any Contractor interpretation of or conclusion drawn from any “technical data” or any such other data, interpretations, opinions, or information.

4.4 On request, Owner will provide Bidder access to the Site to conduct such examinations, investigations, explorations, tests, and studies as Bidder deems necessary for submission of a Bid. Bidder shall fill all holes and clean up and restore the Site to its former condition upon completion of such explorations, investigations, tests, and studies. Bidder shall comply with all applicable Laws and Regulations relative to excavation and utility locates.

4.5 Reference is made to Section 01 10 00: Summary of Work, for work that will be completed and for the identification of the general nature of other work that is to be performed at the Site by Owner or others (such as utilities and other prime contractors) that relates to the Work contemplated by these Bidding Documents. On request, Owner will provide to each Bidder for examination access to or copies of Contract Documents (other portions thereof related to price) for such other work.

4.6 It is the responsibility of each Bidder before submitting a Bid to:

- A. Examine and carefully study the Bidding Documents, the other related data identified in the Bidding Documents, and any Addenda;
- B. Visit the Site and become familiar with and satisfy Bidder as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work;

- C. Become familiar with and satisfy Bidder as to all federal, state, and local Laws and Regulations that may affect cost, progress, and performance of the Work;
 - D. Obtain and carefully study (or accept consequences of not doing so) all examinations, investigations, explorations, tests, studies, and data concerning conditions (surface, subsurface, and Underground Facilities) at or contiguous to the Site which may affect cost, progress, or performance of the Work or which relate to any aspect of the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder, including applying any specific means, methods, techniques, sequences, and procedures of construction expressly required by the Bidding Documents, and safety precautions and programs incident thereto;
 - E. Agree at the time of submitting its Bid that no further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of its Bid for performance of the Work at the price(s) bid and within the times and in accordance with the other terms and conditions of the Bidding Documents;
 - F. Become aware of the general nature of the work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents;
 - G. Correlate the information known to Bidder, information and observations obtained from visits to the Site, reports and drawings identified in the Bidding Documents, and all additional examinations, investigations, explorations, tests, studies, and data with the Bidding Documents;
 - H. Promptly give Engineer written notice of all conflicts, errors, ambiguities, or discrepancies, that bidder discovers in the Bidding Documents and confirm that the written resolution thereof by Engineer is acceptable to Bidder; and
 - I. Determine that the Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance of the Work.
- 4.7 The submission of a Bid will constitute an incontrovertible representation by Bidder that Bidder has complied with every requirement of this Article 4, that without exception the Bid is premised upon performing and furnishing the Work required by the Bidding Documents and applying any specific means, methods, techniques, sequences, and, procedures of construction that may be shown or indicated or expressly required by the Bidding Documents, that Bidder has given Engineer written notice of all conflicts, errors, ambiguities, and discrepancies that Bidder has discovered in the Bidding Documents and the written resolutions thereof by Engineer are acceptable to Bidder, and that the Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performing and furnishing the Work.

ARTICLE 5 – SITE AND OTHER AREAS

- 5.1 The Site is identified in the Bidding Documents. Easements for permanent structures or permanent changes in existing facilities are to be obtained and paid for by Owner unless otherwise provided in

the Bidding Documents. All additional lands and access thereto required for temporary construction facilities, construction equipment, or storage of materials and equipment to be incorporated in the Work are to be obtained and paid for by Contractor.

ARTICLE 6 – INTERPRETATIONS AND ADDENDA

- 6.1 All questions about the meaning or intent of the Bidding Documents are to be submitted to Engineer in writing. Interpretations or clarifications considered necessary by Engineer in response to such questions will be issued by Addenda mailed or delivered to all parties recorded by Engineer as having received the Bidding Documents. Questions received less than ten days prior to the date for opening of Bids may not be answered. Only questions answered by Addenda will be binding. Oral and other interpretations or clarifications will be without legal effect.
- 6.2 Addenda may be issued to clarify, correct, or change the Bidding Documents as deemed advisable by Owner and Engineer.

ARTICLE 7 – BID SECURITY

- 7.1 A Bid shall be accompanied by Bid security made payable to Owner in an amount of five percent (5%) of Bidder's maximum Bid price and in the form of a certified check or bank money order or Bid bond (on the form attached) issued by a surety meeting the requirements of the General Conditions. Submittal of a Bid Bond on a form other than the Bid Bond form included in the Bidding Documents may be cause for rejection of Bid. The fully executed bid bond must be uploaded into QuestCDN. If the bidder elects to furnish bid security other than a bid bond, the bid security must be submitted in a sealed envelope enclosed in a separate package plainly marked on the outside with the notation "BID SECURITY" along with the project number and name and addressed to the Board of Public Works of the City of De Pere, Municipal Service Center, 925 S. Sixth Street, De Pere, WI 54115 **prior to the deadline for submission of bids.**
- 7.2 The Bid security of the Successful Bidder will be retained until such Bidder has executed the Contract documents, furnished the required contract security and met the other conditions of the Notice of Award, whereupon the Bid security will be returned. If the Successful Bidder fails to execute and deliver the Contract Documents and furnish the required contract security within fifteen (15) days after the Notice of Award, Owner may annul the Notice of Award and the Bid security of that Bidder will be forfeited. The Bid security of other Bidders whom Owner believes to have a reasonable chance of receiving the award may be retained by Owner per the General Conditions.
- 7.3 Bid security of other Bidders whom Owner believes do not have a reasonable chance of receiving the award will be returned within seven days after the Bid opening.

ARTICLE 8 – CONTRACT TIMES

- 8.1 The number of days within which, or the dates by which, Milestones are to be achieved and the

Work is to be substantially completed and ready for final payment are set forth in the Bid Form and Summary of Work.

ARTICLE 9 – LIQUIDATED DAMAGES

9.1 Provisions for liquidated damages are set forth in the General Conditions.

ARTICLE 10 – SUBSTITUTE AND “OR-EQUAL” ITEMS

10.1 The Contract, if awarded, will be on the basis of materials and equipment specified or described in the Bidding Documents without consideration of possible substitute or “or-equal” items. Whenever it is specified or described in the Bidding Documents that a substitute or “or-equal” item of material or equipment may be furnished or used by Contractor if acceptable to Engineer, application for such acceptance will not be considered by Engineer until after the Effective Date of the Bid Form and Summary of Work.

ARTICLE 11 – SUBCONTRACTORS, SUPPLIERS, AND OTHERS

11.1 The Bidder shall submit with the Bid to Owner a list of all such Subcontractors, Suppliers, individuals, or entities proposed for those portions of the Work for which such identification is required. Such list shall be accompanied by an experience statement with pertinent information regarding similar projects and other evidence of qualification for each such Subcontractor, Supplier, individual, or entity, Owner may, before the Notice of Award is given, request apparent Successful Bidder to submit a substitute, in which case apparent Successful Bidder shall submit an acceptable substitute, Bidder’s Bid price will be increased (or decreased) by the difference in cost occasioned by such substitution, and Owner may consider such price adjustment in evaluating Bids and making the Contract award.

11.2 If apparent Successful Bidder declines to make any such substitution, Owner may award the Contract to the next lowest Bidder that proposed to use acceptable Subcontractors, Suppliers, individuals, or entities. Declining to make requested substitutions will not constitute grounds for forfeiture of the Bid security of any Bidder. Any Subcontractor, Supplier, individual, or entity so listed and against which Owner makes no written objection prior to the giving of the Notice of Award will be deemed acceptable to Owner subject to revocation of such acceptance after the Effective Date of the Agreement.

11.3 Contractor shall not be required to employ any Subcontractor, Supplier, individual, or entity against whom Contractor has reasonable objection.

ARTICLE 12 – PREPARATION OF BID

12.1 The Bid form is included with the Bidding documents.

12.2 All blanks on the Bid Form shall be completed by printing in ink or by typewrite and the Bid signed in

ink. Erasures or alterations shall be initialed in ink by the person signing the Bid Form. A Bid price shall be indicated for each alternative, and unit price item listed therein, or the words "No Bid," "No Change," or "Not Applicable" entered.

- 12.3 A Bid by a corporation shall be executed in the corporate name by the president or a vice-president or other corporate officer accompanied by evidence of authority to sign. The corporate seal shall be affixed and attested by the secretary or an assistant secretary. The corporate address and state of incorporations shall be shown below the seal.
- 12.4 A Bid by a partnership shall be executed in the partnership name and signed by a partner (whose title must appear under the signature), accompanied by evidence of authority to sign. The official address of the partnership shall be shown below the signature.
- 12.5 A Bid by a limited liability company shall be executed in the name of the firm by a member and accompanied by evidence of authority to sign. The state of formation of the firm and the official address of the firm shall be shown below the signature.
- 12.6 A Bid by an individual shall show the Bidder's name and official address.
- 12.7 A Bid by a joint venture shall be executed by each joint venture in the manner indicated on the Bid Form. The official address of the joint venture shall be shown below the signature.
- 12.8 All names shall be typed or printed in ink below the signatures.
- 12.9 The Bid shall contain an acknowledgement of receipt of all Addenda, the numbers of which shall be filled in on the Bid Form.
- 12.10 The address and telephone number for communications regarding the Bid shall be shown.
- 12.11 The Bid shall contain evidence of Bidder's authority and qualification to do business in the state where the Project is located or covenant to obtain such qualification prior to award of the Contract. Bidder's state contractor license number, if any, shall also be shown on the Bid Form.

ARTICLE 13 – BASIS OF BID; COMPARISON OF BIDS

13.1 Unit Price

- A. Bidders shall submit a Bid on a unit price basis for each item of Work listed in the Bid Schedule.
- B. The total of all estimated prices will be the sum of the products of the estimated quantity of each item and the corresponding unit price. The final quantities and Contract Price will be determined in accord with the General Conditions.
- C. Discrepancies between the multiplication of units of Work and unit prices will be resolved in

favor of the unit prices. Discrepancies between the indicated sum of any column of figures and the correct sum thereof will be resolved in favor of the correct sum. Discrepancies between words and figures will be resolved in favor of the words.

ARTICLE 14 – SUBMITTAL OF BID

14.1 A Bid shall be submitted no later than date and time prescribed and at place indicated in Advertisement for Bids and shall be submitted electronically using the QuestCDN online bidding vBid platform. No paper bids will be accepted.

14.2 See Bid Form for a list of documents typically required to be submitted with the Bid.

ARTICLE 15 – MODIFICATION AND WITHDRAWAL OF BID

15.1 A Bid may be modified or withdrawn by an appropriate document duly executed in the manner that a Bid must be executed and delivered to the place where Bids are to be submitted prior to the date and time for the opening of Bids.

15.2 If within 24 hours after Bids are opened, any Bidder files a duly signed written notice with Owner and promptly thereafter demonstrates to the reasonable satisfaction of Owner that there was a material and substantial mistake in the preparation of its Bid, that Bidder may withdraw its Bid, and the Bid security will be returned. Thereafter, if the Work is rebid, that Bidder will be disqualified from further bidding on the Work.

ARTICLE 16 – OPENING BIDS

16.1 Bids will be opened as indicated in the Advertisement to Bid. The bid opening can be viewed live via the GoToMeeting information shown below. An abstract of the amounts of the base bids and major alternatives, if any, will be made available to bidders after opening the bids.

The bid opening can be viewed live via GoToMeeting as follows:
Please join my meeting from your computer, tablet or smartphone.

<https://meet.goto.com/345634277>

You can also dial in using your phone.
(For supported devices, tap a one-touch number below to join instantly.)

United States (Toll Free): [1 877 309 2073](tel:18773092073)

Access Code: 345-634-277

New to GoToMeeting? Get the app now and be ready when your first meeting starts:
<https://meet.goto.com/install>

ARTICLE 17 – BIDS REMAIN SUBJECT TO ACCEPTANCE

- 17.1 All bids will remain subject to acceptance for the period of time stated in the General Conditions, but Owner may, in its sole discretion, release any Bid and return the Bid security prior to the end of this period.

ARTICLE 18 – EVALUATION OF BIDS AND AWARD OF CONTRACT

- 18.1 Owner reserves the right to reject any or all Bids, including without limitation, nonconforming, nonresponsive, unbalanced, or conditional Bids. Owner further reserves the right to reject the Bid of any Bidder whom it finds, after reasonable inquiry and evaluation, to not be responsible. Owner may also reject the Bid of any Bidder if Owner believes that it would not be in the best interest of the Project to make an award to that Bidder. Owner also reserves the right to waive all informalities not involving price, time, or changes in the Work and to negotiate contract terms with the Successful Bidder.
- 18.2 More than one Bid for the same Work from an individual or entity under the same or different names will not be considered. Reasonable grounds for believing that any Bidder has an interest in more than one Bid for the Work may be cause for disqualification of that Bidder and the rejection of all Bids in which that Bidder has an interest.
- 18.3 In evaluating Bids, Owner will consider whether or not the Bids comply with the prescribed requirements, and such alternates, unit prices and other data, as may be requested in the Bid Form or prior to the Notice of Award.
- 18.4 In evaluating Bidders, Owner will consider the qualifications of Bidders and may consider the qualifications and experience of Subcontractors, Supplier, and other individuals or entities proposed for those portions of the Work for which the identify of Subcontractors, Suppliers, and other individuals or entities must be submitted as provided in the Supplementary Conditions.
- 18.5 Owner may conduct such investigations as Owner deems necessary to establish the responsibility, qualifications, and financial ability of Bidders, proposed Subcontractors, Suppliers, individuals, or entities to perform the Work in accordance with the Contract Documents.
- 18.6 Bidder agrees to waive any claim it has or may have against the Owner and the respective employees arising out of or in connection with the administration, evaluation or recommendation of any Bid.
- 18.7 If the Contract is to be awarded, Owner will award the Contract to the lowest responsible responsive Bidder whose Bid is in the best interests of the Project.

ARTICLE 19 – CONTRACT SECURITY AND INSURANCE

- 19.1 The General Conditions set forth Owner's requirements as to performance and payment bonds and

insurance. When the Successful Bidder delivers the executed Agreement to Owner, it shall be accompanied by such bonds and a certificate of insurance.

ARTICLE 20 – SIGNING OF AGREEMENT

- 20.1 When Owner gives a Notice of Award to the Successful Bidder, it shall be accompanied by the required number of unsigned counterparts of the Agreement with the other Contract Documents which are identified in the Agreement as attached thereto. Within ten (10) days thereafter, Successful Bidder shall sign and deliver the required number of counterparts of the Agreement and attached documents to Owner. Within ten (10) days thereafter, Owner shall deliver one fully signed counterpart to Successful Bidder with a complete set of Drawings with appropriate identification.

END OF SECTION

SECTION 00 41 13

CITY OF DE PERE

BID FORM

PROJECT 25-21

This bid, submitted by the undersigned Bidder to the City of De Pere, in accordance with the Advertisement to Bid, which will be received until 1:00 PM, Thursday July 31, 2025 is to furnish and deliver all materials, and to perform and do all work on the project designated per Section 01 10 00 Summary of Work.

Bidder has examined and carefully prepared the bid from the plans and specifications and has checked the same in detail before submitting said proposal or bid; and that said bidder or bidder's agents, officer or employees have not, either directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken any action in restraint of free competitive bidding in connection with this proposal or bid.

Bidder has examined and carefully studied the Bidding Documents, other related data identified in the Bidding Documents, and the following Addenda, receipt of which is hereby acknowledged:

Addendum No.

Addendum Date

BASIS OF BID:

Bidder will complete the Work in accordance with the Contract documents for the following price(s):

Base lump sum bid for all construction.

Alternate bids to state the amount to be deducted from the base bid to exclude all work labeled "Alternate Bid #1" and "Alternate Bid #2".

Alternate Bid #1 includes all work associated with the front Reception and Waiting area. Demolition of light into Secretary office and installation of bullet proof glass package from owner's stock is included in the base bid and will still be required regardless of accepted or rejected deductive alternate.

Alternate Bid #2 includes all work associated with the Mother's Room. If this area does not become the Mother's Room, this area would become part of the storage room to the east, in which case the wall/door/light between the existing Payroll Office and Water Office would be demolished, the door on the west wall would be demolished and the wall infilled, and the door on the north wall into the Break Area would remain existing.

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Bidder acknowledges that estimated quantities are not guaranteed, and are solely for the purpose of comparison of Bids, and final payment for all Unit Price Bid items will be based on actual quantities, determined as provided in the Contract Documents.

TOTAL BID PRICE: \$ _____

ALTERNATE #1 PRICE (DEDUCT WORK LABELED ALTERNATE #1): \$ _____

TOTAL BID PRICE DEDUCTING ALTERNATE #1: \$ _____

ALTERNATE #2 PRICE (DEDUCT WORK LABELED ALTERNATE #2): \$ _____

TOTAL BID PRICE DEDUCTING ALTERNATE #2: \$ _____

TOTAL BID PRICE DEDUCTING BOTH ALTERNATES #1 AND #2: \$ _____

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City of De Pere

ATTACHMENTS TO THIS BID

The following documents are submitted with and made a condition of this Bid:

- A. Required Bid Security
- B. Tabulation of Subcontractors (Section 00 43 36)

BID SUBMITTAL

This Bid is submitted by _____ of _____,

The Bidder, being duly sworn, does dispose that they are an authorized representative of

Bidder, if Bidder is:

An Individual

Name (typed or printed): _____

By: _____
(Individual's signature)

Doing business as: _____

A Partnership

Partnership Name: _____

By: _____
(Signature of general partner – attach evidence of authority to sign)

Name (typed or printed): _____

A Corporation

Corporation Name: _____

State of Incorporation: _____

Type (General Business, Professional, Service, Limited Liability): _____

By: _____
(Signature – attach evidence of authority to sign)

Name (typed or printed): _____

Title: _____
(CORPORATE SEAL)

Attest _____

Date of Qualification to do business in Wisconsin is ____/____/____.

Joint Venture

Name of Joint Venture: _____

First Joint Venturer Name: _____ (SEAL)

By: _____
(Signature of first joint venture partner – attach evidence of authority to sign)

Name (typed or printed): _____

Title: _____

Second Joint Venturer Name: _____ (SEAL)

By: _____
(Signature of second joint venture partner – attach evidence of authority to sign)

Name (typed or printed): _____

Title: _____

(Each joint venturer must sign. Manner of signing for each individual, partnership, and corporation that is a party to joint venture should be in manner indicated above.)

Bidder's Business Address _____

Phone No. _____ Fax No. _____

E-mail _____

SUBMITTED on _____, 20____.

State Contractor License No. _____ (if applicable)

SECTION 00 43 13

CITY OF DE PERE

BID BOND

KNOW ALL MEN BY THESE PRESENTS: That _____,

as Principal, hereinafter called Principal, and _____,

as Surety, hereinafter called Surety, are held and firmly bound unto the City of De Pere, a municipal corporation of the State of Wisconsin, as Obligee, hereinafter called City, in the amount of _____ dollars (\$_____) for the payment whereof Principal and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presence.

WHEREAS, Principal has made a proposal to the City for furnishing all materials, labor, tools, equipment and incidentals necessary to complete the work of Project 25-21 in accordance with drawings and specifications prepared by the Director of Public Works of said City, which proposal is by reference made a part hereof, and is hereinafter referred to as the BID.

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION is such that, if Principal shall be awarded the contract for said project and Principal shall enter into a contract in accordance with the BID, then this obligation shall be null and void; otherwise it shall remain in full force and effect, provided that:

1. The liability of Surety shall in no event exceed the penalty of this bond.
2. Any suits at law or proceedings, in equity brought or to be brought against Surety to recover any claim hereunder shall be executed within six (6) months from the date of this instrument.

Signed and sealed this _____ day of _____, 20_____.

In the presence of:

WITNESS

PRINCIPAL

(SEAL)

WITNESS

SURETY

(SEAL)

SECTION 00 43 36

TABULATION OF SUBCONTRACTORS

The following information is submitted which gives the name, business address, and portion of work for each subcontractor that will be used in the work if the bidder is awarded the contract, and no subcontractor doing work in excess of one-half of one percent of the total amount of the bid and who is not listed will be used without the written approval of the Engineer. Additional numbered pages outlining this portion of the proposal may be attached to this page.

<u>PORTION OF WORK</u>	<u>BUSINESS NAME</u>	<u>BUSINESS ADDRESS</u>

SECTION 00 51 00

NOTICE OF AWARD

(Contractor)
(Contractor Name)
(Address)
(Address)

Project Description: 25-21 City Hall First Floor Remodel

The City has considered the proposal submitted by you dated (BID DATE) for the above-described project in response to its Advertisement for Bids dated July 11, 2025 and July 18, 2025.

You are hereby notified that the Common Council of the City of De Pere has accepted your bid of (Contract Amount \$_____.00).

You are required to execute the Contract and furnish the required Performance Bond, Payment Bond and Certificates of Insurance within ten (10) calendar days from the date of this notice to you.

If you fail to execute said Agreement and to furnish said bonds within ten (10) days from the date of this notice, said City will be entitled to consider all your rights arising out of the City's acceptance of your bid as abandoned and as a forfeiture of your Bid Bond. The City will be entitled to such other rights as may be granted by law.

You are required to return an acknowledged copy of this NOTICE OF AWARD to the City.

Dated this _____ day of _____ 2025.

DEPARTMENT OF PUBLIC WORKS

BY: Eric P. Rakers, P.E.
City Engineer

ACCEPTANCE OF NOTICE

Receipt of the above NOTICE OF AWARD is hereby acknowledged by:

_____, this the _____ day of _____, 20____

By: _____

Title: _____

SECTION 00 52 13

CONTRACT

This Contract, made and entered into this day _____ (date to be affixed by City), by and between (Contractor Name), hereinafter called Contractor, and the City of De Pere, a municipal corporation of the State of Wisconsin, hereinafter called City.

WITNESSETH: That, in consideration of the covenants and agreements herein contained, to be performed by the parties hereto, and of the payments hereinafter agreed to be made, it is mutually agreed as follows:

ARTICLE I - SCOPE OF WORK

The Contractor shall furnish all materials and all equipment and labor necessary, and perform all work shown on the drawings and described in the specifications for the project entitled Project 25-21 City Hall First Floor Remodel, all in accordance with the requirements and provisions of the following documents, which are hereby made a part of this Contract:

- (a) Advertisement for Bids, dated July 11, 2025 and July 18, 2025.
- (b) Drawings designated for Project 25-21 City Hall First Floor Remodel dated July 11, 2025.
- (c) City of De Pere 2025 Construction Specifications.
- (d) Special Provisions dated July 11, 2025.
- (e) Proposal submitted by (Contractor Name) dated Bid Date.
- (f) Addenda No. _____ dated _____

ARTICLE II - TIME OF COMPLETION

- (a) The work to be performed under the Contract shall be commenced within (number spelled out) (____) calendar days after receipt of written notice to proceed. The work shall be completed within (Number spelled out) (____) calendar days) or (specific calendar dates) after receipt of Notice to Proceed.
- (b) Time is of the essence with respect to the date of completion herein above stated. Failure to complete the work within the number of calendar days stated in this Article, or interim dates included in the work sequence in Section 01 10 00, Summary of Work, including any extensions granted thereto, shall entitle the City to deduct from the monies due the Contractor an amount equal to Update based on 00 70 00 - General Conditions (Page 26)(\$) per day for each calendar day of delay in the completion of the work. Such amount shall be considered and treated not as a penalty but as liquidated damages, which the City will sustain, by failure of the Contractor to complete the work within the time stated.

ARTICLE III - PAYMENT

- (a) The Contract Sum. The City shall pay to the Contractor for the performance of the Contract the amounts determined for the total number of each of the following units of work completed at the unit price stated thereafter. The number of units contained in this schedule is approximate only, and the final payment shall be made for the actual number of units that are incorporated in or made necessary by the work covered by the Contract.
- (b) Progress Payments. The City shall make payments on account of the Contract as follows:
1. On not later than the fourth Friday of every month the Contractor shall present to the City an invoice covering an estimate of the amount and proportionate value of the work done as verified by the City under each item of work that has been completed from the start of the job up to and including the fourth Friday of the preceding month, and the value of the work so completed determined in accordance with the schedule of unit prices for such items, together with such supporting evidence as may be required. This invoice shall also include an allowance for the cost of such materials and equipment required in the permanent work as have been delivered to the site but not as yet incorporated in the work.
 2. On not later than the third week of the following month, the City shall, after deducting previous payments made, pay to the Contractor 95% of the amount of the approved invoice, retaining 5% of the estimate of work done until 50% of the work has been completed. At 50% completion of the work, the previous retainage shall not yet be paid, but further partial payments shall be made in full to the contractor without additional retainage being taken unless the engineer certifies that the work is not proceeding satisfactorily. If the work is not proceeding satisfactorily, additional amounts may be retained. After substantial completion, an amount retained may be paid to the contractor, keeping retained only such amount as is needed for the remaining work.
 3. The Contractor shall notify the City in writing when all work under this Contract has been completed. Upon receipt of such notice the City shall, within a reasonable time, make the final inspection and issue a final certificate stating that the work provided for in this Contract has been completed and is accepted under the terms and conditions thereof, and that the entire balance due the Contractor as noted in said final certificate is due and payable. Before issuance of the final certificate the Contractor shall submit evidence satisfactory to the City that payrolls, material bills, and other indebtedness connected with the work under this Contract have been paid. The City shall make final payment as soon after issuance of the final certificate as practicable.

ARTICLE IV – CONTRACT DOCUMENTS

(a) Contents

1. The Contract documents consist of the following:
 - a. This Contract (pages 00 52 13-1 to 0052-13-3, inclusive).
 - b. Payment bond (pages 00 61 13-1 to 00 61 13-2, inclusive).
 - c. Performance bond (page 00 61 16-1).
 - d. General Conditions (pages 00 70 00-1 to 00 70 00-27, inclusive).

- e. Specifications as listed in the table of contents of the Project Manual.
 - f. Drawings consisting of ____ sheets with each sheet bearing the following general title: ____ [or] the Drawings listed on attached sheet index.
 - g. Addenda (numbers ____ to ____ inclusive), dated ____.
 - h. Exhibits to this Agreement (enumerated as follows):
 - 1) Contractor's Bid (pages 00 41 13-1 to 00 41 13-3, inclusive).
 - 2) Tabulation of Subcontractors (page 00 43 36-1).
 - 3) Documentation submitted by Contractor prior to Notice of Award (page 00 51 00-1).
 - i. The following which may be delivered or issued on or after the Effective Date of the Agreement and are not attached hereto:
 - 1) Notice to Proceed (page 00 55 00-1).
 - 2) Change Orders.
2. The documents listed in Paragraph (a) Contents, are attached to this Agreement (except as expressly noted otherwise above).
3. There are no Contract Documents other than those listed above in this Article IV.

IN WITNESS WHEREOF, the parties hereto have executed this Contract, the day and year first written above.

(WITNESS) (CONTRACTOR) (SEAL)

(WITNESS) BY: _____

(TITLE)

BY: _____

(TITLE)

CITY OF DE PERE (SEAL)

Approved as to Form By: _____ (CITY ATTORNEY)

Sufficient funds are available to provide for the payment of this obligation.

(COMPTROLLER)

BY: _____
(CITY MANAGER)

BY: _____
(CITY CLERK)

SECTION 00 55 00

NOTICE TO PROCEED

Date: _____

(CONTRACTOR NAME)

(ADDRESS)

(ADDRESS)

Project Description: 25-21 City Hall First Floor Remodel

You are hereby notified to commence work in accordance with the CONTRACT dated _____, within ten (10) days of this Notice. All work under this contract shall be completed within _____ (NUMBER IN WORDS) (___#) consecutive days from the start of construction or _____ (DATE) whichever comes first.

Department of Public Works

By: Eric P. Rakers, P.E.
Title: City Engineer

ACCEPTANCE OF NOTICE

Receipt of the above NOTICE TO PROCEED is hereby acknowledged by

_____, this _____ day of _____, 20____.
Company Name

Signature

BY: _____
Printed Name

TITLE: _____

SECTION 00 61 13

CITY OF DE PERE

PAYMENT BOND

KNOW ALL MEN BY THESE PRESENTS: That **(CONTRACTOR NAME)**, as Principal, hereinafter called Contractor, and _____, as Surety, hereinafter called Surety, are held and firmly bound unto the City of De Pere, a municipal corporation of the State of Wisconsin, as Obligee, hereinafter called the City, for the use and benefit of claimants as herein below defined in the **amount of _____** **(CONTRACT AMT. SPELLED OUT) (\$_____)** for the payment whereof Contractor and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, Contractor has by written agreement dated _____ (date to be affixed by City) entered into a contract with City for Project 25-21, in accordance with drawings and specifications prepared by the Director of Public Works of said City, which contract is by reference made a part hereof, and is hereinafter referred to as the CONTRACT.

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION is such that, if Contractor shall promptly make payments to all claimants as hereinafter defined, for all labor and material used or reasonably required for use in the performance of the CONTRACT, then this obligation shall be null and void; otherwise it shall remain in full force and effect, subject, however, to the following conditions.

1. A claimant is defined as one having a direct contract with Contractor or with a subcontractor of Contractor for labor, material, or both, used or reasonably required for use in the performance of the contract, labor and material being construed to include that part of water, gas, power, lights, heat, oil, gasoline, telephone service, or rental of equipment directly applicable to the contract.
2. The above named Contractor and Surety hereby jointly and severally agree with the City that every claimant as herein defined, who has not been paid in full before the expiration of a period of ninety (90) days after the date on which the last of such claimant's work or labor was done or performed, or materials were furnished by such claimant may sue on this bond for the use of such claimant in the name of the City, prosecute the suit to final judgment for such sum or sums as may be justly due claimant, and have execution thereon, provided, however, that the City shall not be liable for the payment of any costs or expenses of any such suit.
3. No suit or action shall be commenced hereunder by any claimant:
 - a. Unless claimant shall have given written notice to any two of the following: The Contractor, the City, or the Surety above named, within ninety (90) days after such claimant did or performed the last of the work or labor, or furnished the last of the materials for which said claim is made, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were furnished, or for whom the work or labor was done or performed. Such notice shall be served by mailing the same by registered mail, postage prepaid, in an envelope addressed to the Contractor, City, or Surety, at any place where an office is regularly maintained for the transaction of business, or served in any manner in which legal process may be served in the State of Wisconsin, save that such service need not be made by a public officer.
 - b. After the expiration of one (1) year following the date on which Contractor ceased work on said CONTRACT.

Project 25-21
City Hall First Floor Remodel

City of De Pere

- c. Other than in a state court of competent jurisdiction in and for the County or other political subdivision of the state in which the project, or any part thereof, is situated, or in the United States District Court for the district in which the project, or any part thereof, is situated, and not elsewhere.
4. The amount of this bond shall be reduced by and to the extent of any payment or payments made in good faith hereunder, inclusive of the payment by Surety of mechanics' liens, which may be filed or recorded against said improvement, whether or not claim for the amount of such lien be presented under and against this bond.

SIGNED AND SEALED THIS _____ DAY OF _____, 20__.

In Presence of:

_____ (WITNESS)	_____ (CONTRACTOR)	_____ (SEAL)
_____ (WITNESS)	_____ (SURETY)	_____ (SEAL)

SECTION 00 61 16

CITY OF DE PERE

PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS: That (CONTRACTOR'S NAME), as Principal, hereinafter called Contractor, and _____, as Surety, hereinafter called Surety, are held and firmly bound unto the City of De Pere, a municipal corporation of the State of Wisconsin, as Obligee, hereinafter called City, in the amount of (AMOUNT WRITTEN OUT) (\$_____) for the payment whereof Contractor and Surety bind themselves, their heirs, executors, administrators, successors and assign, jointly and severally, firmly by these presents.

WHEREAS, Contractor has by written agreement dated _____ (date to be affixed by City), entered into a contract with the City for Project 25-21, in accordance with drawings and specifications prepared by the Director of Public Works of said City, which contract is by reference made a part hereof, and is hereinafter referred to as the CONTRACT.

NOW THEREFORE, THE CONDITION OF THIS OBLIGATION is such that, if the Contractor shall promptly and faithfully perform said CONTRACT, then this obligation shall be null and void; otherwise it shall remain in full force and effect.

Whenever Contractor shall be, and declared by the City to be in default under the CONTRACT, the City having performed City's obligations there under, the Surety may promptly remedy the default, or shall promptly

1. Complete the CONTRACT in accordance with its terms and conditions or
2. Obtain a bid or bids for submission to City for completing the CONTRACT in accordance with its terms and conditions, and upon determination by the City and Surety of the lowest responsible bidder, arrange for a contract between such bidder and City make available as work progresses (even though there should be a default or succession of defaults under the contract or contracts of completion arranged under this paragraph) sufficient funds to pay the cost of completion less the balance of the contract price; but not exceeding, including other costs and damages for which the Surety may be liable hereunder, the amount set forth in the first paragraph hereof. The term "balance of the contract price" as used in this paragraph shall mean the total amount payable by City to Contractor under the CONTRACT and any amendments thereto, less the amount properly paid by City to Contractor.

Any suit under this bond must be instituted before the expiration of two (2) years from the date on which final payment under the CONTRACT falls due. No right of action shall accrue on this bond to or for the use of any person or corporation other than the owner named herein or the heirs, executors, administrators or successors of City.

SIGNED AND SEALED THIS _____ DAY OF _____, 20_____.

In the Presence of:

_____ (WITNESS)	_____ (CONTRACTOR)	_____ (SEAL)
_____ (WITNESS)	_____ (SURETY)	_____ (SEAL)

SECTION 00 62 76

APPLICATION FOR PAYMENT

Contractor's Application for Payment No.

Application Period:	Application Date:
Owner: City of De Pere	Contractor:
	Contractor's Project No.:

APPLICATION FOR PAYMENT

Change Order Summary

Approved Change Orders			1. ORIGINAL CONTRACT PRICE:.....	
Number	Additions	Deductions	2. Net change by Change Orders and Written Amendments (+ or -):.....	\$0.00
			3. CURRENT CONTRACT PRICE (Line 1 plus Line 2):.....	\$0.00
			4. Total completed and stored to date Column H on Progress Estimate:.....	\$0.00
			5. Retainage (per Agreement):	
			a. Work Completed - Column H (95% up to 50% of Contract or 2.5% of 100% of Contract)	\$0.00
Total	\$0.00	\$0.00	6. AMOUNT ELIGIBLE TO DATE (Line 4 minus 5).....	\$0.00
NET CHANGE BY CHANGE ORDERS:			7. LESS PREVIOUS PAYMENTS (Line 6 from prior Application).....	\$0.00
			8. AMOUNT DUE THIS APPLICATION (Line 6 minus Line 7).....	\$0.00

CONTRACTOR'S CERTIFICATION

The undersigned Contractor certifies that:(1) all previous progress payments received from Owner on account of Work done under Contract have been applied on account to discharge Contractor's legitimate obligations incurred in connection with Work covered by prior Applications for Payment; (2) title of all Work, materials and equipment incorporated in said Work or otherwise listed in or covered by this Application for Payment will pass to Owner at time of payment free and clear of all Liens, security interests and encumbrances (except such as are covered by a Bond acceptable to Owner indemnifying Owner against any such Liens, security interest or encumbrances); and (3) all Work covered by the Application for Payment is in accordance with the Contract Documents and is not defective.

By:	Date:

Payment of:	\$	
	(Line 8 or other - attach explanation of other amount)	
is recommended by:		(Date)
	(Contractor)	
Payment of:	\$	
	(Line 8 or other - attach explanation of other amount)	
is recommended by:		(Date)
	(Owner)	

SECTION 00 65 16

CERTIFICATE OF SUBSTANTIAL COMPLETION

Project:	
Owner:	Owner's Contract No.:
Contractor:	

This [tentative] [definitive] Certificate of Substantial Completion applies to:

☐ All Work under the Contract Documents: ☐ The following specified portions of the Work:

Date of Substantial Completion

The Work to which this Certificate applies has been inspected by authorized representatives of Contractor and Engineer, and found to be substantially complete. The Date of Substantial completion of the Project or portion thereof designated above is hereby declared and is also the date of commencement of applicable warranties required by the Contract Documents, except as stated below.

A [tentative] [definitive] list of items to be completed or corrected is attached hereto. This list may not be all-inclusive, and the failure to include any items on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

The responsibilities between Owner and Contractor for security, operation, safety, maintenance, heat, utilities, insurance and warranties shall be as provided in the Contract Documents except as amended as follows:

☐ Amended Responsibilities ☐ Not Amended

Owner's Amended Responsibilities:

Contractor's Amended Responsibilities:

The following documents are attached to and made part of this Certificate:

This Certificate does not constitute an acceptance of Work not in accordance with the Contract Documents nor is it a release of Contractor's obligation to complete the Work in accordance with the Contract Documents.

Executed by Engineer

Date

Accepted by Contractor

Date

SECTION 01 10 00

SUMMARY OF WORK

PART 1 – GENERAL

1.1 SUMMARY

- A. Section Includes
 - 1. References
 - 2. Work Covered by the Contract Documents
 - 3. Work Sequence/Schedule
 - 4. Use of Premises
 - 5. Warranty
 - 6. Work by Others
 - 7. Miscellaneous Provisions

1.2 REFERENCES

- A. General Specifications. The work under this contract shall be in accordance with the City of De Pere, 2025 Construction Specifications and these Special Provisions and plans, and the latest edition of the Wisconsin Department of Transportation Standards Specifications for Highway and Structure Construction, where referenced in the City Specifications.
- B. Definitions. Any reference to the “state” or the “department” in said Standard Specifications shall mean the “City of De Pere” for the purposes of this contract.
- C. Industry Standards
 - 1. Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.
 - 2. Comply with standards in effect as of date of the Contract Documents, unless otherwise indicated.
 - 3. If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement.
 - 4. The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements.
 - 5. Each section of the specifications generally includes a list of reference standards normally referred to in that respective section. The purpose of this list is to furnish the Contractor

with a list of standards normally used for outlining the quality control desired on the project. The lists are not intended to be complete or all inclusive, but only a general reference of standards that are regularly referred to.

6. Each entity engaged in construction on the Project shall be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents. Where copies of standards are needed to perform a required construction activity, obtain copies directly from the publication source and make them available on request.

1.3 WORK COVERED BY THE CONTRACT DOCUMENTS

A. Project Identification

1. Project Location

- a. City Hall
335 S. Broadway Street
De Pere, WI 54115

2. Work will be performed under contract 25-21 City Hall First Floor Remodel.

- a. Base bid includes all the work to remodel the City Hall first floor including:
 - i. Moving furniture
 - ii. Demolition
 - iii. Wall patching and construction
 - iv. Electrical wiring and lighting
 - v. Plumbing and fixture installation
 - vi. Mechanical upgrades and modifications
 - vii. Ceiling construction
 - viii. Painting
 - ix. Flooring installation
- b. Alternate bids to state the amount to be deducted from the base bid to exclude all work labeled "Alternate Bid #1" and "Alternate Bid #2".
 - i. Alternate Bid #1 includes all work associated with the front Reception and Waiting area. Demolition of light into Secretary office and installation of bullet proof glass package from owner's stock is included in the base bid and will still be required regardless of accepted or rejected deductive alternate.
 - ii. Alternate Bid #2 includes all work associated with the Mother's Room. If this area does not become the Mother's Room, this area would become part of the storage room to the east, in which case the wall/door/light between the existing Payroll Office and Water Office would be demolished, the door on the west wall would be demolished and the wall infilled, and the door on the north wall into the Break Area would remain existing.

1.4 WORK SEQUENCE/SCHEDULE

- A. Project shall be completed by December 12, 2025.

- B. No work may occur on the following holidays:
 - 1. Labor Day – Monday, September 1, 2025
 - 2. Thanksgiving Day – Thursday, November 27, 2025
 - 3. Day after Thanksgiving – Friday, November 28, 2025
- C. Work shall be completed in two phases as follows:
 - 1. Phase 1 – Complete work in the Break Area, Copy Room, Water Office, Payroll Office and Waiting Area.
 - 2. Phase 2 – Complete work in the City Assessor and Files/Storage Area. Prior to starting Phase 2, move file cabinets and furniture to the area completed under Phase 1.
- D. Access to the site is to be coordinated with Tom Blohowiak, Maintenance Supervisor at 920-639-1336.

1.5 USE OF PREMISES

- A. Contractor shall have full use of the premises for construction operations, including use of the Project Site, as allowed by law, ordinances, permits, easement agreements and the Contract documents.
- B. Contractor's use of premises is limited only by Owner's right to perform work or to retain other contractors on portions of the Project.
- C. The Project Site is limited to the area shown in Exhibit B.
- D. Provide protection and safekeeping of material and products stored on or off the premises.
- E. Move any stored material or products which interfere with operations of Owner or other Contractors.

1.6 WARRANTY

- A. The Contractor warrants and guarantees to the City that all work shall be in accordance with the Contract Documents and will not be defective. Prompt notice of all defects will be given to the Contractor. All defective work, whether or not in place, may be rejected, corrected or accepted as provided in this proposal.
- B. If within one (1) year after the date of contract work completion or such longer period of time as may be prescribed by law or by the terms of any applicable special guarantee required by the Contract Documents or by a special provision of the Contract Documents, any work is found to be defective, the Contractor shall comply in accordance with the City's written instructions. These written instructions will include either correcting such defective work or, if it has been rejected by the City, removing it from the site and replacing it with non-defective work. If the Contractor does not promptly comply with the terms of such instructions, or in an emergency

where delay would cause serious risk or loss or damage, the City may have the defective work corrected or the rejected work removed and replaced. All direct and indirect costs of correction or removal and replacement of defective work, including compensation for additional professional services, shall be paid by the Contractor.

1.7 WORK BY OTHERS

- A. Prior to moving furniture, City personnel will remove all personal items and electronics and empty drawers and filing cabinets.
- B. Cooperate fully with separate contractors and/or Owner so work by others may be carried out smoothly, without interfering with or delaying work under this Contract.

1.8 MISCELLANEOUS PROVISIONS

- A. Materials shall conform to Exhibits.
- B. The dumpster location will be coordinated with the City of De Pere prior to placement.
- C. Provide dust barriers between construction areas and locations where no work is being performed. Areas not under construction will be used by City staff.
- D. Provide eight moving carts one week prior the start of construction for City staff to use for office items being removed for construction.

PART 2 – PRODUCTS

PART 3 – EXECUTION

END OF SECTION

SECTION 01 29 00

PAYMENT PROCEDURES

PART 1 – GENERAL

1.1 SUMMARY

A. This section includes:

1. Administrative and procedural requirements necessary to prepare and process Applications for Payment.

1.2 SCHEDULE OF VALUES

- A. Unit Price work will be the Schedule of Values used as the basis for reviewing Applications for Payment.**

1.3 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment shall be consistent with previous applications and payments as recommended by the Engineer and approved by Owner.**
- B. The date for each progress payment should be the 3rd Wednesday of each month. The period covered by each Application for Payment starts on the day following the end of the preceding period and ends the 4th Friday of the Month.**
- C. Use forms provided by Engineer for Applications for Payment. Sample copy of the Application for Payment and Continuation Sheet is included in Section 00 62 76.**
- D. Application Preparation Procedures**
1. When requested by the Contractor, the Engineer will determine the actual quantities and classifications of Unit Price Work performed.
 - a. Preliminary determinations will be reviewed with the Contractor before completing Application for Payment.
 - b. Engineer will complete the Application for Payment based on Engineer's decision on actual quantities and classifications.
 - c. Engineer will submit three original copies of Application for Payment to Contractor for certification of all three original copies.
 - d. Contractor shall submit signed Application for Payment to Owner for approval within time frame agreed to at the Preconstruction Conference.
 2. If payment is requested for materials and equipment not incorporated in the Work, then the following shall be submitted with the Application for Payment:
 - a. Evidence that materials and equipment are suitably stored at the site or at another location agreed to in writing.

- b. A bill of sale, invoice, or other documentation warranting that the materials and equipment are free and clear of all liens.
 - c. Evidence that the materials and equipment are covered by property insurance.
 3. Complete every entry on form. Execute by a person authorized to sign legal documents on behalf of Contractor.
- E. With each Application for Payment, submit waivers of liens from subcontractors and suppliers for the construction period covered by the previous application.
 1. Submit partial waivers on each item for amount requested before deduction for retainage on each item.
 2. When an application shows completion for an item, submit final or full waivers.
 3. Owner reserves the right to designate which entities involved in the Work shall submit waivers.
 4. Submit final Application for Payment with or preceded by final waivers from every entity involved with performance of the Work covered by the application.
 5. Submit waivers of lien on forms executed in a manner acceptable to Owner.
- F. The following administrative actions and submittals shall precede or coincide with submittal of first Application for Payment:
 1. List of subcontractors.
 2. Schedule of Values (For Lump Sum Work).
 3. Contractor's construction schedule.
- G. Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted including, but not limited, to the following:
 1. Evidence of completion of Project closeout requirements.
 2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
 3. Updated final statement, accounting for final changes to the Contract Sum.
 4. Consent of Surety to Final Payment.
 5. Final lien waivers as evidence that claims have been settled.
 6. Final liquidated damages settlement statement.

PART 2 – PRODUCTS

PART 3 – EXECUTION

END OF SECTION

SECTION 01 32 33

CONSTRUCTION PHOTOGRAPHS

PART 1 – GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Photographs for construction sites.

1.2 SUBMITTALS

- A. Submit electronic files of each photographic view within seven (7) days of taking photographs.

1.3 QUALITY ASSURANCE

- A. Photographs are to be submitted to the Engineer for approval prior to the start of construction.

PART 2 – PRODUCTS

PART 3 – EXECUTION

3.1 CONSTRUCTION SITES

- A. Prior to start of construction provide sufficient photographs to adequately show the existing facilities and conditions within and adjacent to the construction Site to serve as a guide for final restoration including:
 - 1. Existing floor at match point.
 - 2. Doors and jambs.
 - 3. Abutting rooms and hallways.

END OF SECTION

SECTION 01 33 00

SUBMITTALS

PART 1 – GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for submittals:
 - 1. Progress Schedule.
 - 2. Schedule of Shop Drawings and Sample Submittals.
 - 3. Shop Drawings.
- B. Failure to meet Submittal requirements to the satisfaction of the Engineer will constitute unsatisfactory performance of the work in accordance with the Contract Documents, therefore, the Engineer may recommend to the Owner that all or a portion of payments requested during the corresponding pay period be withheld until these requirements are met.

1.2 SUBMITTAL PROCEDURES

- A. Coordination: Transmit each submittal sufficiently in advance of performance of related construction activities to avoid delay.
 - 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 - 2. Coordinate transmittal of different types of submittals for related elements of the work so processing will not be delayed by the need to review submittals concurrently for coordination.
 - a. The Engineer reserves the right to withhold action on a submittal requiring coordination with other submittals until all related submittals are received.
 - 3. To avoid the need to delay installation as a result of the time required to process submittals, allow sufficient time for submittal review, including time for re-submittals.
 - a. Allow two weeks for initial submittal.
 - b. Allow two weeks for reprocessing each submittal.
 - c. No extension of Contract Time will be authorized because of failure to transmit submittals to the Engineer sufficiently in advance of the work to permit processing.
- B. Submittal Preparation: Place a permanent label or title block on each submittal for identification. Indicate the name of the entity that prepared each submittal on the label or title block.
 - 1. Assign a reference number to each submittal and re-submittal.
 - 2. Provide a space approximately four (4) by five (5) inches (100 by 125 mm) on the label or beside the title block on Shop Drawings to record the Contractor's review and approval markings and the action taken.
 - 3. Include the following information on the label for processing and recording action taken.

- a. Project name.
 - b. Date.
 - c. Name and address of the Engineer.
 - d. Name and address of the Contractor.
 - e. Name and address of the subcontractor.
 - f. Name and address of the supplier.
 - g. Name of the manufacturer.
 - h. Number and title of appropriate Specification Section.
 - i. Drawing number and detail references, as appropriate.
 4. Each submittal shall be stamped by the Contractor indicating that submittal was reviewed for conformance with the Contract Documents. The Engineer will not accept unstamped submittals.
- C. Submittal Transmittal: Package each submittal appropriately for transmittal and handling. Transmit each submittal to the Engineer. The Engineer will not accept submittals received from sources other than the Contractor.
1. On the transmittal, record relevant information and requests for Engineer action. On a form, or separate sheet, record deviations from Contract Document requirements, including variations, limitations, and justifications. Include Contractor's certification that information complies with Contract Document requirements.

1.3 CONTRACTOR'S PROGRESS SCHEDULE

- A. Prepare and submit to the Engineer within 10 (ten) days after the Effective Date of the Agreement, four copies of a preliminary progress schedule of the work activities from Notice to Proceed until Substantial Completion.
1. Provide sufficient detail of the work activities comprising the schedule to assure adequate planning and execution of the work, such that in the judgment of the Engineer, it provides an appropriate basis for monitoring and evaluation of the progress of the work. A work activity is defined as an activity which requires substantial time and resources (manpower, equipment, and/or material) to complete and must be performed before the contract is considered complete.
 2. The schedule shall indicate the sequence of work activities. Identify each activity with a description, start date, completion date and duration. Include, but do not limit to the following items, as appropriate to this contract:
 - a. Shop drawing review by the Engineer.
 - b. Excavation and grading.
 - c. Asphalt and concrete placement sequence.
 - d. Restoration.
 - e. Construction of various segments of utilities.
 - f. Subcontractor's items of work.
 - g. Allowance for inclement weather.
 - h. Contract interfaces, date of Substantial Completion.
 - i. Interfacing and sequencing with existing facilities and utilities.

- j. Sequencing of major construction activities.
 - k. Milestones and completion dates.
- B. Distribution: Following response to the initial submittal, print and distribute copies of the revised construction schedule to the Engineer, Subcontractors, and other parties required to comply with scheduled dates. When revisions are made, distribute to the same parties. Delete parties from distribution when they have completed their assigned portion of the work and are no longer involved in construction activities.
- C. Schedule Updating: Revise the schedule after each meeting, event, or activity where revisions have been recognized or made. Issue the updated schedule concurrently with the report of each meeting.
- D. Punch List: Prepare and submit to the Engineer within ten (10) days after substantial completion a detailed progress schedule for outstanding work and punch list items.

1.4 SCHEDULE OF SHOP DRAWINGS AND SAMPLE SUBMITTALS

- A. Submit electronic or one (1) hard copy of preliminary submittal schedule in accordance with the General Conditions of the Contract and as follows:
- 1. Coordinate submittal schedule with the subcontractors, Schedule of Values, and of products as well as the Contractor's Progress Schedule.
 - 2. Prepare the schedule in chronological order. Provide the following information:
 - a. Scheduled date for the first submittal.
 - b. Related Section number.
 - c. Submittal category (Shop Drawings, Product Data, or Samples).
 - d. Name of the subcontractor.
 - e. Description of the part of the work covered.
 - f. Scheduled date for the Engineer's final release or approval.
- B. Distribution: Following response to the initial submittal, print and distribute copies of the revised construction schedule to the Engineer, Subcontractors, and other parties required to comply with scheduled dates. Post copies in the field office. When revisions are made, distribute to the same parties. Delete parties from distribution when they have completed their assigned portion of the work and are no longer involved in construction activities.
- C. Schedule Updating: Revise the schedule after each meeting or activity where revisions have been recognized or made. Issue the updated schedule concurrently with the report of each meeting.

1.5 SHOP DRAWINGS

- A. Submit newly prepared information drawn accurately to scale. Highlight, encircle, or otherwise indicate deviations from the Contract Documents. Do not reproduce Contract Documents or

copy standard information as the basis of Shop Drawings. Standard information prepared without specific reference to the Project is not a Shop Drawing.

- B. Collect product data into a single submittal for each element of construction of system. Product data includes printed information, such as manufacturer's installation instructions, catalog cuts, standard color charts, roughing-in diagrams and templates, standard wiring diagrams, and performance curves.
 - 1. Mark each copy to show actual product to be provided. Where printed Product Data includes information on several products that are not required, mark copies to indicate the applicable information. Include the following information:
 - a. Manufacturer's printed recommendations.
 - b. Compliance with trade association standards.
 - c. Compliance with recognized testing agency standards.
 - d. Application of testing agency labels and seals.
 - e. Notation of dimensions verified by field measurement.
 - f. Notation of coordination requirements.
- C. Do not use shop drawings without an appropriate final stamp indicating action taken.
- D. Submittals: Submit electronic or one (1) hard copy of each required submittal. The Engineer will scan and return the submittal to the Contractor marked with action taken and corrections or modifications required.
- E. Distribution: Furnish copies of reviewed submittal to installers, subcontractors, suppliers, manufacturers, fabricators, and others required for performance of construction activities. Show distribution on transmittal forms. Maintain one copy at the project site for reference.
 - 1. Do not proceed with installation until a copy of the Shop drawing is in the Installer's possession.
 - 2. Do not permit use of unmarked copies of the Shop Drawing in connection with construction.

1.6 ENGINEER'S ACTION

- A. Except for submittals for the record or information, where action and return is required, the Engineer will review each submittal, mark to indicate action taken, and return promptly. The Engineer will stamp each submittal with a uniform action stamp. The Engineer will mark the stamp appropriately to indicate the action taken, as follows:
 - 1. "No Exceptions Taken": The work covered by the submittal may proceed provided it complies with notations or corrections on the submittal and requirements of the Contract Documents.
 - 2. "Make Corrections Noted": The work covered by the submittal may proceed provided it complies with notations or corrections on the submittal and requirements of the Contract Documents.

3. "Amend and Resubmit": Do not proceed with work covered by the submittal. Resubmit without delay. Do not use, or allow others to use, submittals marked "Amend and Resubmit" at the Project Site or elsewhere where work is in progress.
4. "Rejected – See Remarks": Do not proceed with work covered by the submittal. Resubmit without delay. Do not use, or allow others to use, submittals marked "Rejected and Resubmit" at the Project Site or elsewhere where work is in progress.

- B. Unsolicited Submittals: The Engineer will return unsolicited submittals to the sender without action.

PART 2 – PRODUCTS

PART 3 – EXECUTION

END OF SECTION

EXHIBIT A

DE PERE CITY HALL FIRST FLOOR REMODEL SPECIAL PROVISIONS BY BERNERS-SCHOBER ASSOCIATES, INC

PROJECT MANUAL

City Hall 1st Floor Remodel

De Pere, WISCONSIN

Berners-Schober Associates, Inc.
310 Pine Street
Green Bay, Wisconsin 54301
Phone:(920) 432-4865
Fax:(920) 432-1284

July 3rd, 2025

Commission No. 25CDEP01.00

SECTION 02 41 19

SELECTIVE DEMOLITION

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Remove materials required for remodeling work.

1.02 RELATED WORK

- A. Section 09 51 13 - Removal and Reinstallation of Acoustical Panel Ceilings
- B. Contractors for respective branches of the work shall remove or alter electrical apparatus, heating apparatus, piping, and similar materials. Refer to mechanical and electrical drawings and specifications for extent of this work.

1.03 PROJECT CONDITIONS

- A. All present services installed and operating shall be kept in operation through the new construction until equal new services or temporary lines satisfactory to Owner are installed and operating.
- B. Provide and maintain protection for the public from hazards caused by this work.

PART 2 DOES NOT APPLY

PART 3 EXECUTION

3.01 PREPARATION

- A. Provide enclosures to prevent the spread of dust during demolition operations.
- B. The Owner shall have the right to remove fixed and portable items prior to the start of remodeling work. Verify that the Owner has exercised that right.

3.02 DEMOLITION

- A. Partitions shown to be removed shall be completely removed from structure above to floor slab.
- B. Cut openings in existing walls for new doors, passageways, etc. Execute work with a minimum disturbance to existing construction which remains.

- C. Remove existing slab on grade as required to patch floor or install new floor finish.
- D. Remove existing resilient flooring and carpet as required to install new floor finish.
 - 1. All layers of flooring shall be removed down to concrete slab or topping.
 - 2. Remove all adhesive residue which will interfere with installation of new flooring. All adhesives shall be mechanically removed. Do not use chemicals which may penetrate substrate and react with new adhesives.
 - 3. Remove existing resilient flooring which may be present under existing carpeting.
- E. Unless noted otherwise on the plans, remove existing base as required to install base as scheduled in the New Room Finish schedule. Base shall be removed down to original finished wall surface. Remove all adhesive residue which will interfere with installation of new base.
- F. Remove existing suspended acoustical tile ceilings where new suspended acoustical tile ceilings are scheduled.
- G. Acoustical tile ceilings which are to be removed and reinstalled shall be removed as part of Acoustical Work, Section 09 51 13. Ceilings which are removed and not reinstalled are part of the work under this section.
 - 1. Ceiling tile removed by this Section shall be salvaged and turned over to Owner for attic stock.
 - 2. Do not salvage any cut, damaged or broken ceiling tile.
 - 3. Handle salvaged tile with gloves or clean hands to avoid smearing dirt or leaving finger/hand prints.
- H. Where existing acoustical tile ceilings are removed, remove all supporting grid work, black iron, etc., which is not required for new ceilings.
- I. Remove all other material and equipment shown to be removed or as required for the completion of the project.
- J. Existing materials which are intended to be reused shall be removed with care to avoid damage to finished surfaces. Store in a protected location, in the same manner required for new materials, until the project is ready for their reinstallation. Contractor shall photograph and document all damage prior to removal.

3.03 CLEANING

- A. Materials removed shall become the Contractor's property unless specifically stated otherwise.
- B. All materials, rubbish, and debris shall be removed from the building and from the premises as soon as it accumulates. Removal of rubbish and debris shall be conducted in such a way that a minimum of dust is caused.
- C. Maintain Owner occupied areas as clean as possible to avoid interference with Owner's operations.

SECTION 03 30 00

CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Furnish and install cast-in-place concrete.

1.02 SUBMITTALS

- A. Submit concrete mix designs to the Architect for approval.
- B. Results of field and laboratory tests.

1.03 QUALITY ASSURANCE

- A. Ready-Mix Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C94 requirements for production facilities and equipment.

PART 2 PRODUCTS

2.01 FORM MATERIALS

- A. Form material for concrete surfaces which will be exposed to view shall be Plyform, Class I, B.B. grade plywood conforming to US Product Standard PS-1.

2.02 STEEL REINFORCEMENT

- A. Reinforcing bars shall conform to the requirements of ASTM A615 Grade 60. Grade marks shall be rolled in the bars. All materials shall be produced by domestic mills.
- B. Welded wire reinforcement (WWR) shall be electric welded wire mesh conforming to the requirements of ASTM A1064. Unless noted otherwise, mesh shall be 6 x 6-W1.4 x W1.4 in topping slabs and 6 x 6-W2.9 x W2.9 in equipment pads placed at the center of the slab.

2.03 CONCRETE MATERIALS

- A. Cement for regular concrete shall conform to ASTM Specification C595 Type 1L Portland-Limestone Cement (PLC) or C150 for Type I Portland Cement.
- B. Concrete aggregates shall meet the requirements of ASTM Specification C-33.
- C. Fly Ash shall conform to ASTM Specification C618, Type C.
- D. Water shall be potable, clean and free of injurious amounts of oil, acid, alkali, salts, organic matter, and other deleterious substances.

2.04 CURING MATERIALS

- A. Provide 6 mil polyethylene sheeting conforming to ASTM Specification D2103 Type 1300.
- B. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

2.05 RELATED MATERIALS

- A. Floor Sealer/Hardener:
 - 1. Type: Water soluble, magnesium-fluorosilicate based, reactive with free lime in concrete, non-film forming.
 - a. MasterKure HD 300 WB Concrete Hardener as manufactured by Sika Corporation, Lyndhurst, New Jersey.
- B. Grout
 - 1. Provide SikaGrout® – 212, General purpose, one-component, cementitious, non-shrink grout manufactured by Sika Corporation, Lyndhurst, New Jersey.
- C. Chamfer Strips: 1/2" radius, similar to Cat. No. 602, manufactured by Sika Corporation, Lyndhurst, New Jersey.

2.06 MIXES

- A. Concrete shall be thoroughly mixed to a uniform texture and consistency in accordance with ASTM Specification C-94. Concrete shall not be mixed at the site unless specifically permitted by the Architect.
- B. No admixtures shall be used unless specifically authorized by the Architect.

C. Concrete shall be mixed in accordance with the following table:

<u>Class</u>	<u>Strength</u>	<u>Aggregate Gradation</u>	<u>Max. Water</u>	<u>Min. Cement</u>	<u>Fly Ash</u>	<u>Max. Sand</u>	<u>Allowable Slump</u>	<u>Notes</u>
B	4000 psi	No. 67	340#	560#	70#	45%	3" to 5"	1,2,3
C	3500 psi	No. 67	325#	525#	60#	48%	1" to 3"	1,2,3

Notes:

1. Strength shall be the expected 28-day strength of field cured concrete. It is anticipated that the strength of laboratory cured test samples will exceed the expected strength of field cured specimens.
 2. The maximum water shall include surface water contained in aggregate.
 3. Sand percentage expressed as a percentage of the total aggregate.
- D. In cold weather, the concrete, when deposited, shall conform to the temperature limitations established in ACI: Committee 306.
- E. In hot weather, ingredients shall be cooled so that the maximum concrete temperature does not exceed the recommendations of ACI Report 305, but in no case exceeds 90°F.

PART 3 EXECUTION

3.01 FORMWORK

- A. Forms shall be used, wherever necessary, to confine concrete and shape it to the required dimensions. Forms shall have sufficient strength to withstand the pressure resulting from placement and vibration of the concrete.
1. Provide chamfer strips placed in forms at all permanently exposed outside corners.
- B. All formwork shall be thoroughly cleaned before reuse.

3.02 PREPARATION

A. General

1. Check drawings carefully, including those for other trades, for inserts, fastening devices, sleeves, equipment pads, and openings required for general construction and other work.
 - a. Notify other trades sufficiently in advance of each pour to permit installation of items to be imbedded in concrete.
 - b. Assist others so that all anchors, inserts, bolts, sleeves, etc., are carefully and accurately located and placed.
2. All forms other than metal shall be drenched with water before concrete is deposited.

B. Joints

1. Construction Joints:
 - a. Locate and install construction joints which are not shown on drawings so as not to impair strength and appearance of the structure, as acceptable to Architect.
 - b. Place construction joints perpendicular to the main reinforcement. Continue reinforcement across construction joints except as indicated otherwise. Do not continue reinforcement through sides of strip placements.
 - c. Provide keyways at least 1-1/2" deep.
 - d. Use bonding agent on existing concrete surfaces that will be joined with fresh concrete.
2. Contraction (Control) Joints:
 - a. Contraction joints shall be a formed, sawed or tooled groove which creates a weakened-plane, used to regulate the location of cracking. Contraction joint depth shall be one-fourth the slab thickness.
 - b. Locate and install contraction joints in topping slabs at intervals not to exceed 8'-0" in either direction unless shown otherwise on the drawings. Maintain a length to width ratio of not more than 1-1/2 to 1, staying as close to square as possible.
 - c. Time of Sawing: Afternoon sawing of a morning pour and night sawing of an afternoon pour.

3.03 PLACING CONCRETE

- A. Concrete for floor slab shall be Class C. Changes in consistency may be obtained by changing the proportion of fine and coarse aggregate. In no case shall the amount of water be exceeded.
 - 1. All other concrete shall be Class B, unless noted otherwise.
- B. All concrete shall be carefully placed in such a manner so that no segregation of the aggregate occurs and the concrete is thoroughly in contact with the forms and reinforcing steel.

3.04 CONCRETE FINISHING

- A. Concrete slabs shall be struck off to the established grade, then floated manually. Floating shall be followed by steel troweling after the concrete has hardened sufficiently to prevent excess fine material from working to the surface. The finish shall be brought to a smooth surface free from defects and blemishes. No dry cement nor mixture of dry cement and sand shall be sprinkled directly on the surface of the wearing course to absorb moisture nor to stiffen the mix. After the concrete has further hardened, additional troweling shall be done with hand trowel to remove all blemishes.
 - 1. Cut concrete into areas not to exceed 8'-0" in either direction. Sawing shall begin as soon as the surface is firm enough so that it will not be torn or damaged by the blade.
- B. Concrete floors shall be level to within 1/8" in 10'-0". The Concrete Trade shall be responsible for providing smooth, level floors, ready for the installation of carpet, resilient flooring, or other finish. Level floors with latex cement as necessary to meet this standard.
- C. Interior concrete which is exposed to view shall have fins removed, rough edges ground smooth, and all honeycombing filled with neat cement.

3.05 FIELD QUALITY CONTROL

- A. Samples of concrete shall be obtained in accordance with ASTM-C172 method and shall be transported to a place on the site where tests can be made and cylinders stored without being disturbed.
 - 1. Use of alternate methods of strength testing will be considered upon request. However, any alternate methods proposed will be approved only as a supplement to, not a replacement for, the standard cylinder testing method.

- B. A record shall be made by Contractor of the delivery ticket number for the particular load of concrete tested, date, name of ready-mix supplier, location in job, type and brand of cement, class of concrete, amount of concrete represented, admixtures, if any, water added at job if any, air temperature and slump. In cold weather concreting, concrete temperature shall also be recorded.
- C. All required sampling, preparation of specimens, transportation, and test expenses shall be paid by the Contractor. All testing shall be done by a testing laboratory approved by the Architect.
- D. Strength tests shall be made for each of the following conditions: Each day's pour; each class of concrete; each change of supply or source of concrete.
 - 1. A strength test shall consist of four standard cylinders, with two cylinders tested at 7 days and two at 28 days.
 - 2. Cylinders for strength tests shall be made in accordance with ASTM-31. Cylinders shall be cured on the job site in the same manner as pour from which the sample is procured.
 - 3. To conform to the requirements of this specification, the average of all the strength tests representing each class of concrete, as well as the average of any three consecutive tests of the field cured specimens, shall be equal to or greater than the specified strength, and not more than 10% of the strength tests shall have values less than 90% of the specified strength.
- E. Slump tests shall be made in accordance with ASTM Test C-143 from the same batch of concrete from which strength tests are made.
- F. Test Failure and Rejection
 - 1. If the measured slump falls outside the limits specified, a check test shall be made immediately on another portion of the same sample. In the event of a second failure, the concrete shall be rejected and not used in the structure.
 - 2. If job cured cylinders fail to conform to the above tests, the Architect reserves the right to make such changes to Proportions of Mixes as required at no additional cost to the Owner.
 - 3. Any additional testing required because of failure of concrete to meet specifications shall be paid for by the Contractor including full scale load tests or samples taken in accordance with ASTM-C42 "Method of Obtaining and Testing Drilled Cores and Sawed Beams of Concrete."

3.06 PROTECTION AND CURING

- A. Concrete shall be protected from mechanical injury, premature drying, and excessively hot or cold temperatures beginning immediately after placement.
- B. Maintain concrete with minimal moisture loss and temperature variation for the period necessary for hydration of the cement and hardening of the concrete.
 - 1. The top surface of concrete slabs, where concrete is the substrate for an applied floor finish material, shall be cured with a 6-mil polyethylene moisture retaining cover.
 - a. Moisture retaining cover shall be in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
 - 2. The top surface of concrete slabs, where concrete is the finished surface, may be cured with a membrane forming curing and sealing compound approved by the Architect.
 - a. Apply membrane forming curing and sealing compound uniformly in a continuous operation by power spray or roller according to manufacturer's written instructions. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period. Recoat areas subjected to heavy rainfall within three hours after initial application.

3.07 ADJUSTING AND CLEANING

- A. All patching required by faulty work shall be done carefully and neatly as soon as forms are removed.
- B. All concrete which is not formed as shown on the drawings or is out of alignment or level shall be removed.
- C. Excess concrete shall be removed from the site.

SECTION 03 54 00

SELF-LEVELING UNDERLAYMENT

PART 1 GENERAL

1.01 WORK INCLUDED

- A. This Section includes a fluid-applied self-leveling underlayment formulated to level and smooth interior concrete, terrazzo, ceramic tile and other similar substrates prior to the installation of finished flooring.

1.02 RELATED WORK

- A. Division 9 - Flooring

1.03 SUBMITTALS

- A. Product Data: Submit manufacturer's product data and installation instructions for each material and product used. Include manufacturer's Safety Data Sheets (SDS).
- B. Qualification Data: Provide information verifying Installer complies with requirements indicated under Quality Assurance.

1.04 QUALITY ASSURANCE

- A. Installation must be by a trained applicator with minimum of 5 years of experience installing self-leveling underlayment of the type required for this project.
- B. Primary materials shall be the products of one manufacturer.
- C. Comply with all manufacturer's instructions and recommendations regarding minimum thickness of material. Pay particular attention to feather edges, areas subject to castor/wheel traffic and on non-absorbent surfaces.
- D. Pre-Installation Conference: Prior to starting work of this Section, Contractors shall conduct a pre-installation conference at the project site.
 - 1. Attendees shall include Contractor, Architect, self-leveling underlayment installer, self-leveling underlayment manufacturer's representative and any other parties directly affecting, or affected by the work of this Section.
 - 2. Review self-leveling underlayment requirements including surface preparation, substrate condition and pre-treatment, minimum material thickness, curing period and all installation procedures.
 - 3. Document proceedings including corrective measures and actions required, and furnish copy of record to each participant.

- E. Make arrangements necessary to have a trained employee of the manufacturer on site for the pre-installation conference and periodically during self-leveling underlayment installation work to review installation procedures.

1.05 DELIVERY, HANDLING AND STORAGE

- A. All materials shall be delivered in original, unopened containers with the manufacturer's name, labels, and product identification.
- B. Damaged materials must be removed from site.
- C. Store all materials off the ground and protect from rain, freezing or excessive heat until ready for use.

1.06 SITE CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not apply self-leveling underlayment under environmental conditions outside manufacturer's absolute limits.

PART 2 PRODUCTS

2.01 SELF-LEVELING UNDERLAYMENT MATERIALS

- A. Installer may select any product listed below.
 - 1. Consideration of product cure times in relation to floor covering material and project schedule shall be factored into product selection.
 - 2. Product selection below is based upon a minimum compressive strength of 3000psi as tested per ASTM C109. Alternate manufacturers' full installation systems, submitted during pre-bid Requests For Information (RFIs) may be approved pending documentation of compliance with the performance listed herein.
- B. Schönox HSP North America, Florence, Alabama
 - 1. Schönox US (cement based) - 1/8" to 2 3/8" thickness
 - 2. Schönox SL (cement based) – featheredge – Utilize for transition only
 - 3. Schönox ZM (cement based) - 1/16" to 7/8" thickness
 - 4. Schönox AP (synthetic gypsum based) - 1/8" to 2" thickness

C. UFLOOR Systems, Inc., Aurora, Colorado

1. Uzin NC 170 LevelStar Leveling Compound (cement based) - 1/8" minimum thickness required
2. Uzin NC 888 Turbo Patching Compound (cement based) - 0" to 1/8" overall – Utilize for transition only
3. Uzin NC157 Project Self Leveling Compound (cement based) – 1/8" minimum thickness required
4. Uzin NC 110 Premium Self Leveling Compound (synthetic gypsum based) – 1/8" minimum thickness required

D. Ardex Americas, Aliquippa, Pennsylvania

1. Ardex K10 (cement based) - 1/8" minimum thickness required; allowed up to 1/2" thickness.
2. Ardex K60 (cement based) - 1/8" minimum thickness required (Less compressive strength than K10 or V1200)
3. Ardex V1200 (cement based)- 1/4" minimum thickness required; allowed up to 2" thickness.
4. Ardex Feather Finish (cement based) – 0" to 1/4" maximum - Utilize for transition only

2.02 MOISTURE MITIGATION MATERIALS

A. Installer may select any product listed below.

1. Schönox HSP North America, Florence, Alabama
 - a. Schönox EPA Moisture Barrier
2. UFLOOR Systems, Inc., Aurora, Colorado
 - a. Uzin PE 460 Moisture Vapor Retarder/Primer
3. Ardex Americas, Aliquippa, Pennsylvania
 - a. Ardex MC Rapid Moisture Control System

2.03 ACCESSORIES

- A. Water: Cold, clean, potable.
 - 1. Mix self-leveling underlayment with manufacturer's recommended latex liquid where water is not to be used.
- B. Primers: Type recommended by self-leveling underlayment material manufacturer for actual substrates and toppings conditions.
- C. Aggregate Mix: Type recommended by self-leveling underlayment material manufacturer.
- D. Expansion Strips: Type recommended by self-leveling underlayment material manufacturer.
- E. Furnish all additional materials, products and tools required for a complete installation.

PART 3 EXECUTION

3.01 PREPARATION

- A. Prepare substrate in accordance with manufacturer's instructions.
 - 1. All subfloors must be sound, solid, clean, and free of all oil, grease, dirt, curing compounds and any substance that might act as a bond breaker before priming. Mechanically clean if necessary using shot blasting or other. Acid etching and the use of sweeping compounds and solvents are not acceptable.
 - 2. All cracks and joints shall be filled and/or repaired to minimize telegraphing through the self-leveling underlayment.
 - 3. Apply primers as recommended by self-leveling underlayment manufacturer for applicable substrate.
- B. Coordinate installation with adjacent work to ensure proper sequence of construction. Protect adjacent areas from contact due to mixing and handling of materials.
- C. Substrates shall be tested for moisture vapor emission. Where moisture vapor levels exceed the values listed below, install the appropriate primers and a moisture mitigation system prior to installing self-leveling underlayment.
 - 1. 3 lbs./1,000 sq. ft./24 hr. using the calcium chloride test per ASTM F-1869.
 - 2. 75% relative humidity using In-Situ Relative Humidity Testing per ASTM F-2170.

3.02 INSTALLATION

- A. Install self-leveling underlayment in accordance with manufacturer's instructions.
- B. Comply with manufacturer's minimum and maximum thickness recommendations.
- C. Pour or pump underlayment over substrate, spread, smooth and allow to self-level.
- D. Blend edges of subsequent pours into wet edge of previous pour. Prevent formation of cold joints and flow lines.
- E. Allow to cure in accordance with manufacturer's instructions.

3.03 PROTECTION

- A. Erect suitable barriers and post legible signs at points of entry to prevent traffic and trades from entering the work area during application and cure period of the floor.
- B. Prior to the installation of the finish flooring, the surface of self-leveling underlayment shall be protected from abuse by other trades by the use of plywood, Masonite or other suitable protection course.

SECTION 05 05 20

FASTENERS AND METAL FASTENINGS

PART 1 GENERAL

1.01 DEFINITIONS

- A. Expansion Anchor - Wedge type mechanical expansion bolt.
- B. Screw Anchor - Heavy duty single piece self-threading anchor with integral hex head and washer. (1/4" diameter and larger)
- C. Drop-In Anchor - All-steel internally threaded machine bolt anchor.
- D. Epoxy Anchor - Threaded steel rod set in epoxy or acrylic adhesive which has been injected into the base material.
- E. Concrete Screw - Single piece self-threading screw with integral hex head. (Up to 3/16" diameter)
- F. Concrete Insert - Cold formed, 12 gauge, 1-5/8" wide channel embedded in concrete joists or beams.
- G. Threaded Rod Anchoring System - Self-drilling, self-tapping, all-thread rod anchoring system for 1/4", 3/8", and 1/2" diameter rod. (For use in wood and steel only.)

1.02 RELATED WORK

- A. Section 21 05 29 - Hangers and Supports for Fire Suppression Piping and Equipment
- B. Section 22 05 29 - Hangers and Supports for Plumbing Piping and Equipment
- C. Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment
- D. Section 26 05 33 - Raceway and Boxes
- E. Section 26 05 36 - Cable Trays
- F. Section 26 24 16 - Panelboards
- G. Section 26 27 28 - Disconnect Switches
- H. Section 26 51 13 - Interior Lighting Fixtures, LED's and Drivers

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Hilti Inc.; Tulsa, Oklahoma
- B. DeWalt; Brewster, New York
- C. Simpson Strong-Tie Anchor Systems, Inc.; Pleasanton, California
- D. Red Head; Wood Dale, Illinois
- E. Unistrut; Wayne, Michigan
- F. Eaton (B-Line Division); Highland, Illinois

2.02 MATERIALS

A. Mechanical Anchors

1. Vertical Installation Overhead - Anchors must be certified by ICC (International Code Council) for use in "cracked or un-cracked concrete".
 - a. HILTI KWIK BOLT-TZ2 EXPANSION ANCHOR PER ICC ESR-4561
 - b. "HILTI HSL-4 Heavy Duty Expansion Anchor" PER (ICC-ES ESR-4386
 - c. "STRONG-BOLT 2" by Simpson Strong-Tie (ICC-ES ESR-3037)
 - d. "TITEN HD" by Simpson Strong-Tie (ICC-ES ESR-2713)
 - e. "POWER-STUD + SD2" by DeWalt (ICC-ES ESR-2502)
 - f. "POWER-BOLT+" by DeWalt (ICC-ES ESR-3260)
 - g. "SCREW-BOLT+" by DeWalt (ICC-ES ESR-3889)
 - h. "SNAKE +" (internally threaded screw anchor) by DeWalt (ICC-ES ESR-2272)
 - i. "TITEN HD THREADED ROD HANGER" (internally threaded screw anchor) by Simpson Strong-Tie (ICC-ES ESR-2713)
 - j. "KWIK HUS-EZ SCREW ANCHOR" by Hilti (ICC-ES ESR-3027)
 - k. "KH-EZ I SCREW ANCHOR" (internally threaded screw anchor) by Hilti (ICC-ES ESR-3027)
 - l. "HANGER-MATE+ ROD HANGER SCREW ANCHOR" by DeWalt (ICC-ES ESR-3889)

2. Horizontal or Non-Overhead Vertical Installation
 - a. HILTI KWIK BOLT-1 EXPANSION ANCHOR PER IAPMO ER-67
 - b. "POWER STUD+SD1" by DeWalt (ICC-ES ESR-2818)
 - c. "WEDGE-ALL" by Simpson Strong-Tie (ICC-ES ESR-1396)
 - d. "TRUBOLT" by Red Head (ICC-ES ESR-2251)
 - e. All anchors listed for vertical installation in Sub-paragraph 1.
- B. Screw Anchors
 1. "KWIK HUS SCREW ANCHOR" by Hilti
 2. "SCREW-BOLT" by DeWalt (ICC-ES ESR-3889)
 3. "TITEN HD" by Simpson Strong-Tie (ICC-ES ESR-2713)
 4. "LDT (Large Diameter Tapcon)" by Red Head.
- C. Drop-In Anchors
 1. "HILTI HDI-TZ Per ICC ESR 4236
 2. "STEEL DROPIN" by DeWalt
 3. "DROP-IN (DIAB)" By Simpson Strong-Tie
 4. "MULTI-SET II" by Red Head
- D. Drop-In Anchors for Hollowcore Precast Plank
 1. "HILTI HDI-P TZ" Per ICC ESR 4236
 2. "MINI DROPIN" by DeWalt
 3. "HOLLOW-SET DROPIN" by DeWalt
 4. "MINI-UNDERCUT+" by DeWalt (ICC-ES ESR-3912)
 5. "HOLLOW DROP-IN (HDIA)" by Simpson Strong-Tie
 6. "RX DROP-IN ANCHOR" by Red Head
- E. Epoxy Anchors
 1. "HIT-HY 100 ADHESIVE ANCHOR" by Hilti (ICC-ES ESR-3574)
 2. "PURE220+" by DeWalt (ICC-ES ESR-5144)
 3. "ET-HP" by Simpson Strong-Tie (ICC-ES ESR-3372)
 4. "REDHEAD C6 +" by Red Head (ICC-ES ESR-4046) and ESR-4109

F. Epoxy Anchors for Cold Weather Installation

1. "HIT-HY 200-A V3 ADHESIVE ANCHOR" by Hilti (ICC-ES ESR-3187 and ESR-3963)
2. HILTI KWIK-X DUAL ACTION ANCHOR SAFESET SYSTEM WITH KHC CAPSULE ADHESIVE AND KWIK-HUS EZ PER ICC ESR-5065 (Can be used down to -18F)
3. "AC100 + GOLD" by DeWalt (ICC-ES ESR-2582, ESR-3200, and ESR-4105)
4. "AC200+" by DeWalt (ICC-ES ESR-4027)
5. "AT-XP" by Simpson Strong-Tie (ICC-ES ESR-1958)
6. "RED HEAD A7 + QUICK-CURE ADHESIVE" by Red Head

G. Concrete Screws

1. "KWIK-CON II+" by Hilti
2. HILTI KWIK HUS-EZ (KH-EZ), KH-EZ CRC, KH-EZ SS316, KH-EZ C, KH-EZ E, KH-EZ I, AND KH-EZ P SCREW ANCHOR SAFE SET SYSTEM WITH HOLLOW DRILL BIT AND VACUUM PER ICC-ES ESR-3027 (For pre-drill requirements or reusable temporary fastening.)
3. "ULTRACON+" by DeWalt (ICC-ES ESR-3068)
4. "TITEN / TITEN2" by Simpson Strong-Tie
5. "TAPCON" by Red Head (ICC-ES ESR-2202)

H. Toggle Anchors

1. "TOGGLE BOLT" by DeWalt
2. "HTB TOGGLE BOLT" by Hilti

I. Concrete Inserts

1. "P3254 through P3270" by Unistrut
2. "B52-I Series" by Eaton B-Line

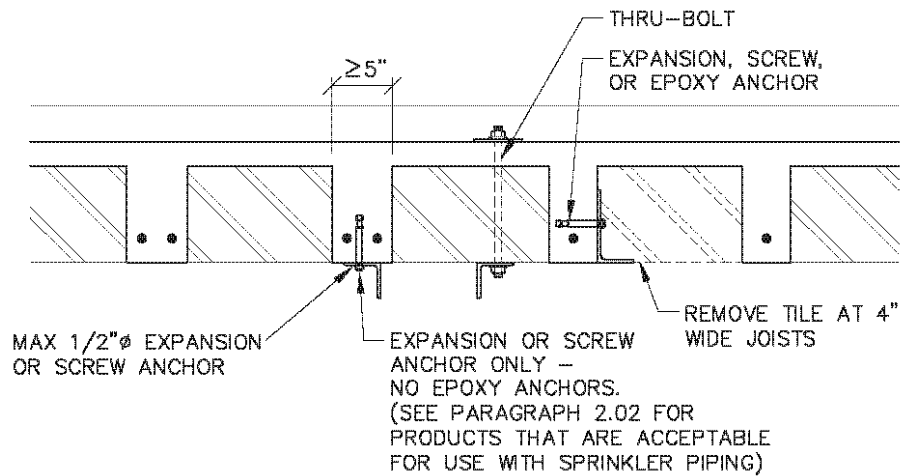
J. Threaded Rod Anchoring System (for steel and wood only)

1. "SAMMYS" fire protection fasteners by ITW-Buildex
2. "HANGER MATE FOR WOOD", "HANGER MATE FOR STEEL", "SUSPENDER FOR WOOD", and "SUSPENDER FOR STEEL" by DeWalt
3. "STEEL ROD HANGER" and "WOOD ROD HANGER" by Simpson Strong-Tie

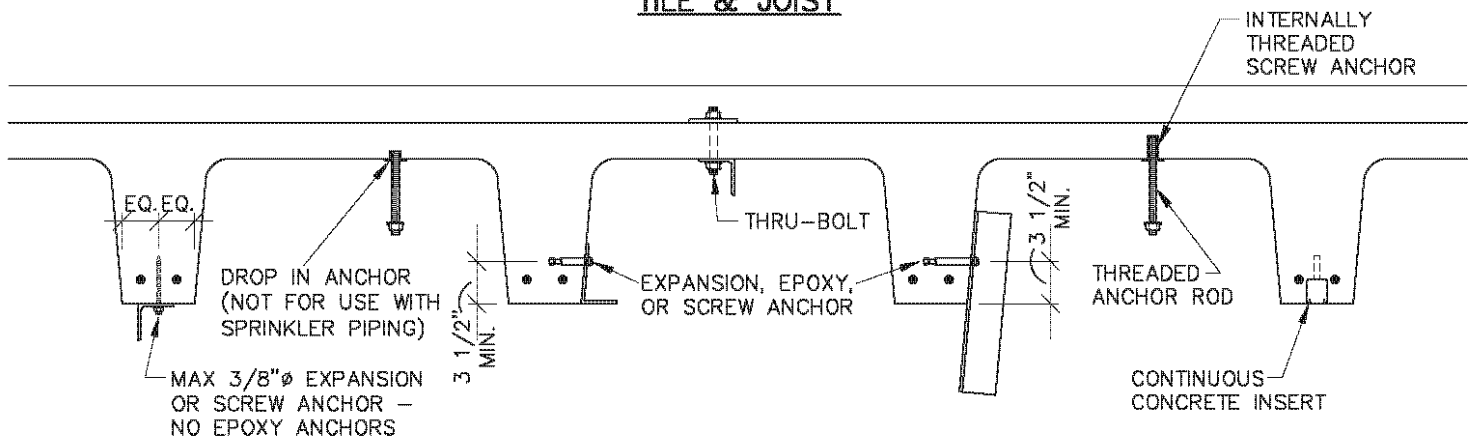
PART 3 EXECUTION

3.01 ACCEPTABLE INSTALLATION LOCATIONS

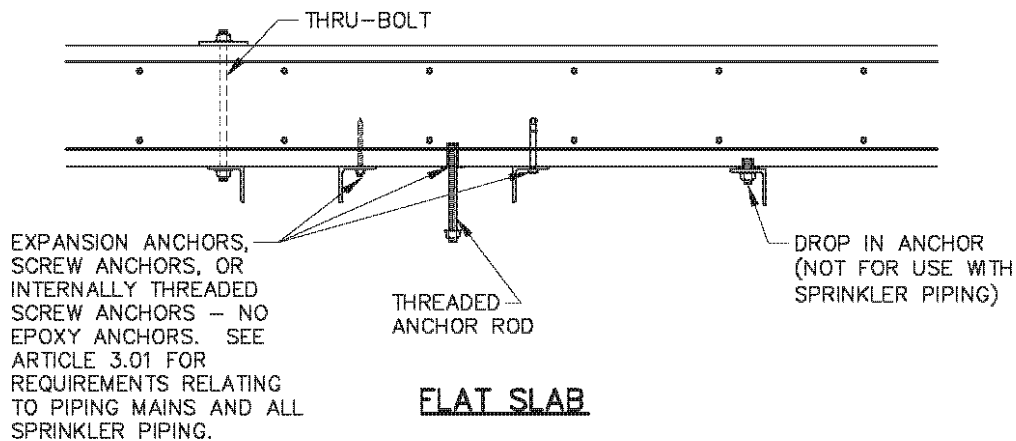
- A. Work with details at the end of this section.
- B. Restrictions
 - 1. All sprinkler piping and piping 6" diameter and larger (including HVAC and plumbing) must be supported by one of the anchors specified for vertical installation (in Article 2.02, Paragraph A.1) or be supported horizontally into the side of the structural element above.
 - 2. Adhesive anchors will not be permitted in an overhead, vertical application.
 - 3. Anchors that qualify for vertical installation (including all manufacturer's spacing and edge distance requirements) in joist-slab or tile and joist systems must be installed in the center of the joist only.
 - 4. If a clay or concrete filler tile must be removed from a tile and joist system to allow for anchor installation, restoration of fire rating may be required by the authority having jurisdiction.
 - 5. Installing anchors into the clay or concrete filler tile of a tile and joist system will not be permitted.
 - 6. Unless specifically noted in the construction documents, each trade shall be responsible for following all of the manufacturer's specifications regarding size, spacing, edge distance, embedment depth, and allowable load capacities of any anchor selected for a particular application.
 - 7. Any trade intending on using concrete inserts shall coordinate with General Contractor as early as possible to assure proper placement and sequencing of their installation.
 - 8. No substitution will be permitted for the anchors listed in this section without approval from the Architect.
 - 9. All post-installed anchors shall be installed by an installer trained for that specific product by a manufacturer's field representative. All training must be conducted on the jobsite prior to the installation of any products. A record of training must be submitted to the EOR per the submittal instructions.
 - 10. For adhesive anchors, maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer. Verify that base material temperature is within manufacturer limits. Do not install adhesive anchors if any criteria do not fall within manufacturer's limits. Ensure that bore holes and anchors are free of dust, standing water, ice, debris, grease, oil, dirt and other foreign matter.



TILE & JOIST



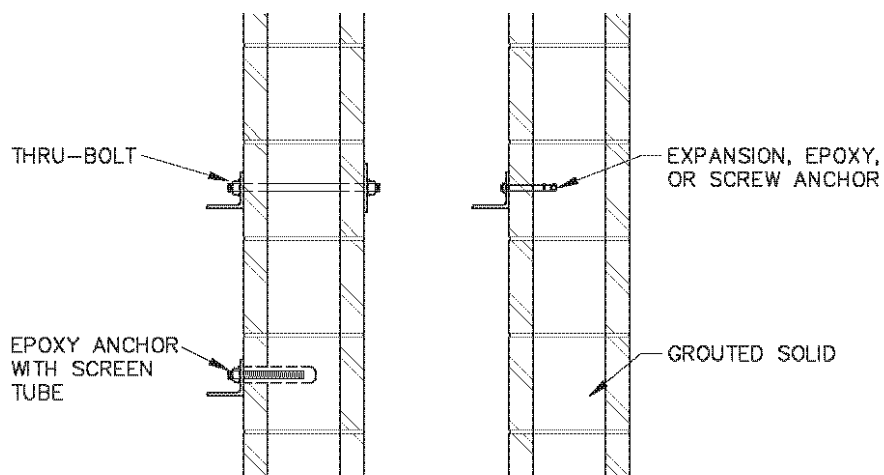
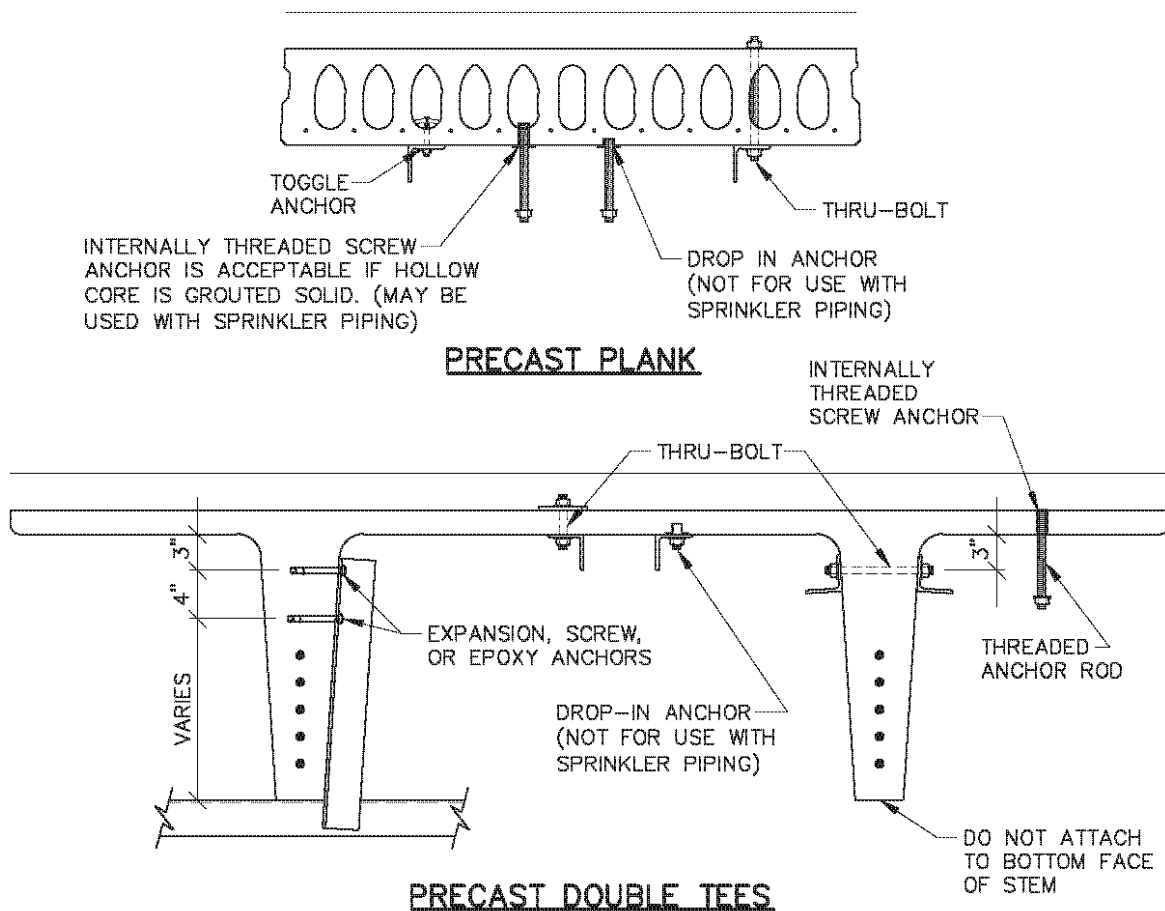
CONCRETE JOIST-SLAB



FLAT SLAB

TYPICAL ATTACHMENTS TO STRUCTURAL ELEMENTS

SCALE: 3/4" = 1'-0"



TYPICAL ATTACHMENTS TO STRUCTURAL ELEMENTS

SCALE: $3/4" = 1'-0"$

SECTION 06 10 00

ROUGH CARPENTRY

PART 1 GENERAL

1.01 WORK INCLUDED

- A. General carpentry work
- B. Installation of finish hardware
- C. Isolation membrane

1.02 RELATED WORK

- A. Section 06 40 00 - Architectural Woodwork
- B. Section 08 12 13 - Hollow Metal Frames
- C. Section 08 14 16 - Flush Wood Doors
- D. Section 08 71 00 - Finish Hardware

1.03 SUBMITTALS

- A. Furnish certificate from wood treatment applicator stating name of preservative and quantity retained per cubic foot.
- B. Furnish chemical manufacturer's data for fire-retardant treatment.

1.04 QUALITY ASSURANCE

- A. Lumber shall be graded by an agency certified by the Board of Review of the American Lumber Standards Committee. A grade stamp indicating the grading association, mill, species and grade shall be affixed to each full piece.
- B. Lumber shall be manufactured in accordance with the most current edition of Voluntary Product Standard PS 20 - American Softwood Lumber Standard, published by the National Institute for Standards and Technology (NIST) operating under the U.S. Department of Commerce.
- C. Plywood shall be graded under the rules of the American Plywood Association.
- D. Carpenters employed for finish work such as installing hardware, millwork and trim shall be skilled craftsmen.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Receive and inventory all finish hardware and store in secure area. Tag all keys showing location and key number. Maintain a record of all keys and store in a secure location until delivery to the Owner at the time of substantial completion.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Lumber 2" and less shall be seasoned to a moisture content of 19% or less. Surfaced framing lumber over 2" in thickness may be unseasoned.
 - 1. 2 x 2 through 4 x 4 lumber shall be Standard or better or stud grade in any commercial species having the following minimum design values (i.e., Doug-Fir-Larch North):

$F_b = 650 \text{ psi}$ $F_c = 900 \text{ psi}$ $E = 1,200,000 \text{ psi}$
- B. Wood Blocking:
 - 1. Lumber and plywood for wood blocking shall be fire retardant treated.
 - 2. Subject to manufacturer's specifications and load limits, Danback Flexible Wood Blocking Plates manufactured by ClarkDietrich Building Systems, LLC, West Chester, OH will be accepted.
- C. Isolation membrane equal to GCP Vycor Deck Protector self-adhered flashing.
- D. Fire-Retardant Coatings
 - 1. The following coatings may be used to provide fire-resistance ratings. Reference manufacturer's literature for information on whether products are approved for wood or for plywood prior to application. Follow manufacturer's instructions for application to one or both sides of wood/plywood.
 - a. Manufacturer: FlameOFF Coatings, Raleigh, North Carolina
 - i. Fire Barrier Paint
 - b. Manufacturer: Desert Research Institute, Inc., Cave Creek, Arizona
 - i. Dri-One Flame Retardant Spray
 - c. Manufacturer: FlameSafe USA, Fort Worth, Texas
 - i. Fire Poly FP100
 - ii. Fire Poly FP 751
 - iii. Fire Poly FP751 WS
 - d. Manufacturer: Flame Seal, LLC, Houston, Texas
 - i. Wood Seal A – Use only for softwood, such as pine.
 - ii. Flame Seal FX950

2.02 ACCESSORIES

- A. Provide all rough hardware such as bolts, expansion bolts, nails, staples, rough screws, bronze finished screws, screen wire, metal lath clips and masonry tee jamb anchors, catches, hooks, etc. Unless otherwise noted, bolts shall be 1/2" at 3'-0" o.c. minimum.
 - 1. Fasteners which are in contact with preservative pressure treated lumber shall be stainless steel or hot-dipped galvanized coated per ASTM A153. Fasteners shall be hot-dip coated after fabrication.
- B. Finish hardware will be furnished to this Section for installation. Refer to Section 08 71 00 for additional information.

PART 3 EXECUTION

3.01 GENERAL CARPENTRY WORK

- A. Install all wood framing, blocking, plates, grounds, etc., as shown on the drawings or required. Nailing shall be well done in accordance with code requirements and industry standards in order to develop the full strength of the members. All joints shall be closely fitted and accurately set to required lines and levels.
- B. Provide all temporary shoring, bracing, blocking required for the installation of the work.
- C. Install isolation membrane between treated lumber and any metal connector or covering.

3.02 APPLICATION OF FINISH HARDWARE

- A. Install all finish hardware furnished under Section 08 71 00 in accordance with the manufacturer's recommendations using proper templates and instruction sheets.
 - 1. Install kickplates at a uniform bottom elevation of 1", measured from finished floor.
- B. All hardware shall be installed in a neat manner and be left free of tool marks or defacements of any kind and be in perfect working order.
- C. Hardware on field finished items shall be removed or covered until final finish coat is dry and then reinstalled.
- D. Adjust door closers to operating force specified in Section 08 71 00.

SECTION 06 40 00

ARCHITECTURAL WOODWORK

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Furnish and install casework
- B. Furnish and install countertops

1.02 RELATED WORK

- A. Section 06 10 00 - Rough Carpentry
- B. Section 09 65 13 - Resilient Base
- C. Section 10 26 41 - Ballistic-Resistant Products
- D. Division 22 - Plumbing Fixtures

1.03 SUBMITTALS

- A. Product Data: Provide manufacturer's catalog cut sheets and descriptive information on each product used including, but not limited to, the following:
 - 1. Hardware and specialty items not manufactured by architectural woodwork fabricator.
 - 2. Finishes and application details by architectural woodwork fabricator.
 - 3. Provide documentation verifying moisture resistant particleboard was used in the construction of cabinets with sinks.
 - 4. Provide documentation verifying Grade M3 particleboard was used in the construction of shelving.
- B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices and other components.
 - 1. Submit, for distribution to other Contractors, dimensioned rough-in drawings for architectural woodwork. Accurately dimension all cutouts and holes for mechanical and electrical connections from walls and other structural elements.

C. Samples for verification:

1. Plastic laminate: Provide minimum of two (2) samples, 2" x 3" minimum in size, for each selected laminate color and texture. Chain sets will not be accepted.
2. Solid surface material or granite/quartz: Provide not less than two (2) samples, 2" x 2" minimum size, of each specified material.
3. Edgebanding: Provide not less than two (2) 4" strips of proposed edgebanding product, if not the same as adjacent surface material.

1.04 QUALITY ASSURANCE

- A. Minimum standards for work in this Section shall be in conformity with the Architectural Woodwork Standards (AWS), First Edition, published jointly by the Architectural Woodwork Institute (AWI), The Architectural Woodwork Manufacturer Association of Canada, and the Woodwork Institute.

1.05 PROJECT CONDITIONS

- A. Do not deliver or install architectural woodwork until building is enclosed, wet work is complete and dry, HVAC system is operating and maintaining temperature between 60°F and 90°F and relative humidity between 25 and 55 percent during the remainder of the construction period.
1. The HVAC systems, as specified elsewhere, may not provide humidity controls. The expected ranges of relative humidity are expected to be as high as 55% to a low of uncontrolled during the heating season. Comply with AWS Section 2, Care and Storage.

1.06 COORDINATION

- A. Coordinate layout and installation of all unique framing and reinforcement required in walls and partitions for support of architectural woodwork.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS / FABRICATORS

- A. Beck's Quality Cabinets, Green Bay, Wisconsin
- B. Benchmark Cabinets & Millwork, Inc., Bellevue, Illinois
- C. Custom Cabinet Co., Inc., Green Bay, Wisconsin
- D. Discher Architectural Millwork, Oshkosh, Wisconsin
- E. DLM Holdings, Green Bay, Wisconsin
- F. Lange Bros. Woodwork Co., Inc., Milwaukee, Wisconsin
- G. O'Keefe Inc., River Falls, Wisconsin

2.02 MATERIALS

A. Core Material: Cores shall be particleboard and shall comply with the following.

1. Except as noted below, all particleboard shall meet or exceed the requirements of ANSI A208.1 - 2022, with no added urea formaldehyde.

Particleboard	Modulus of Rupture lb/in ²	Modulus of Elasticity lb/in ²	Screw holding – face lbs	Screw Holding – Edge lbs	Internal Bond lb/in ²
Grade M-2	1885	290,100	202	180	58

- a. Cabinets with sinks and plastic laminate countertops with sinks shall be fabricated with moisture resistant particleboard as described below.
2. Particleboard used for shelving shall meet the requirements of ANSI A208.1, with no added urea formaldehyde. Shelves shall support 50lbs/sf where installed at all schools, hospitals, libraries and book-supporting cabinets; 40lbs/sf all other applications. Maximum deflection shall be evaluated at L/144 or ¼" in 36" length.

Particleboard	Modulus of Rupture lb/in ²	Modulus of Elasticity lb/in ²	Screw holding – face lbs	Screw Holding – Edge lbs	Internal Bond lb/in ²
Grade M-3i	2176	362600	225	202	73

3. Moisture Resistant Particleboard shall meet the requirements of ANSI A208.1, minimum Grade M2, Moisture Resistance Category MR-10 and a 24-hour water absorption factor of 10% or less.

Particleboard	Modulus of Rupture lb/in ²	Modulus of Elasticity lb/in ²	Screw holding – face lbs	Screw Holding – Edge lbs	Internal Bond lb/in ²	Max Thickness Swell %
Grade M-2-MR10	1885	290100	202	180	58	5.5

- B. Medium Density Fiberboard (MDF) shall meet or exceed the requirements of ANSI A208.2 - 2022, with no added urea formaldehyde.

Particleboard	Modulus of Rupture lb/in ²	Modulus of Elasticity lb/in ²	Screw holding – face lbs	Screw Holding – Edge lbs	Internal Bond lb/in ²
Grade 130	3,130	313,000	222	177	78
Grade 155	4,050	405,000 (580,000 per AWS)	270	225	117

1. Cabinet backs and drawer bottoms: Grade 130 or better.
 2. Shelves: MDF used for shelving shall meet the requirements of ANSI A208.2, Grade 155 or better, with no added urea formaldehyde. Shelves shall support 50lbs/sf where installed at all schools, hospitals, libraries and book-supporting cabinets; 40lbs/sf all other applications. Maximum deflection shall be evaluated at L/144 or ¼" in 36" length.
- C. Plastic Laminate:
1. High-Pressure Decorative Laminate (HPDL)
 - a. Provide high-pressure decorative laminate (HPDL) constructed in conformance with NEMA Standards Publication No. LD-3.
 - b. Manufacturer: As noted in Finish Legend.
 - c. Laminate shall be not less than the following grades:
 - 1) HGS (0.048" thick): Horizontal exposed surfaces.
 - 2) VGS (0.028" thick): Vertical exposed surfaces.
 - 3) HGP (0.039" thick): Radiused surfaces.
 - 4) CLS: Cabinet interiors, thickness as required for balanced construction.
 - d. Colors: As noted in Finish Legend.
 2. Low-Pressure Decorative Laminate (LPDL)
 - a. Provide low-pressure decorative laminate conforming to Architectural Woodwork Standards requirements.
 3. Backer Material:
 - a. Provide thermoset resin-treated wood-fiber, brown-colored, 3-ply construction, thickness as required for balanced construction.

- D. Solid Surfacing Material: Homogeneous solid sheets of filled plastic resin complying with the material and performance requirements of ANSI Z124.3, Type 5 or Type 6, without a precoated finish.
1. Manufacturer: As noted in Finish Legend.
 2. Colors: As noted in Finish Legend.
- E. Lumber used for concealed parts shall be in accordance with the Architectural Woodwork Standards Grade specified for the product being fabricated. Moisture Content shall be 6% to 12% for boards up to 2" nominal thickness, and shall not exceed 19% for thicker pieces.
- F. Edgebanding:
1. Plastic Laminate Construction: Provide plastic laminate matching adjacent exterior exposed surface or rigid PVC extrusions, through-color with satin finish. Thickness of edgband as listed in 2.03 Fabrication.
- G. Adhesives:
1. Water resistant Type II adhesive containing no added urea formaldehyde shall be used, except as noted below.
- H. Hardware:
1. Door and drawer pulls shall be Doug Mockett, DP305A, 6-27/32" Blade Drawer Pull, finish 17S Satin Nickel.
 2. Hinges shall be Grade 1, concealed, self-closing European style hinges with three-way adjustments manufactured by Grass, Blum, or Stanley. Hinges shall allow the door to open 110° degrees, except at corner cabinets where door shall open 95 degrees.
 3. Drawer slides shall have the following features:
 - a. Static Load Capacity: 100 pounds minimum
 - b. Bottom-mounted
 - c. 2-5/8" Self-closing action
 - d. Full-extension
 4. Drawer slides for file drawers shall have the following features:
 - a. Static Load Capacity: 125 pounds.
 - b. Automatic stay-close feature.
 - c. Bottom-mounted
 - d. Full-extension
 - e. Pendaflex File Railing System, white.
 - f. Allow 1-1/4" clear inside cabinet above top of rail for file folder tabs.

5. Wire Management System: Large J-Shape Wire Manager with Flange – WM22A, by Doug Mockett & Company, Manhattan Beach, California. Secure in place with screws.
6. Countertop Brackets: Provide Workstation Brackets manufactured by A & M Hardware, Inc., Mount Joy, Pennsylvania.
 - a. Material: 1/8" steel
 - b. 1-1/2" returns with multiple 1/4" mounting holes per side.
 - c. Size: Refer to Countertop Bracket detail on drawings.
 - d. Capacity: 1,000 lbs. minimum
 - e. Color: To be selected by Architect from manufacturer's standard colors.
7. Shelf Supports: Hafele, Model 282.11.707, steel, nickel finish, angular with riveted pin.
8. Countertop support angles shall be Connecting Bracket, Model # 260.39.940 as manufactured by Hafele. Zinc plated, 90° angle, 16" x 1" x 1" x 16 gauge.
9. Other hardware items shall be the manufacturer's standard.

2.03 FABRICATION

- A. Casework – General Requirements: The following requirements shall apply to all casework items unless noted otherwise.
 1. Wood casework shall comply with Architectural Woodwork Standards, Section 10 – Casework.
 2. Grade: Custom with upgrades as noted herein.
 3. Casework in Storage Rooms, Janitor Closets and Utility Rooms shall be built in conformance to Custom Grade, as specified herein.
 4. Complete fabrication to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
 5. Panel components shall be fabricated with particleboard core material as specified herein.
 - a. All sink base cabinets shall be fabricated with moisture resistant particleboard.
 6. All concealed surfaces shall be covered with backer material or finished with a minimum one coat of sealer.
 7. Case body shall be manufactured with doweled construction.

8. Provide solid subtops of 3/4" particleboard in all base cabinets.
9. Toe bases shall be of separate construction and not an integral part of the cabinet body and shall be fabricated with moisture resistant materials.
10. Provide 4" high x 3" deep toe kick at front. All toe kicks at sides shall be inset 3/4" from base cabinet finished ends for vinyl base to wrap around and be indented. Provide continuous ladder base toe kick platform.
11. Provide a scribe strip at all flat and shaped surfaces.
 - a. Scribe molds and/or closure caps not permitted.
12. Filler strips shall be provided where cabinets abut a wall and at inside corners.
13. Drawers shall be properly fitted to the cabinet without excessive play and fit front to back, less a maximum of 2" of interior cabinet depth
14. Drawer sides shall be doweled or biscuit-jointed.
15. File drawer boxes shall be lock jointed and nailed.
16. Drawer pulls shall be located in the center of drawers. Door pulls shall be located opposite the hinges in the upper corner of base cabinets and the lower corner of wall cabinets. Pulls shall be in the same relative position on all cabinets.
17. Shelves over 29" long shall be 1" thick.
18. Shelves shall be adjustable on 1-1/4" centers.
19. Over fasteners in semi-exposed surfaces, provide cover caps of compatible color to interior.
20. Anchor fasteners shall be neatly installed through the back and anchor strip, at the top and bottom of each cabinet body. In exposed and semi-exposed locations provide flat head fasteners and countersunk finishing washers.
21. Access panels shall be provided as indicated on drawings.
22. Support panels shall be 1-1/2" wide minimum and shall have concealed floor brackets to anchor against lateral movement.

B. Casework: Plastic Laminate Clad

1. Casework shall be Architectural Woodwork Standards, Construction Type A, frameless and cabinet and door Interface Style 1, flush overlay.
 - a. Edgeband at doors, drawer fronts, and cabinet fronts exposed to wear shall be 3 mm PVC.
 - b. The front edge of all shelves shall be 1 mm PVC edgeband.
 - c. Cabinet bodies shall receive 1mm PVC.

C. Countertops

1. Countertops shall comply with Architectural Woodwork Standards, Section 11 – Countertops and the following.
2. Plastic Laminate Countertops
 - a. Grade: Grade to match casework quality specified.
 - b. Design: As indicated on drawings.
 - c. High Pressure Decorative Laminate (HPDL): Provide HGS (0.048" thick) laminate except where HGP (0.039" thick) post-forming grade is required.
 - d. Core Material:
 - 1) Particleboard as listed herein.
 - 2) Provide moisture resistant particleboard at countertops with sinks.
 - e. Provide drip groove at countertops with sinks.
 - f. All unfinished edges, including shop and field made cut-outs, shall be sealed with a color-toned (for verification) water-resistant sealer.
 - g. Outside corners on edges of counter tops shall be radiused.
 - h. Provide scribes at all back splashes and side splashes including all flat and shaped surfaces.
3. Solid Surface Countertops
 - a. Grade: Custom
 - b. Grade: Grade to match casework quality specified. Provide custom [premium] grade at windowsills.
 - c. Design: As indicated on drawings with coved splashes hard seamed and integral to the countertop.
 - d. Substrate: Particleboard as listed herein. Provide moisture resistant particleboard at countertops with sinks.
 - e. Provide drip groove at countertops with sinks.
 - f. Outside corners on edges of counter tops shall be radiused.

PART 3 EXECUTION

3.01 PREPARATION

- A. Inspect areas to receive architectural woodwork. Walls and openings must be plumb, straight and square. Proceed with installation only after unsatisfactory conditions have been corrected.
- B. Inspect building conditions to see that walls are adequately constructed to support architectural woodwork. Verify blocking is installed where required.
- C. Coordinate the installation of plumbing and electrical rough-ins with the appropriate trades.
- D. Prior to installing, condition all architectural woodwork to average humidity that will prevail after installation.

3.02 INSTALLATION

- A. Install all work in conformance with Architectural Woodwork Standards, First Edition.
 - 1. Installation shall conform to the AWS Grade of the item being installed.
- B. All work shall be secured in place, square, plumb and level.
- C. All work abutting other building components shall be properly scribed.

3.03 ADJUSTING AND TOUCH-UP

- A. Before completion of the installation, the installer shall adjust all moving and operating parts to function smoothly and correctly.
- B. All nicks, chips and scratches in the finish shall be filled and re-touched.
Damaged items which cannot be repaired shall be replaced.

3.04 CLEANING

- A. Upon completion of installation, the installer shall clean all installed items of pencil and ink marks and broom clean the area of operation, depositing debris in proper containers.
- B. Clean the inside of cabinets and drawers of all construction dirt.

SECTION 07 92 00

JOINT SEALANTS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Furnish and install joint sealants and backing material.

1. Joints requiring sealant include, but are not limited to:

a. Interior Locations:

- 1) Interior door/borrowed lite frames
- 2) Perimeter around sinks and other plumbing fixtures
- 3) Joints at cabinetry
- 4) Joints between dissimilar materials

1.02 RELATED WORK

A. Section 03 30 00 - Cast-In-Place Concrete

B. Section 03 41 13 - Precast Concrete Hollow Core Planks

C. Section 04 20 00 - Masonry

D. Section 04 72 00 - Cast Stone Masonry

E. Section 09 21 16 - Gypsum Board Assemblies

F. Division 22 - Plumbing

1.03 PERFORMANCE REQUIREMENTS

A. Provide sealants that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.

B. Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

1. Prior to the installation of joint sealants, backings, and other related items, notify Architect of any potential material or installation conflicts or incompatibilities.

1.04 SUBMITTALS

- A. Product Data: Submit manufacturer's technical data for each joint sealant product required, including instructions for joint preparation and joint sealant application. Submittals shall include movement abilities and acceptable materials for sealant to adhere, as well as minimum joint sizes in width and depth.
- B. Samples: Submit cured strip samples of actual product of each color selected by Architect.
- C. Joint Sealant Schedule: Include the following information for each joint type and/or location.
 - 1. Sealant product name.
 - 2. Sealant color.
 - 3. Joint sizes and required sealant depth.
 - 4. Location of intended installation.

1.05 QUALITY ASSURANCE

- A. All caulking work shall be executed by experienced and skilled mechanics in strict accordance with the manufacturer's printed instructions.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to project site in original unopened containers or bundles with labels containing information about manufacturer, product name and designation, color, expiration period for use, pot life, curing time and mixing instructions for multi-component materials.
- B. Store and handle materials in compliance with manufacturer's recommendations to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

1.07 SITE CONDITIONS

- A. No sealant shall be applied on damp, wet or frosty surfaces. Sealant installation shall only be done when temperature is above 40°F or below 80°F. Any deviation from this requirement shall require written authorization from the Architect.
- B. Examine Drawings and verify that all joints are properly detailed and proportioned for expansion and/or control, as recommended in writing by the sealant manufacturer. Immediately notify Architect of any deviations.
- C. Contaminants capable of interfering with adhesion shall be removed from joint substrates prior to sealant installation.

PART 2 PRODUCTS

2.01 SILICONE JOINT SEALANTS

- A. Single-Component, Moisture-Curing or Neutral-Curing, Mildew Resistant Silicone Sealant:
1. Products: Provide one of the following:
 - a. Dow Corning Corporation: 786 Silicone Sealant
 - b. Momentive Performance Materials (GE): SCS 1700 Sanitary
 - c. Pecora Corporation: 898NST Sanitary Mildew Resistant Silicone Sealant
 - d. Tremco: Tremsil 200 with fungicide
 2. Type and Grade: S (single component) and NS (non-sag) per ASTM C920.
 3. Class: 25 per ASTM C920.
 4. Use Related to Exposure: NT (non-traffic) per ASTM C920.
 5. Color: Selected by Architect from manufacturer's full range of options.
 6. Applications:
 - a. Joints between plumbing fixtures and adjoining walls, floors and counters.
 - b. Between countertop and wall surfaces.

2.02 URETHANE JOINT SEALANT

- A. Single-Component Non-Sag Urethane Sealant:
1. Products: Provide one of the following:
 - a. BASF Building Systems (Sonneborn): Sonolastic NP-1
 - b. Bostik, Inc.: Chem-Calk 2020
 - c. Sika Corporation: Sikaflex-1a
 2. Type and Grade S (single-component) and NS (non-sag) per ASTM C920.
 3. Class: Not less than 35 per ASTM C920.
 4. Applications: Install in the following interior wall joints.
 - a. Expansion joints and working joints in non-smoke resistant walls.
 - b. Urethane sealants shall not be installed where exposed to UV; if exposed to UV, utilize silicone sealants.

B. Multi-Component Non-Sag Urethane Sealant:

1. Products: Provide one of the following:
 - a. Pecora Corporation: Dynatrol II
 - b. Tremco: Dymeric 240/240FC
2. Type and Grade: M (multi-component) and NS (non-sag) per ASTM C920.
3. Class: 50 per ASTM C920
4. Applications: Install in the following interior wall joints.
 - a. Expansion joints and working joints in smoke resistant walls.
 - b. Urethane sealants shall not be installed where exposed to UV; if exposed to UV, utilize silicone sealants.

2.03 LATEX JOINT SEALANTS

A. Acrylic Sealant: Latex sealant complying with ASTM C 834.

1. Products: Provide one of the following:
 - a. BASF Building Systems (Sonneborn): Sonolac
 - b. Pecora Corporation: AC-20+ Silicone
 - c. Tremco: Tremflex 834
2. Applications:
 - a. Use for perimeter joints between interior wall surfaces and frames of interior doors, windows and elevator entrances – not at exterior wall fenestrations.
 - b. Interior joints where no movement is anticipated.

2.04 ACOUSTICAL JOINT SEALANT

A. Acoustical Sealant for Exposed Joints: Except as noted below, provide non-sag, paintable, non-staining latex sealant complying with ASTM C834. Product shall be effective in reducing airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies per ASTM E 90.

1. Products: Provide one of the following:
 - a. Pecora Corporation: AC-20 FTR Acoustical and Insulation Sealant
 - b. United States Gypsum Co.: SHEETROCK Acoustical Sealant

- B. Acoustical Sealant for Concealed Joints: Except as noted below, provide non-drying, non-hardening, non-skinning, non-staining, gunnable synthetic rubber sealant for sealing interior concealed joints. Product shall be designed to reduce airborne sound transmission.
 - 1. Products: Provide one of the following:
 - a. Pecora Corporation: BA-98 Non-Skinning Butyl Sealant
 - b. Tremco, Inc.: Tremco Acoustical Sealant
- C. Acoustical Sealant for Non-Fire Rated Head of Wall Joints:
 - 1. Products: Provide one of the following:
 - a. Fire Joint Spray (CFS-SP WB), manufactured by Hilti Inc., Tulsa, Oklahoma, Phone: 800-879-6000
 - b. RectorSeal Smoke and Acoustic Sealant, manufactured by RectorSeal, Houston, Texas, Phone: 800-231-3345
 - 2. Minimum Properties:
 - a. Class II and III Movement Capability: +/-33% or greater
 - b. ASTM E 84: Flame Spread 5 / Smoke Index ≤10
 - c. Color: White, gray or beige. Red will not be accepted.
 - d. Paintable
 - 2. Provide bond breaker tape, mineral wool or other accessory materials required for a complete system per manufacturer's instructions.

2.05 JOINT-SEALANT BACKING

- A. General: Provide sealant backings of material and type that are non-staining; are compatible with joint substrates, sealants, primers and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Cylindrical Sealant Backings: ASTM C1330, Type as approved by sealant manufacturer for the type of sealant used and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
- C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.06 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint sealant manufacturer where required for adhesion of sealant to joint substrates indicated.
- B. Cleaners for Non-Porous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent non-porous surfaces in any way and formulated to promote optimum adhesion of sealants with joint substrates.
- C. Masking Tape: Non-staining, non-absorbent material compatible with joint sealants and surfaces adjacent to joints.

2.07 COLOR

- A. Color selection of all sealants will be made by the Architect.

PART 3 EXECUTION

3.01 PREPARATION

- A. Allow minimum 28 day curing period for concrete, grouts or mortars prior to caulking.
- B. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint sealant manufacturer's written instructions and the following requirements:
 - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt and frost.
 - 2. Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air.
 - 3. Remove laitance and form-release agents from concrete.
 - 4. Clean non-porous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.

- C. Joint Priming: Prime joint substrates where recommended in writing by joint sealant manufacturer, or based on prior experience. Apply primer to comply with joint sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- D. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.02 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations of ASTM C 1193 for use of joint sealants as applicable to materials, applications and conditions indicated.
- C. Acoustical Sealant Application Standard: Comply with recommendations in ASTM C 919 for use of joint sealants in acoustical applications as applicable to materials, applications, and conditions indicated.
- D. Install sealant backings of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 - 1. Do not leave gaps between ends of sealant backings.
 - 2. Do not stretch, twist, puncture or tear sealant backings.
 - 3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
- E. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and back of joints.
- F. Install sealants by proven techniques to comply with the following and at the same time backings are installed:
 - 1. Place sealants so they directly contact and fully wet joint substrates.
 - 2. Completely fill recesses provided for each joint configuration.
 - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

G. Tooling of Non-Sag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealants from surfaces adjacent to joint.
2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
3. Provide concave joint configuration per Figure 8A in ASTM C 1193, unless otherwise indicated.
 - a. Use masking tape to protect adjacent surfaces of recessed tooled joints.

3.03 CLEAN-UP

- A. Remove excess caulking and leave surface neat, smooth and clean.

SECTION 08 12 13

HOLLOW METAL FRAMES

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Furnish and install hollow metal frames.

1.02 RELATED WORK

- A. Section 08 71 00 - Finish Hardware

1.03 SUBMITTALS

- A. Product Data: For each type of frame indicated, include door/frame designation, material description, construction details, label compliance, fire-resistance ratings, and finishes.
- B. Shop Drawings:
 - 1. Include the following:
 - a. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
 - b. Locations of reinforcement and preparations for hardware.
 - c. Details of each different wall opening condition.
 - d. Details of anchorages, joints, field splices, and connections.
 - e. Details of accessories.
 - f. Details of moldings, removable stops, and glazing.
- C. Schedule: Provide a schedule of hollow metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with door hardware schedule.

1.04 QUALITY ASSURANCE

- A. Comply with ANSI/SDI A250.8, latest edition, "Recommended Specifications for Standard Steel Doors and Frames".

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Frames shall be received by the contractor at the job site and handled in a manner so as not to be damaged. They shall be stored upright in a protected area on wood runners and shall be covered with vented tarpaulins or vented plastic.

PART 2 PRODUCTS

2.01 MATERIALS

A. All steel used to manufacture frames, anchors, and accessories shall meet at least one or more of the following requirements:

1. Cold-rolled steel shall conform to ASTM designations A1008, "Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable" and A568, "Standard Specification for Steel, Sheet, Carbon, Structural, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements for".
2. Hot-rolled, pickled and oiled steel shall comply with ASTM designation A1011, "Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength" and A568, "Standard Specification for Steel, Sheet, Carbon, Structural, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements for".
3. Hot-dipped zinc coated steel shall be of the alloyed type and comply with ASTM designation A924, "Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process" and A653, "Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process".

B. Glass:

1. Tempered glass shall be horizontal tempered and shall meet the requirements of ASTM C1048, Kind FT, and Federal Standard 16 CFR 1201. All tempered glass shall have a permanent mark which signifies compliance with Federal Standard 16 CFR 1201.
2. Glass Thickness: 1/4" unless noted otherwise.

2.02 HOLLOW METAL FRAMES

A. Hollow metal frames shall comply with the following requirements:

1. Interior Frames:
 - a. Classification, ANSI/SDI A250.8: Level 3
 - b. Steel: Commercial Steel (CS), Type B, thickness: 0.053" (16 ga.)

- B. All frames shall be face welded per ANSI/SDI A250.8.
 - 1. The joint between the head and jamb face shall be completely arc welded along their length either internally or externally.
 - 2. Face joints shall be ground and finished smooth and flush with no visible seams. Face joints at meeting mullions or between mullions and other frame members shall be completely arc welded externally, ground, and finished smooth.
- C. Provide anchors to suit wall conditions at each jamb. Floor anchors shall be securely welded inside each jamb for floor anchorage. All frames shall be provided with a steel spreader temporarily attached to the feet of both jambs to serve as a brace during shipping and handling.
- D. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as frames.
 - 1. Provide plaster guard at all hardware mortises.
- E. Loose glazing stops shall be not less than 20 gauge cold rolled steel, butted at corner joints and secured for frames with countersunk screws.

2.03 FINISH

- A. After fabrication, all tool marks and surface imperfections shall be dressed, filled, and sanded as required to make all exposed surfaces smooth, level and free of all irregularities. Frames shall then be chemically treated to ensure maximum paint adhesion and shall be coated on all accessible surfaces with a rust-inhibiting primer which is fully cured before shipment.
- B. All inside surfaces shall be thoroughly cleaned and coated with a rust-inhibiting paint before fabrication.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.

3.02 PREPARATION

- A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.
- B. Prior to installation, adjust and securely brace welded hollow metal frames for squareness, alignment, twist, and plumbness.
- C. Drill and tap frames to receive non-templated, mortised and surface-mounted door hardware.

3.03 INSTALLATION

- A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.
- B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11.
 - 1. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
 - a. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
 - b. Install frames with removable glazing stops located on secure side of opening.
 - c. Install door silencers in frames before grouting.
 - d. Remove temporary braces necessary for installation only after frames have been properly set and secured.
 - e. Check plumbness, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
 - f. Field apply bituminous coating to backs of frames that are filled with grout containing anti-freezing agents.
 - 2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with post-installed expansion anchors.
 - a. Floor anchors may be set with power-actuated fasteners instead of post-installed expansion anchors if so indicated and approved on Shop Drawings.
 - 3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation behind frames.
 - 4. In-Place Gypsum Board Partitions: Secure frames in place with post-installed expansion anchors through floor anchors at each jamb. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.

5. Ceiling Struts: Use only where walls do not extend to structure will require additional support. Extend struts vertically from top of frame at each jamb to overhead structural supports or substrates above frame unless frame is anchored to masonry or to other structural support at each jamb. Bend top of struts to provide flush contact for securing to supporting construction. Provide adjustable wedged or bolted anchorage to frame jamb members.
 6. Installation Tolerances: Adjust hollow metal door frames for squareness, alignment, twist, and plumb to the following tolerances:
 - a. Squareness: Plus or minus 1/16", measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - b. Alignment: Plus or minus 1/16", measured at jambs on a horizontal line parallel to plane of wall.
 - c. Twist: Plus or minus 1/16", measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - d. Plumbness: Plus or minus 1/16", measured at jambs at floor.
- C. Glazing: Comply with installation requirements in hollow metal manufacturer's written instructions.
1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9" o.c. and not more than 2" o.c. from each corner.

3.04 ADJUSTING AND CLEANING

- A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.
- B. Remove grout and other bonding material from hollow metal work immediately after installation.
- C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.
- D. Metallic-Coated Surfaces: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

SECTION 08 14 16

FLUSH WOOD DOORS

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Furnish and install solid core doors with wood veneer finish.

1.02 RELATED WORK

- A. Section 06 10 00 - Rough Carpentry
- B. Section 08 12 13 - Hollow Metal Frames
- C. Section 08 34 53 - Ballistic-Resistant Wood Door and Frame Assemblies
- D. Section 08 71 00 - Door Hardware

1.03 PERFORMANCE REQUIREMENTS

- A. Low-Emitting Materials: Provide doors made with adhesives and composite wood products that do not contain urea formaldehyde.

1.04 SUBMITTALS

- A. Product Data: Provide manufacturer's technical data for each type of door. Include details of core and edge construction, trim for openings and factory-finishing specifications. Include manufacturer's fire rated testing approval and necessary technical bulletins regarding door hardware and glazing installation instructions. Furnished information shall include, but not be limited to: edge guards, fire latch installation in compliance with UL10C, lite kit installation, blocking requirements, undercutting, and hardware mounting.
- B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; location and extent of hardware blocking; and other pertinent data.
 - 1. Indicate dimensions and locations of mortises and holes for hardware.
 - 2. Indicate dimensions and locations of cutouts.
 - 3. Indicate requirements for veneer matching.
 - 4. Indicate doors to be factory finished and finish requirements.
 - 5. Glass size, type, pattern and thickness for factory glazed doors.

- C. Samples for Initial Selection: Color charts consisting of actual materials in small sections for the following:
 - 1. Faces of Factory-Finished Doors: Show full range of colors available for stained finishes.
- D. Samples for Verification:
 - 1. Factory finishes applied to actual door face materials, approximately 8" x 10", for each material and finish. For each wood species and transparent finish, provide set of three samples showing typical range of color and grain to be expected in the finished work.
- E. Manufacturer's full lifetime warranty.

1.05 QUALITY ASSURANCE

- A. Source Limitations: Obtain flush wood doors through one source from a single manufacturer.
- B. Wood doors shall meet or exceed the Architectural Woodwork Institute Quality Standards, Edition 1, 2009, for the type and grade of doors specified.
- C. Labeled doors shall be provided for those openings requiring fire protection ratings as shown on the door schedule. Such doors shall be constructed as tested and certified by Underwriters Laboratories, Inc. and shall bear the U.L. Label.
- D. Labeled doors shall comply with Positive Pressure Testing; UBC 7-2-97 or UL10C, Category A.
- E. No urea formaldehyde resins or other added urea formaldehyde shall be permitted in any materials.

1.06 DELIVERY, HANDLING, AND STORAGE

- A. The doors shall not be delivered until wet operations are completed and dry. Do not expose doors to dampness resulting from the work of fresh concrete, plaster or masonry.
- B. Care shall be taken to ensure that the doors are not subjected to abnormal heat, dryness, humidity, or sudden changes in these conditions.
- C. Package doors individually in cardboard cartons and wrap bundles in plastic sheeting.

1.07 WARRANTY

- A. The door manufacturer shall furnish to the Owner a written warranty against manufacturing defects for the period indicated. The warranty shall cover the replacement cost of the doors as originally installed and installation cost.
 - 1. Solid core and mineral core interior doors: Life of Installation

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Marshfield-Algoma by Masonite Architectural, Tampa, Florida; www.masonitearchitectural.com
- B. VT Industries, Inc. – Eggers Division, Two Rivers, WI; www.vtindustries.com
- C. Oshkosh Door Company, Oshkosh, WI; www.oshkoshdoor.com

2.02 MATERIALS

- A. Solid core wood doors shall be hot press 5-ply 1-3/4" thick doors manufactured in accordance with AWI Specification for Type PC-5 Custom Grade doors.
 - 1. Performance Duty Level: All doors shall be Extra Heavy Duty level.
 - 2. Core material shall be particle board or solid agrifiber composite material conforming to ANSI 208.A, Grade LD-2, with no added urea formaldehyde.
 - 3. Stiles shall consist of 2-ply laminated edge strip with minimum 1/4" matching hardwood lumber edge after pre-trimming. Top rails shall have matching veneer banding.
- B. Face veneers shall be A Grade and match existing for species. Transparent finish.
 - 1. Match between Veneer Leaves: Book match.
 - 2. Assembly of Veneer Leaves on Door Faces: Balance match.
 - 5. All veneers shall be similar color and grain to existing.
- C. Glass:
 - 1. Tempered glass shall be horizontal tempered and shall meet the requirements of ASTM C1048, Kind FT, and Federal Standard 16 CFR 1201. All tempered glass shall have a permanent mark which signifies compliance with Federal Standard 16 CFR 1201.
 - a. Etched texture shall be as approved by Architect.
 - 2. Glass Thickness: 1/4" unless noted otherwise.

2.03 FABRICATION

- A. Adhesives containing urea formaldehyde shall not be used.
- B. Doors shall be pre-fit to net size and pre-machined for all hardware at the factory except for those items considered surface mounted.
 - 1. Bevel non-fire-rated doors 1/8" in 2" (3-1/2 degrees) at lock and hinge edges.
 - 2. After hanging, the maximum allowable clearance shall be 1/8" at both sides and top, 1/8" over thresholds, and 1/2" at other locations, unless otherwise shown.
 - a. Clearance shall not exceed 1/16" per leaf at meeting edge of two doors.
 - 3. Machine doors in accordance with templates provided by hardware supplier and shop drawings provided by hollow metal supplier.
- C. Make cutouts for light openings as shown on the door schedule.
 - 1. Lights in non-labeled doors shall be fitted with wood glazing beads.

2.04 FACTORY FINISHING

- A. Wood veneer faced doors shall be prefinished by the manufacturer in accordance with AWI Quality Standards: Section 1500, AWI Finish System TR-6 – Catalyzed Polyurethane.
 - 1. AWI Grade: Premium
 - a. Closed grain hardwood veneers shall receive an initial washcoat per AWI Premium Standards.
 - 2. Door Color: Custom to match existing doors.
 - 3. Top and bottom rails of all doors shall be sealed with a UV curable sealer.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine doors and installed door frames before hanging doors.
 - 1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
 - 2. Reject doors with defects.
 - 3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Install doors in accordance with manufacturer's instructions.
- B. Install doors plumb, level, square, true to line, and without warp or rack.
- C. Install wood doors after work of other trades which could damage doors is finished.
- D. Doors requiring job-site fitting or machining shall have all cut edges (including top and bottom edges) sealed.

3.03 ADJUSTING

- A. Operation: Rehang or replace doors that do not swing or operate freely.
- B. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.

SECTION 08 34 53

BALLISTIC-RESISTANT WOOD DOOR AND FRAME ASSEMBLIES

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Furnish and install bullet-resistant wood doors and frame assemblies.
 - 1. Note: All non-bullet-resistant metal frames and wood doors will be furnished by Section 08 12 13 and Section 08 14 16, respectively.

1.02 RELATED WORK

- A. Section 08 12 13 - Hollow Metal Frames
- B. Section 08 14 16 - Flush Wood Doors
- C. Section 08 71 00 - Door Hardware
- D. Section 09 21 16 - Gypsum Board Assemblies
- E. Section 09 91 00 - Painting

1.03 PERFORMANCE REQUIREMENTS

- A. Bullet-resistant wood door and frame assembly shall be not less than UL 752, Listed and Labeled for Protection Level 3, Super Power Small Arms (SPSA).

1.04 SUBMITTALS

- A. Submit shop drawings for all work under this section according to the requirements of Division 01.
- B. Certification shall be furnished indicating that all materials are UL Listed and Labeled to the Protection Levels specified.
- C. Samples for verification:
 - 1. Factory finishes applied to actual door face materials, approximately 8" x 10", for each material and finish. For each wood species and transparent finish, provide set of three samples showing typical range of color and grain to be expected in the finished work. Coordinate wood finish with supplier of doors specified in 08 14 16.

1.05 QUALITY ASSURANCE

- A. Underwriters Laboratory, UL 752 - Bullet-Resisting Equipment
- B. Architectural Woodwork Institute (AWI): Quality Standards

1.06 DELIVERY, HANDLING AND STORAGE

- A. Do not deliver products to the site until the building is ready for their installation.
- B. Handle products with care to avoid damage to finished surfaces.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Subject to compliance with requirements stated herein, acceptable manufacturers are limited to the following:
 - a. Armortex, Schertz, Texas
 - b. North American Bullet Proof, Cibolo, Texas

2.02 MATERIALS

- A. Bullet-Resistant Wood Doors and Frame Assemblies
 - 1. Wood Door:
 - a. Door Type: Solid Core (Composite of particle board and manufacturer's bullet resistant composite material as required to provide Protection Level specified)
 - b. Door Thickness: 1-3/4"
 - c. Wood Species: Veneer face shall be AWI Grade – A. Face veneer shall match existing doors. Vertical edges shall be same species and grade.
 - d. Finish: Transparent finish to match existing.
 - 2. Hollow Metal Frame:
 - a. Construction: All welded, clamp on type
 - b. Metal: 12 gauge brake formed primed steel
 - c. Lining: Manufacturer's bullet-resistant composite material, thickness as required to provide Protection Level specified
 - 3. Hardware:
 - a. Hinge: Provide a heavy-duty continuous-gear hinge with tamper resistant dogging pins.
 - b. Silencers: Provide at strike-jamb stop.
 - c. Anchor hole plugs shall be provided.
 - d. Balance of hardware will be provided by Section 08 71 00.

2.03 FABRICATION

- A. Doors and frames shall be prepped in the factory for all hardware. Refer to Section 08 71 00 for additional information.
- B. Provide bullet-resistant wood door and frame assembly pre-hung and ready for installation.
- C. Labeling:
 - 1. Bullet-resistant doors and frame assemblies shall be plainly and permanently labeled. The label shall be compatible with finishes. The label shall be visible only on the secure side, after installation, and shall include:
 - a. Manufacturer's name or identifying symbol
 - b. Model Number
 - c. Date of manufacture by month and year. This may be done through use of lot number or other traceable code
 - d. Correct mounting position including threat side and secure side (by removable label on glazing material)
 - e. Code indicating bullet-resistant rating and test standard used (by removable label on glazing material)

PART 3 EXECUTION

3.01 INSPECTION

- A. Prior to commencing installation, examine all areas to receive the bullet-resistant doors and frames to ensure that they are ready for installation. Components shall be checked and corrected for racking, twisting, and other malformation prior to installation. All surfaces and connections shall be examined for damage prior to installation.
- B. Verify all components comply with indicated requirements for type, size, location and Protection Level.
- C. Do not proceed with installation until unsatisfactory conditions have been corrected.
- D. Coordinate work with other trades affected by this work.

3.02 INSTALLATION

- A. Install bullet-resistant wood door and frame assembly per manufacturer's instructions and shim for plumb and level. Secure with anchors. Install the anchor-hole plugs.
- B. Test door for proper fit and operation. If required, remove the unit, adjust shims, and reinstall.

SECTION 08 71 00

DOOR HARDWARE

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Furnish finish hardware for wood, hollow metal and aluminum doors.

1.02 RELATED WORK

- A. Section 06 10 00 - Installation of Hardware
- B. Section 08 12 13 - Hollow Metal Frames
- C. Section 08 14 16 - Flush Wood Doors
- D. Division 26 - Electrical Work

1.03 QUALITY ASSURANCE

- A. Items of hardware not definitely specified herein but necessary for completion of the Work shall be provided. Such items shall be of type and quality suitable to the service required and comparable to the adjacent hardware. Where size and shape of members is such as to prevent the use of types specified, hardware shall be furnished of suitable types having as nearly as practicable the same operation and quality as the type specified. Sizes shall be adequate for the service required.
- B. Include such nuances as strike type, strike lip length, raised barrel hinges, mounting brackets, blade stop spacers, special templates, fasteners, shims, and coordination between conflicting products. All doors shall be provided with a stop.
- C. Where fire-rated door assemblies are indicated, provide door hardware rated for use in assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C, unless otherwise indicated. Provide positive latching and self-closing, regardless of whether they are specified in sets.
- D. The hardware supplier shall assist the Contractor with the coordination and adjustment of finished hardware.
- E. Prior to the start of hardware installation, a representative of the manufacturer, or the hardware supplier who is familiar with the installation of the type of hardware furnished, shall meet with the carpenters who will be installing the hardware to ensure that the carpenters know the correct installation procedures.
- F. Supplier qualifications:
 - 1. Supplier shall be a member in good standing of the Door and Hardware Institute (DHI).
 - 2. Supplier shall employ an Architectural Hardware Consultant (AHC) who is currently participating in DHI's continuing education program (CEP).

1.04 SUBMITTALS

- A. Hardware schedules shall be submitted in accordance with the provisions of Division 01 for Shop Drawings.
- B. The hardware schedule shall be specific with respect to catalog numbers, finishes, template requirements, brackets, types of fastenings, and locations. Each door opening shall receive a separate item number on the hardware schedule.
- C. Submit required templates to door and frame manufacturers to enable proper and accurate sizing and locations of hardware.
- D. Submit details of electrical door hardware, including the following:
 - 1. Wiring Diagrams: Power, signal and control wiring. Include the following:
 - a. System schematic.
 - b. Point-to-point wiring diagram.
 - c. Elevation of each door.
- E. Submit a keying schedule prepared in conjunction with the Owner and Architect.
- F. Provide maintenance instructions for each type of hardware.

1.05 DELIVERY, HANDLING AND STORAGE

- A. Hardware shall be delivered to the Contractor at the job site completely packaged with all necessary screws, bolts, miscellaneous parts, instructions and installation templates. Each package shall be legibly and properly labeled, corresponding to the approved hardware schedule.
- B. Hardware shall be delivered to the Contractor by the hardware supplier, not via a direct factory shipment. All hardware will be checked in jointly by representatives of the Contractor and hardware supplier to avoid any discrepancies.
- C. All hardware shall be stored in a dry, secure area, in a manner to facilitate sorting, checking and unpacking.

PART 2 PRODUCTS

2.01 HINGES

A. Acceptable Manufacturers

1. Subject to compliance with specifications, acceptable manufacturers shall include, but not be limited to, the following.
 - a. Best
 - b. Hager
 - c. Ives

B. Hinge Type:

1. All hinges shall be five-knuckle, full mortise, ball bearing, template type with non-removable pins, unless specified otherwise.

C. Hinge Base Metal:

1. Steel with steel pin at interior.
2. Stainless Steel with stainless steel pin at exterior.

D. Hinge Size:

1. Hinges shall be 4-1/2" x 4-1/2", unless specified otherwise.
 - a. Provide wide throw hinges, where required, to clear jambs.
2. Hinges shall be .134" thick except doors over 36" shall have heavy weight .180 hinges, unless specified otherwise.
3. Hinges shall be 5" x 4-1/2" for doors over 36" wide.

E. Hinge Quantity:

1. Provide 3 hinges for all doors with heights up to 90" tall. Provide 4 hinges for doors 91" to 120" tall.

2.02 LOCKSETS

- A. Locksets and latches shall be ANSI A156.2, series 4000, grade 1 cylindrical locks. Lever design shall be "16D" as indicated in hardware sets. Provide mortise locks where indicated in hardware sets.

B. Acceptable Manufacturers

1. Best.
2. No Substitutions.

C. Materials

1. The Contractor shall develop a key schedule with Owner and Architect prior to releasing the locks for manufacture.
 - a. Locks shall be keyed to the existing master key system.
 - b. Provide 3-cylinder change keys for each lock. Stamp all keys with "Do Not Duplicate".
 - c. Cylinders shall be manufacturer's standard, constructed from brass or bronze, stainless steel, or nickel silver.
2. Provide strike box for all locksets in hollow metal frames.

D. Functions

1. As listed in the hardware schedule.

2.03 CLOSERS

A. Provide the following closers.

1. Interior Doors:
 - a. In general, closers shall be located on the room side of the door.
 - b. Closers shall be adjusted to an opening force of not exceeding 5 pounds.
 - c. Fire doors shall be adjusted to the lowest possible force which provides control of the door, other closers shall be adjusted to an opening force of not exceeding 5 pounds.
 - d. Provide special template and mounting brackets as required for overhead stops and other conditions.
 - e. Provide extra duty arms at parallel arm applications.

B. Acceptable Manufacturers

1. LCN
2. No Substitutions.

C. Furnish closer for all fire doors.

2.04 EXIT DEVICES

A. Acceptable Manufacturers

1. Von Duprin
2. No Substitutions.

- B. Furnish all components required for function described in the hardware schedule.
 - 1. Provide reinforced crossbar for all devices where available.
 - 2. Lever handle shall match lockset trim design.
- C. Provide UL listed fire exit devices at labeled doors scheduled to have exit devices.

2.05 PROTECTION PLATES

- A. Kickplates shall be 10" high x width of door less 2", 16 gauge stainless steel, beveled 3 edges, with countersunk holes.
 - 1. Kickplates at double doors shall be width of door less 1".
- B. Armor plates shall be 34" high x width of door less 2", 16 gauge stainless steel, beveled 3 edges, with countersunk holes.
 - 1. Armor plates at double doors shall be width of door less 1".

2.06 WALL BUMPERS

- A. Acceptable Manufacturers:
 - 1. Hager
 - 2. Ives
 - 3. Rockwood Mfg.
- B. Rockwood; 409.
 - 1. Provide wall bumpers for all interior doors except those equipped with overhead holders or stops.

2.07 DOOR HOLDER

- A. Glynn-Johnson GJ100 Series Heavy Duty Concealed Overhead Door Stops and Holders (unless otherwise specified in hardware sets).
- B. Acceptable Manufacturers:
 - 1. Glynn-Johnson
 - 2. Architectural Builders Hardware Mfg., Inc. (ABH)
 - 3. Norton-Rixson

2.08 WEATHERSTRIPPING AND SEALS

A. Acceptable Manufacturers:

1. Hager
2. National Guard Products
3. Pemko

2.09 ELECTRIC STRIKES

A. Acceptable Manufacturers

1. Hanchett Entry Systems, Inc. (HES)
2. No Substitutions

B. Electric strikes shall provide remote release of latchbolts. They shall be designed for use with the type locks shown at each opening where required. They shall be UL listed as Burglary-Resistant Electric Door Strikes and, where required, shall be UL listed as Electric Strikes for Fire Doors or Frames.

1. Faceplates shall be stainless steel with finish as specified for each opening.
2. The locking components shall be stainless steel to resist damage and abuse.
3. Solenoids shall be of the continuous duty type for the voltage specified. Plug connectors will be furnished. Strikes shall have an adjustable backbox to compensate for misalignment of door and frame.

2.10 SILENCERS

A. Provide three round silencers for all interior frames except label frames.

2.11 MISCELLANEOUS ITEMS

A. Other items shall be the type shown on the hardware schedule.

2.12 FINISH

- A. Unless noted otherwise, the finish of locksets and other plated items shall be BHMA 626 or BHMA 630.
- B. Flat goods, bolts and trim, where specified as stainless steel shall be finish BHMA 630.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Hardware shall be installed under Section 06 10 00.
- B. Mounting Heights: Locate hardware per ANSI/SDI A250.8 or at manufacturer's standard locations.
- C. Door edge protector, where required, shall be installed on the hinge side of the door.

3.02 HARDWARE SCHEDULE

SET 01

HARDWARE IS EXISTING TO BE RE-USED

SET 02

3 EA	HINGES	BB1279 – 4.5 X 4.5 NRP	639	HAGER
1 EA	EXIT DEVICE	99L-NL	612	VON DUPRIN
1 EA	CYLINDER	AS REQUIRED	612	BEST
1 EA	CLOSER	4111	691	LCN
1 EA	WALL STOP	409	612	ROCKWOOD
1 EA	KICKPLATE	10" X 2" LDW	612	ROCKWOOD
1 EA	ELECTRIC STRIKE	9600	612	HES
1 EA	POSITION SWITCH	BY SECURITY SUPPLIER		
1 EA	POWER SUPPLY	BY SECURITY SUPPLIER		
1 EA	CARD READER	BY SECURITY SUPPLIER		
1 EA	REQUEST TO EXIT	BY SECURITY SUPPLIER		

OPERATION: DOOR NORMALLY LOCKED AND CLOSED. VALID CARD READ RELEASES ELECTRIC STRIKE TO ALLOW ENTRY. UPON LOSS OF POWER OPENING REMAINS SECURED. FREE EGRESS IS ALWAYS ALLOWED.

SET 03

3 EA	HINGES	BB1279 – 4.5 X 4.5	639	HAGER
1 EA	OFFICE LOCK	9K3-7-AB-16D-S3	612	BEST
1 EA	WALL STOP	409	612	ROCKWOOD

SET 04

3 EA	HINGES	BB1279 – 4.5 X 4.5	639	HAGER
1 EA	PASSAGE	9K3-0-N-16D-S3	612	BEST
1 EA	WALL STOP	409	612	ROCKWOOD

SET 05

3 EA	HINGES	MATCH EXISTING PREP	639	HAGER
1 EA	PRIVACY	45H-0-L-16S-VIB	612	BEST
1 EA	OVERHEAD STOP	GJ100 SERIES	612	GLYNN-JOHNSON

**PROVIDE NEW HINGES AND LOCK STRIKE TO MATCH EXISTING FRAME PREPS. FIELD VERIFY.

SET 06

3	EA	HINGES	BB1279 – 4.5 X 4.5	639	HAGER
1	EA	STOREROOM LOCK	9K3-7-D-16D-S3	612	BEST
1	EA	CLOSER	4011	691	LCN
1	EA	WALL STOP	409	612	ROCKWOOD
1	EA	KICKPLATE	10" X 2" LDW	612	ROCKWOOD
1	EA	ELECTRIC STRIKE	1500C	612	HES
1	EA	POSITION SWITCH	BY SECURITY SUPPLIER		
1	EA	POWER SUPPLY	BY SECURITY SUPPLIER		
1	EA	CARD READER	BY SECURITY SUPPLIER		
1	EA	REQUEST TO EXIT	BY SECURITY SUPPLIER		

OPERATION: DOOR NORMALLY LOCKED AND CLOSED. VALID CARD READ RELEASES ELECTRIC STRIKE TO ALLOW ENTRY. UPON LOSS OF POWER OPENING REMAINS SECURED. FREE EGRESS IS ALWAYS ALLOWED.

SET 07

2	EA	KICKPLATE	WA-A	630	TRIMCO

**KICKPLATE IS TO HAVE TOP CAP. PROVIDE KICKPLATE FULL WIDTH OF DOOR AND CAP IS TO BE OF CUSTOM LENGTH TO MEET GLASS ON DOOR. KICKPLATE IS NEEDED TO MEET ADA REQUIREMENTS FOR DOOR HAVING MINIMUM 10" BOTTOM SECTION WITH TOP CAPPED. FIELD MEASURE EXISTING CONDITIONS.

SECTION 09 21 16

GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Furnish and install studs and furring for interior gypsum board.
- B. Furnish and install gypsum board.

1.02 RELATED WORK

- A. Section 05 40 00 - Cold-Formed Metal Framing
- B. Section 07 84 00 - Firestopping
- C. Section 07 92 00 - Joint Sealants
- D. Section 08 34 53 - Ballistic-Resistant Wood Doors and Frames
- E. Section 09 81 00 - Acoustic Insulation
- F. Section 10 26 41 - Ballistic Protection Products

1.03 SUBMITTALS

- A. Product Data: Catalog sheets, specifications, and installation instructions for each item specified.
 - 1. Third party testing results in compliance with ICC-ES AC86.
- B. Shop Drawings: Show locations, fabrication, and installation of control and expansion joints including plans, elevations, sections, details of components, and attachments to other units of Work.

1.04 DELIVERY, HANDLING AND STORAGE

- A. All materials shall be delivered in original packages, containers, or bundles bearing the brand name and the name of the manufacturer or the supplier for whom the product is manufactured.
- B. All materials shall be kept dry by being stored inside the building under roof or in an enclosed shelter.
- C. Damaged or deteriorated materials shall be removed from the premises.
- D. Protect gypsum products from moisture and contaminants. Do not store near materials that may off-gas harmful volatile organic compounds, such as solvents, kerosene, etc.

1.05 SITE CONDITIONS

- A. In cold weather and during gypsum panel joint finishing, temperatures within the building shall be maintained within the range of 55°F to 70°F. Adequate ventilation shall be provided to carry off excess moisture.

1.06 PERFORMANCE REQUIREMENTS

- A. Installation of metal framing shall comply with requirements of ASTM C754.
- B. Installation and finishing of gypsum board shall comply with requirements of ASTM C840.
- C. Installation of metal stud framing serving as structural members for deflection, i.e. box headers, shall comply with requirements of ASTM C1007.
 - 1. Provide submittals as required per this ASTM standard which include but are not limited to attachment connections and fastener spacing, engineering calculations that meet local codes and authorities.

PART 2 PRODUCTS

2.01 METAL FRAMING AND FURRING MATERIALS

- A. Steel studs, runners and furring shall be made of coated steel in accordance with ASTM Specification C645. Width of studs as noted on drawings.
 - 1. Corrosion Protection: G40 hot-dipped galvanized coating per ASTM A653/A653M.
 - 2. Studs, in general, shall be made of not less than 25 gauge steel. Provide heavier gauge studs where noted on drawings, where the indicated minimum performance requirements are not achieved, and where specified.
 - 3. Minimum Performance Requirements: Studs shall meet the performance criteria of 5 PSF lateral load with minimum deflection as follows:
 - a. L/240 At typical gypsum board walls
 - b. L/360 Where tile wainscot and full height tile is scheduled. L/240 will be acceptable where only tile base and/or terrazzo base is scheduled.
 - c. Minimum performance requirements shall be based on actual stud spacing and floor to deck heights.

4. Stud gauges listed herein shall be based on the most current editions of the Steel Stud Manufacturers Association's (SSMA), Product Technical Guide – Steel Thickness Table and the ICC-ES Evaluation Report ESR-3064P.
 - a. Minimum galvanized coated metal thickness.
 - 1) 25 gauge - 0.0179"
 - 2) 20 gauge - 0.0296"
 - 3) 18 gauge - 0.0428"
 - 4) 16 gauge - 0.0538"
 - b. Equivalent thicknesses submitted in compliance with ASTM C645 meeting the requirements of ICC-ES AC86: Cold-Formed Steel Framing Members – Interior Non-Load-Bearing Wall Assemblies and ICC-ES AC46: Acceptance Criteria for Cold-Formed Steel Framing Members will be acceptable.
5. Studs Used at Each Side of Door Frames: Provide same gauge as wall studs but not less than 0.0320" thick galvanized steel. Equivalent thickness not acceptable.
6. Floor Channel: Provide same gauge as wall stud but not less than 25 gauge galvanized steel.
7. Top Channel: Provide deep leg design, same gauge as wall stud but not less than 25 gauge galvanized steel.
8. Runners utilized for box header construction shall comply with ASTM C955.
- B. Metal Furring Channels:
 1. Hat-shaped: ASTM C645, 7/8" high, 25 [20] gauge, with G40 hot-dipped galvanized coating per ASTM A653/A653M.

2.02 BOARD MATERIALS

- A. Gypsum board panels shall be tapered edge 4 foot wide panels manufactured in accordance with ASTM C1396. Thickness as shown on the drawings. Furnish longest lengths possible to minimize end joints.
 1. Acceptable Manufacturers:
 - a. CertainTeed Corp., Valley Forge, Pennsylvania
 - b. National Gypsum Company, Charlotte, North Carolina
 - c. USG Corporation, Chicago, Illinois
 - d. Georgia Pacific, Mississauga, Ontario will be considered an equal manufacturer to those listed above provided the following are submitted by the Contractor:
 - i. Performance criteria of the gypsum board panels
 - ii. UL wall assemblies matching the hourly ratings of those listed in the drawing set, utilizing submitted board product.
 2. Unless noted otherwise, all gypsum board shall be Type "X".
 - a. Where fire resistance classifications are indicated, provide materials and application procedures identical to those listed by the testing authority or tested according to ASTM E119 for the type of construction shown.

- B. Mold and Moisture Resistant Gypsum Board: Gypsum board with enhanced core formulated for resistance to moisture and mold; UL Classified for fire resistance (Type X). Surfaced with moisture/ mold resistant paper on front, back, and long edges. Complying with ASTM C1396.
 - 1. Acceptable Products:
 - a. CertainTeed Corp. - M2Tech Type X.
 - b. National Gypsum Company - Gold Bond Brand XP Fire-Shield Gypsum Board.
 - c. USG Corporation - Sheetrock Brand Mold Tough Gypsum Panels with Firecode Core.
 - 2. Mold Resistance: Panel score of 10 when tested in accordance with ASTM D3273

2.03 ACCESSORIES

- A. Joint treatment materials shall comply with ASTM C 475 and shall be approved by the panel manufacturer.
- B. Fasteners: Except as noted below, fasteners shall comply with ASTM C 1002 and shall be approved by the panel manufacturer.
 - 1. Use screws complying with ASTM C 954 for fastening panels to steel members 0.033" to 0.122" in thickness (i.e. 20 gauge to 10 gauge).
 - 2. Fasteners for fire rated construction shall comply with the requirements of the fire test.
 - 3. Fasteners for attaching metal stud runners to structure above shall be spaced 24" on center maximum and shall be suitable for substrate material.
- C. Except as noted below, accessories shall be equal to USG Dur-A-Bead corner reinforcement, No. 93 zinc control joints and 200 series casing trim.
 - 1. Metallic Trim:
 - a. Equal to USG Dur-A-Bead corner reinforcement.
 - b. Equal to USG Dur-A-Bead No. 93 zinc control joints or Drywall Reveal V by Truform Profiles, a division of Gordon Architectural and Engineering Solutions, Bossier City, Louisiana.
 - i. 3/8" wide x 7/16" or deeper square shaped control joints will also be accepted.
 - c. Equal to USG Paper-faced Metal Trim "J" Shaped (B9) trim or Metal U-Trim #200-A (part M20A) by ClarkDietric. Provide at all locations where gypsum board edge may be subjected to water. Locations may include but are not limited to exterior fenestrations and where shown on drawings as a casing bead wrapping the edge of gypsum board, engaging the front and back paper faces of the board.

2. Non-Metallic Corner Trim: The following are the only non-metallic corner trims that will be permitted in lieu of the metal trim specified above.
 - a. No-Coat Drywall Corners manufactured by CertainTeed Corp., Malvern, PA.
 - b. Gypsum board control joints equal to Trim-Tex Drywall Solutions 093V.
 - c. Equal to Trim-Tex Drywall Solutions Tear-Away Bead. This product is ONLY approved for use where edge is protected from traffic or where gypsum board edge is not subject to water contact through condensation, splash conditions or run-off. Sealant will NOT be considered as an acceptable separation from the gypsum board.
- D. Panel Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to substrate.
 1. Use adhesives that have a VOC content of 50 g/L or less.
- E. Isolation Strip at Exterior Walls: Provide the following:
 1. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch (3.2 mm) thick, in width to suit steel stud size.

PART 3 EXECUTION

3.01 INSPECTION

- A. Examine all surfaces to receive gypsum panels and report all defects to the Contractor which may prevent satisfactory installation of the gypsum panels. The Contractor shall be responsible for correcting defects so reported.
- B. Verify that all blocking is in place before closing up walls.

3.02 INTERIOR METAL STUD SYSTEM INSTALLATION

- A. Attach metal runners at floor and ceiling to structural elements with specified fasteners located 2" from each end and spaced 24" o.c.
- B. Position studs vertically, engaging floor and ceiling runners, and spaced 16" o.c. unless noted otherwise. When necessary, splice studs with 8" nested lap and one positive attachment per stud flange. Place studs in direct contact with all door frame jambs, abutting partitions, partition corners and existing construction elements.

- C. Anchor all studs adjacent to door and window frames, partition intersections, and corners to floor runner flanges with punch lock riveting tool or mechanical fastener. Securely anchor studs to jamb and head anchor clips of door or borrowed-light frames by bolt or screw attachment. Over metal door and borrowed-light frames, place horizontally a cut-to-length section of runner, with a web-flange bend at each end, and secure with one positive attachment per flange. Position a cut-to-length stud (extending to ceiling runner) at vertical board joints over door frame header.
 - 1. Unless noted otherwise, partitions shall extend to underside of structure.
 - 2. Stud partitions under structural slabs and beams shall be installed to accommodate anticipated structural deflection.
- D. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.
- E. Install shaft wall system in accordance with the manufacturer's instructions and in compliance with the fire test.

3.03 GYPSUM BOARD INSTALLATION

- A. General Requirements:
 - 1. Prior to start of gypsum board installation, tracks and concealed spaces shall be broom cleaned.
 - 2. Provide panel products in maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.
 - 3. For non-fire rated partitions, extend one layer of gypsum board on one side to structure above. Other gypsum board shall extend 4" above ceiling, unless noted otherwise.
 - 4. Partitions with sound attenuation blankets shall have at least one layer of gypsum board on each side of the partition extended to the structure and shall be caulked with acoustical sealant at the perimeter. Apply one 1/4" round bead of sealant to each side of runners, including those used at partition intersections with dissimilar wall construction. Immediately install boards, squeezing sealant into firm contact with adjacent surface.
 - 5. Use temporary shims, spacers or kick lifter to provide 1/4" to 1/2" clearance between floor and bottom of gypsum panel.

B. Non-Fire Rated Systems:

1. Apply gypsum panels horizontally or vertically Position all edges over studs. Use maximum practical lengths to minimize end joints. Fit ends and edges closely but do not force together. Stagger joints on opposite sides of partition.
2. Power drive screws at least 3/8" from edges or ends of gypsum board to provide uniform dimple 1/32" deep.
3. For single layer non-rated construction, space screws 16" o.c. in field of panels and along vertical abutting edges.

C. Drywall Soffits:

1. Drywall soffits shall be rigidly constructed of metal studs and furring channel suspended from the structure above.

D. Control Joints:

1. Provide control joints max. 30'-0" o.c. (unless noted otherwise on drawings).
 - a. Provide at the following locations in order of importance:
 - 1) Where partition, furring or column fireproofing abuts a structural element (except floor) or dissimilar wall or ceiling.
 - 2) Construction changes within the plane of the partition or ceiling.
 - 3) Above both corners of door frames from top of frame to top of partition where door frame occurs near 30' joint division location.
 - 4) Equally spaced on walls exceeding 30' length.
 - 5) Ceiling dimensions exceeding 30'-0" in either direction.
 - 6) Wings of "L", "U", or "T" shaped ceiling areas.

E. Penetrations Through Partitions:

1. Where penetrations are required through gypsum board partitions, the trade requiring the penetration shall cut a minimum size hole through the partition.
2. If the pipe penetrating the partition is in place prior to the installation of the gypsum board, this trade shall fit the gypsum board as close as possible around the penetration. Sleeves, where required, will be provided by the trade requiring the penetration.
3. The trade providing the penetration shall provide caulking between pipe and gypsum board.

3.04 FINISHING AND ACCESSORIES

- A. Reinforce all vertical and horizontal exterior corners with metal corner bead attached 9" o.c. on both flanges along entire length of bead.
- B. Where gypsum board terminates against masonry or other dissimilar material, apply metal trim over gypsum board edge fastened at 12" o.c.
- C. Finish gypsum board in accordance with ASTM Specification C-840 and the requirements of this specification. The level of finish shall be as defined in this paragraph unless more stringent requirements are needed for fire rating.
 - 1. Level 1: All joints and interior angles shall have tape embedded in joint compound. Surface shall be free of excess joint compound. Tool marks and ridges are acceptable.
 - 2. Level 2: All joints and interior angles shall have tape embedded in joint compound and one separate coat of joint compound applied over all joints, angles, fastener heads and accessories. Surface shall be free of excess joint compound. Tool marks and ridges are acceptable.
 - 3. Level 3: All joints and interior angles shall have tape embedded in joint compound and two separate coats of joint compound applied over all joints, angles, fastener heads and accessories. All joint compound shall be smooth and free of tool marks and ridges.
 - 4. Level 4: All joints and interior angles shall have tape embedded in joint compound and three separate coats of joint compound applied over all joints, angles, fastener heads and accessories. All joint compound shall be smooth and free of tool marks and ridges.
- D. Gypsum board shall be finished according to this schedule:
 - 1. From 4" above finished ceiling to structure and other concealed spaces, unless noted otherwise: Level 1
 - 2. Mechanical equipment rooms and smoke and/or fire rated partitions above finished ceilings:..... Level 2
 - 3. Storage rooms: Level 3
 - 4. All other gypsum board surfaces:..... Level 4

SECTION 09 51 13

ACOUSTICAL PANEL CEILINGS

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Furnish and install acoustical panel ceilings.
- B. Remove and reinstall ceilings for remodeling work.

1.02 RELATED WORK

- A. Section 02 41 19 - Removal of Existing Ceilings
- B. Division 23 - Air Diffusers and Grilles
- C. Division 26 - Light Fixtures

1.03 SUBMITTALS

- A. Product Data: Submit manufacturer's printed information for each type of product furnished and/or installed.
- B. Submit data from the manufacturer that products furnished comply with the fire tests as specified.
- C. Coordination Drawings: Drawn to scale and coordinating acoustical tile ceiling installation with hanger attachment to building structure and ceiling mounted items. Show size and location of initial access modules.

1.04 QUALITY ASSURANCE

- A. Coordinate layout and installation of acoustical panels and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials in their original unopened packages and store in an enclosed shelter providing protection from damage and exposure to the elements.
- B. Prior to installation, store materials at same temperature and humidity conditions anticipated during installation and occupancy for a sufficient amount of time to stabilize temperature and moisture content.
- C. Damaged or deteriorated materials shall be removed from the site.

1.06 SITE CONDITIONS

- A. Do not install acoustical panel ceilings until wet work in spaces is complete and dry and work above ceilings is complete.
- B. The interior temperature shall be maintained at 60°F to 85°F and the relative humidity shall not exceed 70%.

1.07 EXTRA MATERIALS

- A. Furnish extra materials described below that matches products installed and are packaged with protective coverings for storage and identified with labels describing contents.
 - 1. Type ACT1; remainder of open box.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Ceiling Tile:
 - 1. Armstrong World Industries Inc., Lancaster, Pennsylvania
 - 2. USG Interiors, LLC, Chicago, Illinois
 - 3. CertainTeed Corp., Valley Forge, Pennsylvania
- B. Suspended Grid System:
 - 1. Armstrong World Industries Inc., Lancaster, Pennsylvania
 - 2. CertainTeed Corp., Valley Forge, Pennsylvania
 - 3. Chicago Metallic Corp, Chicago, Illinois
 - 4. Gordon Inc., Shreveport, Louisiana

2.02 ACOUSTICAL MATERIALS

- A. Match existing ceiling tile. Product listed below is a probable match. Submit samples to confirm.
- B. Type ACT1 Tile: Lay-in and Tegular;USG Radar 2210, 24" x 24" x 1" Square Edge, wet-formed mineral fiber, painted acoustical ceiling tile with small holes in a non-directional pattern. ClimaPlus system warranty.
 - 1. Standard 15/16" Grid System
 - 2. NRC: 0.50 minimum
 - 3. Fire Class A per ASTM E84
 - 4. Classification: ASTM E1264 Type III
- C. Alternate ceiling product: Certaineed Performa Baraque, BET-157.

2.03 SUSPENSION MATERIALS

- A. Standard 15/16" Grid System
 - 1. Manufacturers/Products:
 - a. Armstrong World Industries.....Prelude 15/16 System
 - b. CertainTeed.....15/16" Classic System
 - c. Chicago Metallic Corp. Snap Grid 200
 - 2. Main runners, cross tees and all moldings shall be of cold rolled electro-galvanized steel manufactured in accordance with ASTM C635: Intermediate Duty Classification.
 - 3. Cap Material: Steel, painted white unless noted otherwise.
- B. Hanger wire shall be galvanized soft annealed carbon steel wire in accordance with ASTM Specification A641. Galvanized coating shall be Class 1.
 - 1. Wire for exposed grid systems shall be 12 gauge.
- C. Furnish all components required for a complete system.

PART 3 EXECUTION

3.01 GENERAL

- A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.

3.02 HANGER INSTALLATION

- A. Install hangers not over 4'-0" o.c. in both directions and not over 12" from any wall or partition.
 - 1. Hanger wires suspended from existing structural systems shall be securely anchored to the structure by wiring to available structural members or by other appropriate means as required to develop the full strength of the hanger wire, subject to approval of the Architect.
 - a. All ceiling grids shall be supported from structure above. Under no circumstances shall ceiling grid wire ties be tied off to any mechanical, plumbing or electrical equipment.

3.03 EXPOSED GRID SYSTEM INSTALLATION

- A. Exposed ceiling systems shall be installed in accordance with the recommendations of ASTM Standard C636. Loading of any component shall not cause deflection of more than $L/360$ of the span.
- B. Main runners shall be installed 48" on center and be directly suspended by not less than 12 gauge galvanized steel wire spaced 48" on center along the main runners.
- C. Main runners shall be interconnected by locking cross tees 48" long to form 24 x 48 modules. Where 24" x 24" tile is shown, these modules shall be divided by cross tees installed perpendicular to the other cross tees.
- D. Check electrical and mechanical drawings and specifications for size, location and extent of openings in acoustical ceilings. Frame all openings with structural tee members on all sides.
- E. Provide suspension (perimeter) trim where suspended ceiling system does not abut a vertical surface.

3.04 ACOUSTICAL PANEL INSTALLATION

- A. Install acoustical panels in coordination with metal grid system, with edges resting on flanges of main runners, cross tees and edge moldings. Cut and fit panels neatly against abutting surfaces. Support edges by wall moldings.
 - 1. Install square edge panels with edges fully hidden from view by flanges of suspension system runners and moldings.
 - 2. Where tegular edge tiles are cut to fit perimeter conditions, the edge shall be routed to match the tegular edge. Paint all visible surfaces to match face of tile.
- B. Handle tile only with gloves or clean hands to avoid smearing dirt.

3.05 REMODELING WORK

- A. Remove acoustical tile ceilings where required for mechanical, electrical or other remodeling work.
 - 1. Ceilings which are intended to be reinstalled shall be removed and reinstalled as part of this section.
 - 2. Ceilings which are not intended to be reinstalled shall be removed as part of Section 02 41 19.
- B. Handle tile only with gloves or clean hands to avoid smearing dirt. Select tile for replacement with care so that the use of off color or damaged tile is avoided.

3.06 CLEANING

- A. Upon completion of the work, clean the metal edging to remove all discoloration and clean or replace all soiled, defaced or discolored acoustical panels.
- B. Replace damaged and broken panels.

SECTION 09 65 13

RESILIENT BASE

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Furnish and install rubber base.

1.02 RELATED WORK

- A. Section 06 40 00 - Architectural Casework
- B. Section 09 65 19 - Resilient Tile Flooring
- C. Section 09 68 13 - Tile Carpeting
- D. Section 09 91 00 - Painting

1.03 PERFORMANCE REQUIREMENTS

- A. Provide rubber base to meet the following fire test performance criteria as tested by a recognized independent testing laboratory:
 - 1. ASTM E 648, Standard Test Method for Critical Radiant Flux of 0.45 watts/cm² or greater, Class I.
 - 2. ASTM E 84, Standard Test Method for Surface Burning Characteristics of Building Materials, Class A, Smoke <450.

1.04 SUBMITTALS

- A. Product Data: Submit manufacturer's catalog cut sheets and specifications for each product furnished.
- B. Submit data from the manufacturer that products furnished comply with the fire tests as specified.
- C. Samples: Provide sample chip of each color specified on project. Complete chain sets will not be accepted.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to site in sealed, unbroken, original packages bearing the manufacturer's name, brand and grade.

1.06 SITE CONDITIONS

- A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 60°F or more than 90°F.

1.07 EXTRA MATERIALS

- A. Furnish extra materials described below that matches products installed and are packaged with protective coverings for storage and identified with labels describing contents.
 - 1. Rubber Base: Furnish a partial coil, i.e. the remainder of last coil used, of each color of rubber base installed.

PART 2 PRODUCTS

2.01 RUBBER BASE

- A. Provide new rubber base to match existing for size, gauge, color and texture.
- B. Resilient Base Standard: ASTM F 1861.

2.02 ACCESSORIES

- A. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.
 - 1. Use adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - a. Cove Base Adhesives: Not more than 50 g/L.

PART 3 EXECUTION

3.01 PREPARATION

- A. Examine all surfaces to receive resilient material. Report all conditions which may interfere with a satisfactory installation to the Contractor. The Contractor shall correct all conditions so reported.
- B. Installation shall not begin until the work of all other trades, including painting, has been completed.
- C. Ventilate products prior to installation. Remove from packaging and ventilate in a secure, dry, well-ventilated space free from strong contaminant sources and residues. Provide a temperature range of 60°F minimum to 90°F maximum continuously for minimum 72 hours. Do not ventilate within limits of Work unless otherwise approved by Architect.

3.02 RESILIENT BASE INSTALLATION

- A. Products shall be installed by experienced installers in strict accordance with the manufacturer's printed instructions.
- B. Install resilient base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.
- C. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
 - 1. Adhesive shall be applied in a thin film and spread evenly with a cement finisher's trowel of the type recommended by the resilient base manufacturer. If a notched trowel is used, the notches shall conform to the resilient base manufacturer's specifications and shall be renewed periodically on the gradual wear of the trowel.
- D. Do not stretch resilient base during installation.
- E. On irregular substrates, fill voids along top edge of resilient wall base with manufacturer's recommended adhesive filler material.
- F. Corners:
 - 1. Provide pre-molded inside corners or form on job from straight pieces of maximum lengths possible by cutting an inverted V-shaped notch in toe of wall base at the point where corner is formed. Shave back of base where necessary to produce snug fit to substrate.
 - 2. Provide pre-molded outside corners or form on job from straight pieces of maximum lengths possible by shaving back of base at point where bending will occur. Remove a strip perpendicular to length of base and only deep enough to produce a snug fit without bends whitening or removal of more than half the thickness of wall base.

3.03 ADJUSTING AND CLEANING

- A. Upon completion of the work, remove all surplus material and debris and rubbish incident to the work.

RESILIENT TILE FLOORING

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Furnish and install resilient tile (LVT) flooring.

1.02 RELATED WORK

- A. Section 03 54 00 - Self-Leveling Underlayment
- B. Section 09 65 13 - Resilient Base
- C. Section 09 68 13 - Carpet Tile

1.03 SUBMITTALS

- A. Submit product data for each type of product specified. Include installation instructions and maintenance information. Include a list of manufacturer recommended cleaning products.
- B. Submit data from the manufacturer that products furnished comply with the fire tests as specified.
- C. Samples for Verification: Provide one 3" square of each color and pattern of resilient floor tile required.
- D. Test Results: Submit a copy of all moisture test and Ph test results within one week of performing test.

1.04 QUALITY ASSURANCE

- A. Flooring material shall comply with the following:
 - 1. Smoke Density: ASTM E 662, results shall be less than 450.
 - 2. Flammability: ASTM E 648, results shall be not less than 0.45 watts per square centimeter, Class I.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to site in sealed, unbroken, original packages bearing the manufacturer's name, brand and grade.
- B. Store materials in a dry location inside the building.

1.06 SITE CONDITIONS

- A. Maintain room and floor temperature between 65°F and 80°F for 48 hours prior, during and after the installation of flooring. A minimum temperature of 55°F must be maintained afterwards.
 - 1. All flooring material, adhesives and accessories shall be stored under these same conditions.

1.07 WARRANTY

- A. Provide manufacturer's standard warranty, executed by authorized company official. Manufacturer's warranty is in addition to and not a limitation of rights Owner may have under Contract Documents.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Luxury Vinyl Tile - Type LVT1:
 - 1. Manufacturer: Milliken
 - 2. Product: Refer to Finish Legend
 - 3. Adhesive: Manufacturer's recommended type for substrate and moisture/pH conditions present.
 - 4. Refer to Finish Legend for additional information.

2.02 ACCESSORIES

- A. Trowelable Leveling and Patching Compound: Latex-modified, portland cement based or blended hydraulic cement based formulation provided or approved by floor covering manufacturer for applications indicated.
- B. Edge molding, transition and reducer strips shall be the type recommended by the manufacturer to give the lowest profile and thinnest line.
- C. Incidental supplies, installation materials, primers, etc., shall be furnished by one manufacturer or recommended by the manufacturer of the resilient floorings for use with specified products.

PART 3 EXECUTION

3.01 PREPARATION

- A. Examine all surfaces to receive resilient material. Report all conditions which may interfere with a satisfactory installation to the Contractor. The Contractor shall correct all conditions so reported.
- B. Dust, scale, and loose particles must be removed. The surface must be free of

solvents, paint, grease, oil, wax, alkali, sealing compounds, residual adhesive, chemical adhesive remover and any other foreign material, which could affect adhesive bonding.

- C. Apply latex leveling cement as required to correct irregularities in the subfloor. Floor shall be level to within 1/8" in ten feet.
- D. Subfloor Moisture Testing: Prior to installing resilient flooring material, perform moisture testing per ASTM F2170 and pH Testing per ASTM F710 and as required by flooring material manufacturer's requirements.
 - 1. Quantity of Tests: Comply with the indicated ASTM test method recommendations or as required by flooring material manufacturer's requirements, whichever is greater.
 - 2. Maintain a record of all moisture and pH test results. Submit a copy of all test results to Architect within one week of performing test.
 - 3. Do not begin installation until satisfactory results have been obtained.
- E. Installation shall not begin until the work of all other trades, including painting, has been completed.

3.02 INSTALLATION

- A. All resilient flooring material shall be installed in strict accordance with manufacturer's recommendations and installation instructions using manufacturer's approved adhesive.
 - 1. Scribe and cut floor coverings to butt neatly and tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings.
 - 2. Extend floor coverings into toe spaces, door reveals, closets, and similar openings.
 - 3. Adhesive shall be applied in a thin film and spread evenly with a cement finisher's trowel of the type recommended by the covering manufacturer. If a notched trowel is used, the notches shall conform to the flooring material manufacturer's specifications and shall be renewed periodically on the gradual wear of the trowel.
 - 4. Randomly check tiles for complete coverage of adhesive onto back of tile.
 - 5. Clean excess adhesive as you install before it is allowed to dry.
 - 6. Provide reducer strips at edges of floor coverings that would otherwise be exposed. Tightly adhere to substrates throughout length of each piece.

3.03 INITIAL MAINTENANCE

- A. Perform initial maintenance operations per manufacturer's current printed instructions.

3.04 PROTECTION

- A. No traffic shall be permitted on floors for at least 24 hours after tile is laid.
Do not expose flooring to rolling load traffic for at least 72 hours after installation.
- B. After the initial 24 hour period, if traffic is unavoidable, protect floor with non-staining, waterproof paper or approved covering.
- C. When moving heavy or sharp objects over flooring, the flooring shall be protected with 1/4" or thicker plywood, hardboard or other underlayment panels.

SECTION 09 68 13

TILE CARPETING

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Furnish and install tile carpeting and accessories.

1.02 RELATED WORK

- A. Section 09 65 13 - Resilient Base
- B. Section 09 65 19 - Resilient Tile Flooring

1.03 SUBMITTALS

- A. Product Data: Provide data on all specified products (including carpeting, adhesives, carpet accessories, fillers and other floor preparation materials), describing physical and performance characteristics; sizes, patterns, colors available, and method of installation.
- B. Shop Drawings: Indicate areas to be carpeted, direction of carpet, edge terminations and details of all special treatments.
- C. Provide manufacturer's printed information for selected products.
- D. Submit the tile carpeting manufacturer's list of recommended adhesives along with technical data on the adhesive which is proposed for use on this project.
- E. Test Results: Submit a copy of all moisture test and pH test results within one week of performing test.
- F. Submit one (1) of the manufacturer's complete maintenance manual for the carpet tile specified.
- G. Submit data from the manufacturer that products furnished comply with the fire tests as specified.

1.04 QUALITY ASSURANCE

- A. Tile carpeting shall be installed by skilled workers, well experienced in the type of installation specified.
- B. Installation shall be in accordance with the manufacturer's printed instructions.
- C. Deliver materials in good condition to the jobsite in the manufacturer's original unopened containers that bear the name and brand of the manufacturer, project identification, and shipping and handling instructions.

1.05 SITE CONDITIONS

- A. Store materials in a clean, dry, enclosed space off the ground, and protected from the weather and from extremes of heat and cold. Protect adhesives from freezing. Store flooring, adhesives and accessories in the spaces where they will be installed for at least 72 hours before beginning installation.
- B. Maintain a minimum temperature in the spaces to receive the flooring and accessories of 65°F and a maximum temperature of 85° for at least 72 hours before, during, and for not less than 72 hours after installation. Thereafter, maintain a minimum temperature of 55°F in areas where work is completed. Protect all materials from the direct flow of heat from hot-air registers, radiators, or other heating fixtures and appliances.
- C. Install flooring and accessories after the other finishing operations, including painting, have been completed. Close spaces to traffic during the installation of the flooring. Do not install flooring over concrete slabs until they are sufficiently dry to achieve a bond with the adhesive, in accordance with the manufacturer's recommended bond and moisture tests.

1.06 WARRANTY

- A. Provide manufacturer's standard warranty, executed by authorized company official. Manufacturer's warranty is in addition to and not a limitation of rights Owner may have under Contract Documents.

PART 2 PRODUCTS

2.01 TILE CARPETING - TYPE CPT1

- A. Manufacturer: Milliken Flooring, Spartanburg, SC
- B. Product/Collection:
 - 1. Color/Style: Refer to Finish Legend/ Match existing.
 - 2. Tile Size: Match existing
- C. Adhesive: Manufacturer's recommended type for substrate and moisture/pH conditions present.
- D. Refer to Finish Legend for additional information.

2.02 ACCESSORIES

- A. Trowelable Leveling and Patching Compound: Latex-modified, portland cement based or blended hydraulic cement based formulation provided or approved by floor covering manufacturer for applications indicated.
- B. Edge moldings, transition and reducer strips shall be the type recommended by the manufacturer to give the lowest profile and thinnest line.
 - 1. Color shall be selected by the Architect.
- C. Incidental supplies, installation materials, primers, etc., shall be furnished by one manufacturer or recommended by the manufacturer of the tile carpeting for use with specified products.

PART 3 EXECUTION

3.01 PREPARATION

- A. Examine all surfaces to receive tile carpeting. Report all conditions which may interfere with a satisfactory installation to the Contractor. The Contractor shall correct all conditions so reported.
- B. Dust, scale, and loose particles must be removed. The surface must be free of solvents, paint, grease, oil, wax, alkali, sealing compounds, residual adhesive, chemical adhesive remover and any other foreign material, which could affect adhesive bonding.
- C. Apply latex leveling cement as required to correct irregularities in the subfloor. Floor shall be level to within 1/8" in ten feet.
- D. Subfloor Moisture Testing: Prior to installing tile carpet, perform moisture testing per ASTM F2170 and pH Testing per ASTM F710 and as required by flooring material manufacturer's requirements.
 - 1. Quantity of Tests: Comply with the indicated ASTM test method recommendations or as required by flooring material manufacturer's requirements, whichever is greater.
 - 2. Maintain a record of all moisture and pH test results. Submit a copy of all test results to Architect within one week of performing test.
 - 3. Do not begin installation until satisfactory results have been obtained.
- E. Installation shall not begin until the work of all other trades, including painting, has been completed.

3.02 INSTALLATION

- A. Tile carpeting shall be laid in the scheduled pattern according to register numbers on cartons and according to dye lots.
 - 1. Tile carpeting shall be laid starting at center of rooms and worked toward the walls. Lay out carpet tile in each room so that, as far as practicable, there will be no pieces of carpet tile less than one-half the width of a full tile.
 - 2. Installation shall be direct glue down method with a full spread adhesive under all carpet tiles.
 - 3. Cut edges shall be trued and appropriately treated to form non-raveling joints where exposed.
 - 4. All warped, off color, defaced, or odd size carpet tile shall be discarded.
- B. Install edge moldings at all areas where floor covering material changes or where a carpet tile edge does not abut a vertical surface.

3.03 ADJUSTING AND CLEANING

- A. Remove all dirt, carpet scraps, and debris from the face of the tile carpeting.
 - 1. Vacuum the surface of tile carpeting at the completion of the installation and prior to the placement of equipment and furnishings.
- B. Clean soiled spots and remove excess adhesive with the proper spot remover.
- C. Trim loose pieces of face yarn with a sharp scissors.
- D. Repair all damage to walls, doors, trim, etc., caused by the installation of the tile carpeting.

3.04 PROTECTION

- A. No traffic shall be permitted on floors for at least 48 hours after tile carpeting has been laid.
- B. When moving heavy or sharp objects over flooring, the flooring shall be protected with 1/4" or thicker plywood, hardboard or other underlayment panels.

SECTION 09 81 00

ACOUSTIC INSULATION

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Furnish and install acoustic batt insulation.

1.02 RELATED WORK

- A. Section 09 21 16 - Gypsum Board Assemblies

1.03 SUBMITTALS

- A. Product Data: Submit manufacturer's descriptive and technical data, clearly marked to show materials involved. Include manufacturer's printed installation instructions.
- B. Where acoustical insulation is scheduled in UL rated partitions, provide UL data verifying products have been tested and are approved for use in the applicable UL Design.
- C. Provide third party documentation of laboratory tested STC values of the submitted acoustical insulation. Include the laboratory name and testing number showing compliance.

1.04 QUALITY ASSURANCE

- A. Fire Ratings: Comply with fire-resistance and flammability ratings specified.

1.05 DELIVERY, HANDLING, AND STORAGE

- A. Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Acoustic Insulation: ASTM C665, Type I, unfaced semi rigid mineral fiber or fiberglass batt type, thickness indicated on drawings, friction fit, with maximum flame/smoke properties of 25/450 in accordance with ASTM E84:
 - 1. Fire Rated Partitions: Insulation type as required by fire resistant design indicated on drawings.
 - 2. Other Partitions: Insulation type as required by Sound Transmission Class (STC) rating indicated on Drawings.

PART 3 EXECUTION

3.01 GENERAL

- A. During installation, protect ducts and HVAC system from loose insulation particulates.
- B. Provide temporary ventilation of building areas where building insulation is being installed.

3.02 INSTALLATION

- A. Comply with manufacturer's instructions for installation conditions.
- B. Do not install insulation until building is sufficiently enclosed or protected against absorption of moisture by the insulation, and do not install insulation unless supporting framing and construction is in a thoroughly dry condition.
- C. Install snugly between framing members with ends snugly fitted between units and against adjacent construction.
 - 1. For metal-framed wall cavities where cavity heights exceed 96 inches, support unfaced batt mechanically or with supplemental framing.
- D. Carefully cut and fit insulation around pipes, conduit, and other obstructions and penetrations.
- E. Stuff loose-fill acoustical insulation into miscellaneous voids and cavity spaces where shown. Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft.
 - 1. Where door and window frames occur in framing, cut additional strips of insulation and hand-pack as required to fill voids in and around such frames.

3.03 PROTECTION

- A. Protect acoustic insulation from damage, deterioration, and displacement until permanently enclosed or covered by other materials.
- B. Provide temporary coverings or enclosures where materials are subject to abuse or damage and cannot be concealed and protected by permanent construction immediately after installation.

3.04 WASTE MANAGEMENT

- A. Plan and coordinate acoustical insulation work to minimize generation of off cuts and waste.
- B. Use acoustical insulation scraps in non-standard framing spaces as feasible to minimize waste.

SECTION 09 91 00

PAINTING

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Furnish all labor, materials, services, and supervision required to field apply all paint, stain on interior and exterior surfaces.
- B. Work also includes surface preparation of substrates as required for application of finishes of this section and for application of wall coverings.

1.02 RELATED WORK

- A. The drawings, specifications, and general provisions of the Contract, including General and Supplementary Conditions apply to this Section.

1.03 DEFINITIONS

- A. Coat: A layer of paint, varnish, lacquer, or other material applied, then allowed to dry. To back roll or apply a wet-on-wet film still constitutes a single coat.

1.04 SUBMITTALS

- A. For each color and type of paint selected, submit two 8-1/2" x 11" draw-downs on white smooth card stock with all prime and finish coats specified. Each succeeding layer of product shall be held back 1" and the layer labeled.
 - 1. Use same designations indicated on drawings and in schedules.
- B. For all products not listed on the Paint Products Schedule, submit the following:
 - 1. Manufacturer's specification sheet, including VOC content.
 - 2. Draw-down applied in accordance with Paragraph A showing sheen for each product.
 - 3. Retail price per gallon.
 - 4. Contractor's purchase price per gallon.
 - 5. List of all proposed substitutions.
- C. Material Safety Data Sheets (MSDS) shall be provided in compliance with OSHA Standard 1910.1200 Hazard Communications.

1.05 EXTRA MATERIALS

- A. Furnish extra materials from the same product run, that match products installed and are identified with labels describing contents.
 - 1. Paint: Furnish not less than 1 gallon of each paint finish and color used on project.
 - 2. Color-spot each lid.
 - 3. Identify with formula, product name and date on lid. Include general description of application.

1.06 DELIVERY, STORAGE AND HANDLING

- A. All material shall be delivered to the site in sealed, unbroken, original containers bearing the manufacturer's label. Label shall give manufacturer's name, brand, type of paint, and instructions for use.
- B. All materials shall be stored in a single place designated by the Owner or Architect. All soiled or used rags, waste and trash shall be removed from the building every night and every precaution taken to avoid the danger of fire.
- C. Store materials in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 50°. Refer to product data sheets for specific product information.

1.07 JOB CONDITIONS

- A. Cleaning
 - 1. Areas to be painted shall be clean and free of dust and shall remain in that condition through the painting process.
- B. Field Environmental Conditions
 - 1. Perform all painting and decorating work only when the ambient temperature and substrate temperatures, relative humidity, dew point and substrate moisture content all meet the manufacturer's requirements.
 - 2. Ensure adequate continuous ventilation and sufficient heating and lighting is in place during execution of work.
- C. Protection of the Work
 - 1. Protect all work performed under this section at all times and protect all adjacent work and materials by suitable covering or other method during progress of the work.

1.08 QUALITY ASSURANCE

- A. Contractor shall have a minimum of five (5) years of successful experience and shall maintain a qualified crew of painters throughout the duration of the work.

1.09 DESCRIPTION OF THE WORK

- A. Unless specifically noted as being finished otherwise or specifically noted as unfinished, the painter shall paint or finish as specified all new exposed wood, plaster, gypsum board, concrete, lightweight concrete block, and metal surfaces on the interior and exterior of the project except anodized aluminum, bronze, copper, stainless steel, or plastic laminate surfaces.
- B. Examine the specifications for the various other trades, including Mechanical and Electrical, and become thoroughly familiar with all their provisions regarding their painting. All surfaces that are left unfinished by the requirements of other specifications shall be painted or finished as a part of this work.
- C. All new exposed heating cabinets, radiation, heating piping, ductwork, plumbing piping, fire lines, electrical conduit and boxes, including hangers, shall be painted under this section of the work.
 - 1. Mechanical and electrical piping concealed in pipe shafts, walls, and above ceilings will not be painted.
 - 2. Pre-finished items of a standard grey, tan, or similar color such as exposed panel covers, surface mounted raceways, heating cabinets, etc., shall be painted to match adjacent surfaces.
- D. Remodeling Work
 - 1. Where remodeling work occurs in the existing building, all new work shall be painted in accordance with this specification. Extend new paint to natural break point such as room corner, column projection or door frame.
- E. All other material of any nature requiring painting shall be painted under this section in a professional manner using materials suitable for the location and character of the work and as approved by the Architect. Any item not specifically covered in painting schedule shall be painted color of adjacent surface.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Materials for each paint system shall be compatible with one another and substrates indicated as recommended by manufacturer.
- B. Other materials such as linseed oil, shellac, thinners, solvents, etc. shall be the highest quality product and compatible with paint materials being used, as required. Where no product is listed, material shall be of the highest grade from manufacturer.

2.02 FINISH, COLOR

- A. Colors shall be as noted on the Finish Legend.
- B. Colorants shall be added by established formula and the paint thoroughly mixed by mechanical means prior to delivery to the site. Color may be added in the field only with the Architect's approval.
 - 1. Except as noted below, tint primer with one-half the required colorant.
 - 2. Refer to the manufacturer's recommendations for primer color when applying darker colors.
 - 3. Colors shall be as selected by the Architect. More than one color may be selected for any single room or location.

2.03 MANUFACTURERS

- A. Except as noted below, Provide Sherwin Williams products.

2.04 MATERIALS

- A. Interior Paints:
 - 1. Latex Primer
 - a. [ProMar 200 Zero VOC Interior Latex Primer](#) B28W02600
 - 2. Latex Enamel Topcoat
 - a. [ProMar 200 Zero VOC Interior Latex EgShel](#) B20-2600 Series
 - 3. Interior Metal Primer
 - a. Primer not required on shop-primed items.
 - b. [Pro-Cryl Universal Acrylic Primer](#) B66-1300
 - 4. Interior Metal Topcoat
 - a. [Emerald® Urethane Trim Enamel Interior-Exterior Waterbased Semi-Gloss](#)

PART 3 EXECUTION

3.01 INSPECTION

- A. Examine substrates and conditions prior to the application of any paint or finishing material. Do not proceed with finishing until substrates and all environmental conditions (heating, ventilation, lighting, and completion of other substrate work) are acceptable for application of products.
- B. If any surface to be finished cannot be put in proper condition for finishing by customary cleaning, sanding and puttying operations, notify the Contractor immediately in writing. Application of paint or finish to the surface constitutes acceptance of the surface.

3.02 SURFACE PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.
- B. General
 - 1. Surfaces to be painted shall be clean as well as floors and adjacent surfaces.
 - 2. Mildew, efflorescence, and all foreign material shall be removed from surfaces by appropriate methods.
 - 3. Verify adhesion of primers and finishes prior to painting.
- C. Gypsum Board
 - 1. Fill all scratches, nicks, and uneven areas with spackling compound and sand flush with the surface.
 - 2. Verify that finishing compound is sanded smooth. Remove sanding dust.
- D. Metal
 - 1. Galvanized metal: Clean with a strong solvent (Duosol, Xylol) before applying recommended primer.
 - 2. Ferrous metal: Clean with mineral spirits to remove oil, grease, and dirt.
 - 3. Shop-primed steel: Clean field welds, bolted connections, and areas where shop paint is abraded. Prime exposed areas with material similar to shop primer before applying finish coats.

3.01 EXISTING SURFACE PREPARATION

- A. Where new work joins existing work, prepare existing surfaces extending to the nearest break in the plane. Wash surfaces with T.S.P. and water or other solution as required.
 - 1. Remove all accumulated film of wax, oil, grease, smoke, or other foreign matter.
 - 2. After washing, rinse with potable water and let thoroughly dry.
- B. In addition to the above cleaning, provide the following work:
 - 1. Existing Gypsum Wallboard:
 - a. Fill minor isolated defects and damaged areas in previously painted surfaces with vinyl base spackle. Apply texture on minor work repaired under this Section as required to match existing adjacent surfaces.
 - b. Using primer-sealer, prime all bare and newly textured surfaces scheduled to receive paint.
 - 2. Existing Painted Ferrous Metal:
 - a. Sand rough edges of bare areas to feathered edge at adjacent sound paint. Remove rust and loose paint to bare metal; solvent wash, then apply prime paint.
 - b. Remove rust and scale by scraping and wire-brushing. Clean all welds and abrade with power tool. Spot prime all areas at once.

3.02 APPLICATION

- A. Employ skilled painters to ensure the very best applications. Materials to be applied by painters experienced in the use of the specific product involved.
- B. Apply paint in accordance with the manufacturer's directions Use the techniques and applications best suited for the type of material being applied.
- C. Apply all material under adequate illumination. Spread evenly and flow on smoothly without runs or sags.
- D. All coats must be thoroughly dry before applying succeeding coats.
- E. At new work where resilient base occurs, terminate paint finish 1" below top of base.
- F. Between coats applied to wood or metal, sand enamel or varnish finish with fine sandpaper and clean to produce an even, smooth finish.
- G. Doors requiring job-site fitting or machining shall have all cut edges (including top and bottom edges) sealed.

3.03 CLEANING AND TOUCH-UP

- A. Upon completion of the work, remove all paint and varnish spots from the floors, glass, and other surfaces.
- B. Remove from the premises all rubbish and accumulated material of whatever nature resulting from this work and leave work in clean, orderly, and acceptable condition.
- C. Repair all damages caused by the storage, mixing or misapplication of paint products.
- D. Do final touching up of all decorated surfaces of minor patched gypsum board around pipe openings, electric fixture openings, and all parts of wood and metal finishing requiring a final touching up.
- E. Do not dispose of paint or solvents by pouring materials on the ground. Place products in designated containers for proper disposal.

3.04 INTERIOR PAINTING SYSTEMS

- A. For any substrate not listed below, follow recommendations in "MPI Manual".
- B. Gypsum Board, Plaster
 - 1 coat Latex Wall Primer
 - 2 coats Latex Enamel Topcoat
 - (Where epoxy paint is scheduled, provide one (1) coat epoxy primer and two (2) coats epoxy topcoat in lieu of the latex primer/topcoat.)
- C. Hollow Metal Frames, Hollow Metal Doors and Interior Ferrous Metal
 - 1 coat Interior Metal Primer (Where surfaces are furnished pre-primed, just spot prime bare spots with a compatible primer.)
 - 2 coats Interior Metal Topcoat
- D. Covered Piping and Ductwork
 - 1 coat Interior Metal Primer
 - 2 coats Interior Metal Topcoat
- E. Existing Surfaces
 - Paint the same as new work except delete primer
 - Spot prime where necessary

BALLISTIC PROTECTION PRODUCTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Ballistic-Resistant Fiberglass Panels
- B. Recessed Cash Tray
- C. Ballistic-Resistant Glazing

1.02 RELATED SECTIONS

- A. Section 06 10 00 - Rough Carpentry

1.03 REFERENCES

- A. ASTM A 666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate and Flat Bar.
- B. ASTM B 209/B 209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- C. Underwriters Laboratories: UL 752 - Standard for Bullet Resisting Equipment.

1.04 PERFORMANCE REQUIREMENTS

- A. Design, fabricate, and install all partition materials specified in this section to meet or exceed the requirements of UL 752.

1.05 SUBMITTALS

- A. 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.
- B. Shop Drawings: Submit Manufacturer approved shop drawings detailing plan, section and elevation views as necessary to ensure proper field installation procedures. Coordinate locations with those listed in the Contract Drawings.
- C. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.
- D. Verification Samples: For each finish product specified, two samples (minimum 6" square) representing actual product, color, and patterns.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: All primary products specified in this section will be supplied by a single manufacturer with a minimum of ten (10) years' experience.
- B. Installer Qualifications: All products listed in this section are to be installed by a single installer with a minimum of five (5) years' demonstrated experience in installing products of the same type and scope as specified.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store and dispose of hazardous materials and materials contaminated by hazardous materials, in accordance with requirements of local authorities having jurisdiction.

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.

1.09 WARRANTY

- A. At project closeout, provide to Owner or Owner's Representative an executed copy of the manufacturer's standard limited warranty against manufacturing defect, outlining its terms, conditions, and exclusions from coverage.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Armortex, Schertz, Texas. Web: www.armortex.com. Phone: 210-661-8306. Email: info@armortex.com
- B. North American Bullet Proof, Cibolo, Texas. Web: www.nabulletproof.com. Phone: 888-746-8427. Email: info@nabulletproof.com.
- C. Total Security Solutions, 170 National Park Drive, Fowlerville, MI 4883. Web: www.tssbulletproof.com. Phone: 888-703-8882. Email: info@tssbulletproof.com;

2.02 MATERIALS

- A. Aluminum Sections: Extruded aluminum alloy 6063 T5 manufactured in accordance with ASTM B209. Anodized or powder coated finish to match the existing décor and be free of sharp edges or burrs when in place.
 - 1. Glazing Channel: U-Channel specifically designed for securing transparencies tightly in place. Angles and stops are only acceptable for top attachment.

2.03 COMPONENTS

A. Ballistic-Resistant Fiberglass Armor Panels:

1. Basis of Design model – Shotgard Ballistic Fiberglass, BB-3, as manufactured by North American Bullet Proof.
 - a. Ballistic Resistance Performance Level: U.L. 752 Level 3 and National Institute of Justice (N. I. J.) 0108.1/Level IIIA - .44 Mag., 240 Gr., minimum 1350 Ft. per Second, Semi Wad Cutte.
 - b. Nominal Thickness: 7/16”.
 - c. Nominal Weight: 4.9 lbs./SF
 - d. Bullet-resistant fiberglass panels shall be constructed of a multi-ply ballistic fiberglass laminate produced from ballistic fiberglass and impregnated with a thermostat polyester resin binder. The multi-ply configuration is to provide a delaminating effect when ballistically attacked.

B. Glazing Type: Laminated polycarbonate, UL 752 Level 3 as manufactured by Total Security Solutions.

1. Thickness: 1-1/4”

C. Recessed Currency Tray, as manufactured by Total Security Solutions.

1. Mounting: Recessed
2. Construction: 18 gauge stainless steel with #4 finish. Joints welded and ground smooth.
3. Size: 16” x 8” x 1-1/2”
4. Performance level: Level 3 minimum.

2.04 STRUCTURAL SUPPORTS

- ### A. Where installation requires lateral bracing, locate braces no wider than 96” on centerlines. The depth of the brace below the counter and vertical support (brace) above the counter must maintain a ratio of at least 20 percent of the total installation height.

PART 3 EXECUTION

3.01 EXAMINATION

- ### A. Inspect areas to receive bullet-resistant products to ensure that building is ready for their installation. Report all problems to the Contractor. Do not begin installation until substrates have been properly prepared.
- ### B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 SUPPORTING MEMBERS

- A. Prior to installing the ballistic-resistive materials and products, verify that all supports and backing materials have been installed as required to maintain the specified ballistic-resistive rating.

3.04 JOINTS

- A. All fiberglass panel joints shall be reinforced by a back-up layer of ballistic-resistive material. The ballistic resistance of the joint, as reinforced, shall be at least equal to that of the panel. Minimum width of reinforcing layer at joint shall be 4". (2" on each panel or a 2" minimum overlap)

3.04 INSTALLATION

- A. Ballistic-resistant fiberglass panels shall be installed in accordance with the manufacturer's printed recommendations. Ballistic-resistant fiberglass panels shall be adhered using an industrial adhesive, mastic, screws or bolts. Method of application shall maintain the specified bullet resistive rating at junctures with the existing construction.
- B. Install all components in accordance with manufacturer's instructions.

3.04 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair, or replace damaged products before Substantial Completion.

COMMON WORK RESULTS FOR PLUMBING

PART 1 GENERAL

1.01 SCOPE

- A. This section includes information common to two or more technical plumbing specification sections or items that are of a general nature, not conveniently fitting into other technical sections. Included are the following topics:

PART 1 - GENERAL

- Scope
- Related Work
- Standards
- Quality Assurance
- Continuity of Existing Services
- Protection of Finished Surfaces
- Sleeves and Openings
- Sealing
- Off Site Storage
- Codes
- Certificates and Inspections
- Submittals
- Operating and Maintenance Instructions
- Training of Owner Personnel
- Record Drawings
- Scheduling
- Data and Drawings
- Hot Water Recirculation

PART 2 - PRODUCTS

- Access Panels and Doors
- Identification
- Bedding and Backfill
- Sealing
- Drip Pans

PART 3 - EXECUTION

- Demolition
- Excavation and Backfill
- Sheeting, Shoring and Bracing
- Dewatering
- Surface Restoration
- Concrete Work
- Cutting and Patching
- Building Access
- Equipment Access
- Coordination
- Identification
- Sealing
- Storage and Handling
- Paint
- Protection of Existing Equipment
- Hot Water Recirculation

1.02 RELATED WORK

- A. Applicable provisions of Division 01 govern work under this section.
- B. Section 05 05 20 - Fasteners and Metal Fastenings
- C. Division 23 - Heating and Air Conditioning
- D. Division 26 - Electrical
- E. This section applies to all Division 22 00 00 sections of plumbing.

1.03 STANDARDS

- A. Provide all materials and equipment under this contract in accordance with the following applicable Technical Society, Organization, or Body.

Abbreviations of standards organizations referenced in this and other sections are as follows:

ADA	Americans With Disabilities Act (1990)
ANSI	American National Standards Institute
ARI	Air Conditioning and Refrigeration Institute
ASME	American Society of Mechanical Engineers
ASPE	American Society of Plumbing Engineers
ASSE	American Society of Sanitary Engineering
ASTM	American Society for Testing and Materials
AWWA	American Water Works Association
AWS	American Welding Society
BOCA	Building Officials Code Administrators International, Inc.
CDA	Copper Development Association
CS	Commercial Standards, Products Standards Sections, Office of Eng. Standards Service, NBS
EPA	Environmental Protection Agency
FS	Federal Specifications, Superintendent of Documents, U.S. Government Printing Office
FM	Factory Mutual
IAPMO	International Association of Plumbing & Mechanical Officials
IECC	International Energy Conservation Code
IPC	International Plumbing Code
IEEE	Institute of Electrical and Electronics Engineers
ISA	Instrument Society of America
MCA	Mechanical Contractors Association
MICA	Midwest Insulation Contractors Association
MSS	Manufacturer's Standardization Society of the Valve & Fitting Industry, Inc.
NBS	National Bureau of Standards
NEC	National Electric Code
NEMA	National Electrical Manufacturers Association
NSF	National Sanitation Foundation
OSHA	Occupational Safety and Health Act
PDI	Plumbing and Drainage Institute
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association, Inc.
UL	Underwriters Laboratories Inc.
WQA	Water Quality Association

- B. Reference to Standards shall mean and intend the latest edition of specifications adapted and published at the time of invitation to submit proposals.

Standards referenced in this section:

ASTM D1557	Standard Test Method for Moisture-Density Relations of Soils
ASTM E84	Standard Test Method for Surface Burning Characteristics of Building Materials
D.O.T.	Standard Specifications for Road and Bridge Construction, State of Wisconsin Dept. of Transportation
- - -	Reduction of Lead in Drinking Water Act
SDWA	Safe Water Drinking Act
UL1479	Fire Tests of Through-Penetration Firestops
UL723	Surface Burning Characteristics of Building Materials
ANSI/NSF 372	Lead-Free Products
IECC	2015 Table C404.5.1

1.04 QUALITY ASSURANCE

- A. Refer to Division 01, General Conditions, Equals and Substitutions.
- B. All products and materials, of first quality of manufacturers, used are to be new, undamaged, clean and in good condition. Existing products and materials are not to be reused unless specifically indicated.
- C. Where equipment or accessories are used which differ in arrangement, configuration, dimensions, ratings, or engineering parameters from those indicated on the contract documents, the Contractor is responsible for all costs involved in integrating the equipment or accessories into the system and for obtaining the intended performance from the system into which these items are placed.
- D. Plumbing work shall be installed in strict conformity with the specifications and applicable State and local codes and ordinances.
1. The rules of the State of Wisconsin Department of Safety and Professional Services Plumbing Code shall be part of this specification and are hereby incorporated by reference.
 - a. All plumbing products and related appliance or equipment shall be listed and approved per the stipulated requirements of Comm. 384 PLUMBING PRODUCTS which includes being listed in the latest edition of the WISCONSIN PLUMBING PRODUCTS REGISTER - Document SBD-8871-P.
 2. If the requirements of the applicable State and local codes and ordinances are contrary to or more stringent than the requirements of the specification, the requirements of the codes and ordinances shall govern.

- E. Installation shall be by qualified personnel thoroughly trained and experienced in skills required and completely familiar with the manufacturer's current recommended methods of installation as well as the requirements of the work. System shall be ready for satisfactory use.
- F. All plumbing equipment to be installed per manufacturer's recommendations.

1.05 CONTINUITY OF EXISTING SERVICES

- A. Do not interrupt or change existing services without prior written approval from the Owner and the Architect's Representative. When interruption is required, coordinate scheduling of down-time with the Owner to minimize disruption to his activities. Unless specifically stated, all work involved in interrupting or changing existing services is to be done during normal working hours.
- B. The existing buildings will be occupied and maintained in normal use by the Owner during the progress of these contracts.
- C. Schedule work to reduce to the minimum the period of interruption or outages to the various services.
- D. Notify the Owner and the Architect, no less than 120 hours before any system is to be put out of service, of the extent of the work to be done during the outage, the probable length of time required for that phase of the work, and the desired time at which the outage is to begin.
- E. Provide temporary piping and systems as required to keep building operational with minimal shutdown/disruption. Temporary piping and systems to keep construction progressing shall be included in Plumbing Contractor's scope of work.

1.06 PROTECTION OF FINISHED SURFACES

- A. Refer to Division 01, General Requirements, Protection of Finished Surfaces.

1.07 SLEEVES AND OPENINGS

- A. Refer to Section 22 05 00, Article 3.14 SLEEVES.

1.08 SEALING

- A. Sealing between piping, etc. and the non-rated partition opening shall be the responsibility of the contractor whose work penetrates the opening. Seal all openings with caulk sealant or another approved product.

1.09 OFF SITE STORAGE

- A. Prior approval by the Architect/Engineer will be needed. The Contractor shall submit a written request for consideration of off site materials storage. Generally, sleeves, pipe/pipe fittings and similar rough-in material will not be accepted for off site storage. No material will be accepted for off site storage unless shop drawings for the material have been approved.

1.10 CODES

- A. Comply with requirements of Wisconsin Administrative Code, International Plumbing Code, City of De Pere, WI. Plumbing Codes, IECC-Recirculation codes.

1.11 CERTIFICATES AND INSPECTIONS

- A. Refer also to Division 01, General Conditions, Permits, Regulations, Utilities and Taxes.
- B. Obtain and pay for all required State installation inspections except those provided by the Owner or Architect/Engineer in accordance with Wis. Admin. Code Section Comm. 61.30, State and Local Codes, Ordinances, and Authorities with Jurisdiction. Include copies of the certificates in the Operating and Maintenance Instructions.
- C. The installing contractor is required to certify in writing the installations of the systems and equipment. See Conditions of Contract regarding progress payments defining Substantial Completion and Section 01 70 00 Project Closeout for certification requirements, the installing contractor shall certify that, to the best of his knowledge, the following has been completed:
 - 1. The plumbing has been installed, complying with the specifications, and with National, State, and Local Codes.

Each Contractor is required to supply the appropriate support documentation and UL listings to substantiate the certifications.

1.12 SUBMITTALS

- A. Refer to Division 01, General Conditions, Submittals.
- B. Not more than two weeks after award of contract but before any shop drawings are submitted, contractor to submit the following plumbing system data sheet. List piping material type for each piping service on the project, ASTM number, schedule or pressure class, joint type, manufacturer and model number where appropriate. List valves and specialties for each piping service, fixture and equipment with manufacturer and model number.

- C. The approved plumbing system data sheet(s) will be made available to the Project Representative for their use on the project.

PLUMBING SYSTEM DATA SHEET

<u>Item</u>	<u>Pipe Service/Sizes</u>	<u>Manufacturer/Model No.</u>	<u>Remarks</u>
Pipe			
Fittings			
Unions			
Valves:			
Ball			
Balancing			
Check			
Pipe Specialties:			
Thermometers			
Building Penetrations			
Hangers and Supports			
Concrete Anchors			
Insulation			
Plbg. Specialties:			
Cleanouts			
Plbg. Fixtures			

- D. Shop drawing submittals are to be bound, labeled, contain the project manual cover page and a material index list page showing item designation, manufacturer and additional items supplied with the installation. Submit for all equipment and systems as indicated in the respective specification sections, marking each submittal with that specification section number. Mark general catalog sheets and drawings to indicate specific items being submitted and proper identification of equipment by name and/or number, as indicated in the contract documents.
- E. Shop drawings for any material or product used in the plumbing system which does not comply with the requirements of Comm. 384 shall include a copy of the Wisconsin Department of Safety and Professional Services approval letter.
- F. Submit 4 copies of water test report.
- G. Submit 2 copies of final inspection report from District Plumbing Inspector.

1.13 OPERATING AND MAINTENANCE INSTRUCTIONS

- A. Refer to Division 01, General Requirements, Operating and Maintenance Instructions.
- B. Assemble material in three-ring or post binders, using an index at the front of each volume and tabs for each system or type of equipment. Provide electronic and paper copies as indicated in Division 01. In addition to the data indicated in the General Requirements, include the following information:
 - Copies of all approved shop drawings.
 - Records of tests performed to certify compliance with system requirements.
 - Certificates of inspection by regulatory agencies.
 - Parts lists for fixtures, equipment, valves and specialties.
 - Manufacturer's installation, operation and maintenance recommendations for fixtures, equipment, valves and specialties.
 - Valve schedules.
 - Warranties.
 - Additional information as indicated in the technical specification sections.
 - Reconditioning schedule of replaced parts, room numbers, etc. completed and signed by person doing reconditioning work.

1.14 TRAINING OF OWNER PERSONNEL

- A. Instruct user agency personnel in the proper operation and maintenance of systems and equipment provided as part of this project. Include not less than 0.5 hour of instruction, using the Operating and Maintenance manuals during this instruction. Demonstrate startup, operation and shutdown procedures for all equipment. All training to be during normal working hours. Provide a letter signed by the Owner indicating completion of training. The Contractor shall include written instruction for systems installed and shall include pertinent plans identifying system components requiring regular maintenance or seasonal maintenance. This information shall be included with the O&M Manual for reference.

1.15 RECORD DRAWINGS

- A. Refer to Division 01, General Requirements, Record Drawings.
- B. Refer to Division 01, Section 01 70 00, Execution and Closeout Requirements.

1.16 SCHEDULING

- A. Install all sewers and drains below grade as soon after the award of contract as possible. Start underground work immediately after building excavations are made.
- B. Install general plumbing work as fast as construction progress permits.
- C. Provide temporary piping and systems as required for construction.

1.17 DATA AND DRAWINGS

- A. See Instructions to Bidders regarding examination of site and special site conditions.
- B. The information given herein and on the drawings is as exact as can be secured. Its accuracy is not guaranteed. Examination of site will be required to verify all measurements, distances, levels, and elevations before starting the work.
- C. If any omissions or discrepancies occur between the drawing and actual site conditions, the Architect shall be notified for clarification.
- D. The location of piping, fixtures, or equipment which is governed by architectural features shall be established by reference to dimensions on architectural-structural drawings. THE DRAWINGS SHALL NOT BE SCALED FOR EXACT DIMENSIONS. Consult complete drawings and details for dimensions of all partitions, their construction, and location in relation to plumbing fixtures.
- E. The approximate locations of all fixtures, equipment, and piping are shown on the drawings. The Architect reserves the right to change the location of any fixtures and equipment 5 feet and piping 10 feet in any direction without these changes being made subject of an extra charge, provided such changes are made before the rough-in, piping, or sleeves have been installed.
- F. Changes of the drawing necessary to make the plumbing systems conform to the building as constructed and to fit the work of other trades shall be made without extra cost.
- G. Deviations or changes in location of fixtures, equipment, and/or piping made in the field shall be carefully recorded on field set of drawings and the Architect shall be informed of all deviations and changes. Submit (2) two sets of as-built drawings per Section 01 70 00.
- H. Where demolition and remodeling work require removal and/or relocation of existing fixtures, equipment or trim, the Plumbing Contractor shall include same as part of his contract work.

1.18 HOT WATER RECIRCULATION

- A. Provide hot water recirculation to within 2'-0" of the fixture, as required per Code SPS 382.40(5)(b)1. and the 2015 International Energy Conservation Code (IECC) Table C404.5.1.
- B. This shall apply to all public and/or employee (public hand washing) exam sinks, sinks, or lavatories.

PART 2 - PRODUCTS

2.01 ACCESS PANELS AND DOORS

A. Lay-In Ceilings

1. Removable lay-in ceiling tiles in 2 x 2 foot or 2 x 4 foot configuration provided under Section 09 51 13 are sufficient; no additional access provisions are required unless specifically indicated.

B. Plaster Walls and Ceilings

1. 0.045 T5 extruded aluminum frame with rolled 1-5/16" flange, 0.063 aluminum panel insert door, aluminum continuous piano type hinge, screwdriver cam locks, mill finish UL listed for use in fire rated partitions if required by the application. Use the largest size access opening possible, consistent with the space and the item needing service. Use 18" x 18" unless space limitations require a smaller panel. Larsen Manufacturing Co. L-LCP series lightweight access panel or equal.

- C. Where remodeling creates inaccessibility of existing valves, equipment, the Plumbing Contractor shall provide access panels as specified above.

2.02 IDENTIFICATION

A. Stencils

1. Not less than 1" high letters/numbers for marking pipe and equipment.

B. Snap-Around Pipe Markers

1. One-piece, preformed, vinyl construction, snap-around or strap-around pipe markers with applicable labeling and flow direction arrows, 3/4" minimum size for lettering. Provide nylon ties on each end of pipe markers. Equal to Seton Setmark.

C. Valve Tags

1. Valve tags to identify project name and valve number. Provide (2) two tags - per valve, if necessary. Round brass tags with 1/2" numbers, 1/4" system identification abbreviation, 1-1/4" minimum diameter, with brass jack chains, brass "S" hooks or one-piece nylon ties around the valve stem, available from EMED Co., Seton Name Plate Company, or W.H. Brady.
2. Indexing sheets for valve numbers shall be typewritten, encased in a transparent case and frame, and posted in main service room of building or as directed. Provide Architect with two (2) copies of index sheets.
 - a. If valve numbers are to be added to an existing system, the numbers shall be verified with the Owner as to the number and system abbreviation.
THIS VERIFICATION SHALL BE COMPLETED BEFORE MATERIAL IS ORDERED.

2.03 BEDDING AND BACKFILL

- A. Bedding up to a point 12" above the top of the pipe shall be thoroughly compacted sand or crushed stone chips meeting the following gradations:

Gradation for Bedding Sand

<u>Sieve Size</u>	<u>% Passing (by Wt)</u>
1 inch	100
No. 16	45 - 80
No. 200	2 - 10

Gradation for Crushed Stone Chip Bedding

<u>Sieve Size</u>	<u>% Passing (by Wt)</u>
1/2 inch	100
No. 4	75 - 100
No. 100	10 - 25

- B. Backfill above the bedding in lawn areas shall be thoroughly compacted excavated material free of large stones, organic, perishable, and frozen materials.
- C. Backfill above the bedding under existing and future utilities, paving, sidewalks, curbs, roads and buildings shall be granular materials, pit run sand, gravel, or crushed stone, free from large stones, organic, perishable, and frozen materials.

2.04 SEALING

- A. At pipe penetrations of non-rated interior partitions, floors and walls, use urethane caulk in annular space between pipe insulation and sleeve. For non-rated drywall, plaster or wood partitions where sleeve is not required, use urethane caulk in annular space between pipe insulation and wall material

2.05 DRIP PANS

- A. Over connected electrical equipment and other critical areas, as noted on drawings, furnish and install water tight pans below soil, waste, roof conductors, clearwater drains, and all water piping. Pans shall be a minimum of 12" wide for single pipe served. Multiple piping racks shall have pans 4" wider on both sides of outside pipes. Pans shall be at least 6" deep constructed of 18" gauge sheet aluminum, with all joints sealed watertight.

PART 3 EXECUTION

3.01 DEMOLITION

- A. Perform all demolition as indicated on the drawings to accomplish new work.
Where demolition work is to be performed adjacent to existing work that remains in an occupied area, construct temporary dust partition to minimize the amount of contamination of the occupied space. Where pipe is removed and not reconnected with new work, cap ends of existing services as if they were new work. Coordinate work with the Owner to minimize disruption to the existing building occupants.
- B. All pipe, fixtures, equipment, wiring and associated conduit, insulation and similar items demolished, abandoned, or deactivated are to be removed from the site by the Contractor except as specifically noted otherwise. All designated equipment is to be turned over to the user agency for their use at a place and time so designated. Maintain the condition of material and/or equipment that is indicated to be reused equal to that existing before work began.
- C. Cutting of slabs shall be work by This Trade. Patching and restoring shall be work by the General Contractor.
- D. Wall rough-in for sinks, lavatory, and like fixtures where wall construction is to remain shall include capping waste and water supplies at the finished wall surface.
- E. Where remodeling of floor and walls involves exposing existing stacks, risers and/or rough-in of services, same shall be verified and disconnected from mains below floor and above finished ceilings or relocated as required to maintain a working system. In all cases, the Contractor shall verify final quantities of demolition work and complete the required changes to the present system design to maintain the system in working condition.
- F. Chasing of existing walls for new plumbing piping shall be done by This Trade. See Division 01, Section 01 00 00 for patching and restoring.

3.02 EXCAVATION AND BACKFILL

- A. Perform all excavation and backfill work necessary to accomplish indicated plumbing systems installation. Excavate to bottom of pipe and structure bedding, 4" in stable soils, 6" in rock or wet trenches and 8" in unstable soil. Finish bottoms of excavations to true, level surface. All trenching excavations shall be open trench method, unless otherwise noted.
- B. Strip topsoil from area to be excavated, free from subsoil and debris, and store for later resspreading.
- C. At no time place excavated materials where they will impede surface drainage unless such drainage is being safely rerouted away from the excavation.

- D. Remove surplus excavated materials from site.
- E. Verify the locations of any water, drainage, sewer, electric, telephone lines which may be encountered in the excavation. Underpin and support all lines. Cut off service connections encountered which are to be removed at the limits of the excavation and cap. In the event of a break in an existing utility main or service, notify immediately an official from the utility interrupted, lend all possible assistance in restoring the service, and assume costs or claims connected with the interruption and repair of utility break.
- F. Provide and maintain all fencing, barricades, signs, warning lights, and/or other equipment necessary to keep all excavation pits and trenches and the entire subgrade area safe under all circumstances and at all times. No excavation shall be left unattended without adequate protection.
- G. Verify existing sanitary, storm sewer elevations prior to installation of new piping and/or new piping connection(s). Camera/video of existing sewer(s) to be included in Plumbing Contractor's work as needed.
- H. Bed pipe up to a point 12" above the top of the pipe. Take care during bedding, compaction and backfill not to disturb or damage piping.
- I. Mechanically compact bedding and backfill to prevent settlement. The initial compacted lift to not exceed 24" compacted to 95% density per Modified Proctor Test (ASTM D-1557). Subsequent lifts under pavements, curbs, walks and structures are not to exceed 12" and be compacted to 95% density per Modified Proctor Test. In all other areas where construction above the excavation is not anticipated within 2 years, mechanically compact backfill in lifts not exceeding 24" to 90% density per Modified Proctor Test. Route the equipment over each lift of the material so that the compaction equipment contacts all areas of the surface of the lift.

3.03 SHEETING, SHORING AND BRACING

- A. Provide shoring, sheet piling and bracing in conformance with the Wisconsin Administrative Code to prevent earth from caving or washing into the excavation. Shore and underpin to properly support adjacent or adjoining structures. Abandon in place shoring, sheet piling and underpinning below the top of the pipe, or, if approved in advance by the Engineer, maintained in place until other permanent support approved by the Engineer is provided.

3.04 DEWATERING

- A. Provide, operate, and maintain all pumps and other equipment necessary to drain and keep all excavation pits, trenches and the entire subgrade area free from water under all circumstances.

3.05 SURFACE RESTORATION

- A. Completely restore the surface of all disturbed areas to a like condition of the surface prior to the work. Level off all waste disposal areas and clean up all areas used for the storage of materials or the temporary deposit of excavated earth. Remove all surplus material, tools and equipment.

3.06 CUTTING AND PATCHING

- A. Refer to Division 01, General Requirements, Cutting and Patching.
- B. General Trade to sawcut and remove existing concrete slab as required to install new sanitary piping to new sink location. After piping is installed, General Trade to patch and match concrete depth and metal reinforcing – coordinate

3.07 BUILDING ACCESS

- A. Arrange for the necessary openings in the building to allow for admittance or removal of all apparatus. When the building access was not previously arranged and must be provided by this Contractor, restore any opening to its original condition after the apparatus has been brought into the building.

3.08 EQUIPMENT ACCESS

- A. Install all piping, conduit, and accessories to permit access to equipment for maintenance. Coordinate the exact location of wall and ceiling access panels and doors with the General Contractor, making sure that access is available for all equipment and specialties. Where access is required in plaster walls or ceilings, furnish the access doors to the General Contractor.

3.09 COORDINATION

- A. Coordinate all work with other contractors prior to installation. Any work that is not coordinated and that interferes with other contractor's work shall be removed or relocated at the installing contractor's expense.
- B. Verify that all devices are compatible for the type of construction and surfaces on which they will be used.
- C. Coordination for "equal manufacturers" of fixtures/equipment to be done by Plumbing Trade. Coordinate electrical requirements needed. Cost for electrical changes/coordination to be at Plumbing Contractor's expense.

3.10 IDENTIFICATION

- A. Identify equipment in mechanical equipment rooms by stenciling equipment number and service with one coat of black enamel against a light background or white enamel against a dark background. Use a primer where necessary for proper paint adhesion.
- B. Where stenciling is not appropriate for equipment identification, engraved name plates may be used.
- C. Identify interior piping not less than once every 30 feet, not less than once in each room, adjacent to each access door or panel, and on both side of the partition where accessible piping passes through walls or floors. Place flow directional arrows at each pipe identification location. Use one coat of black enamel against a light background or white enamel against a dark background.
- D. Identify valves with brass tags bearing a system identification and a valve sequence number. Valve tags are not required at a terminal device unless the valves are greater than ten feet from the device, located in another room or not visible from device. Provide a typewritten valve schedule and pipe identification schedule indicating the valve number and the equipment or areas supplied by each valve and the symbols used for pipe identification; locate schedules in mechanical room and in each Operating and Maintenance manual. Schedule in mechanical room to be framed under clear plastic.

3.11 SEALING

- A. Non-Rated Partitions
 - 1. At all interior partitions and walls, pipe penetrations are required to be sealed. Apply sealant to both sides of the penetration in such a manner that the annular space between the pipe sleeve or cored opening and the pipe or insulation is completely blocked.

3.12 STORAGE AND HANDLING

- A. Promptly inspect shipments to ensure that the material is undamaged and complies with specifications.
- B. Cover pipe to prevent corrosion or deterioration while allowing sufficient ventilation to avoid condensation. Do not store materials directly on grade. Protect pipe, tube, and fitting ends so they are not damaged. Where end caps are provided or specified, take precautions so the caps remain in place. Protect fittings, flanges, and unions by storage inside or by durable, waterproof, above ground packaging.
- C. Off-site storage agreements will not relieve the Contractor from using proper storage techniques.
- D. Storage and protection methods must allow inspection to verify products.

3.13 PAINT

- A. All interior non-prefinished equipment supports shall have prime coat of paint.

3.14 PROTECTION OF EXISTING EQUIPMENT

- A. Contractor shall not perform any pipe cutting, grinding, assembly, etc. without proper protection of the Owner equipment.
- B. Protection to consist of poly visqueen film, minimum thickness 4 mil. Secure from bottom of structure to floor.
- C. Coordinate set-up staging area with the Owner.
- D. Any equipment not protected by the Contractor during construction shall be cleaned and/or replaced by the Contractor at fault.

3.15 HOT WATER RECIRCULATION

- A. Provide hot water recirculation to within 2'-0" of public and/or employee sinks/lavatory as required per Code SPS 382.40(5)(b)1. and the 2015 IECC Table C404.5.1.
- B. This shall apply to all public and/or employee sinks/lavatories.
- C. Install balancing valve assembly on the hot water return piping and balance hot water and hot water return system per specification Section 22 11 00, Article 3.13 Testing, Adjusting and Balancing.
- D. Hot water recirculation assembly to be installed in an accessible location or in coordination with an access panel.

SECTION 22 05 14

PLUMBING SPECIALTIES

PART 1 GENERAL

1.01 SCOPE

- A. This section includes specifications for cleanouts and other plumbing specialties.

- PART 1 - GENERAL

- Scope

- Related Work

- Reference

- Reference Standards

- Quality Assurance

- Shop Drawings

- PART 2 - PRODUCTS

- Cleanouts

- Water Hammer Arrestor (WHA)

- PART 3 - EXECUTION

- Installation

1.02 RELATED WORK

- A. Section 22 05 23 - General-Duty Valves for Plumbing Piping
- B. Section 22 11 00 - Facility Water Distribution
- C. Section 22 13 00 - Facility Sanitary Sewerage

1.03 REFERENCE

- A. Applicable provisions of Division 01 shall govern work under this section.

1.04 REFERENCE STANDARDS

- ANSI/NSF 372 – Lead-Free Products

1.05 QUALITY ASSURANCE

- A. Substitution of Materials: Refer to Section GC - General Conditions of the Contract, Article 7.
- B. Plumbing products requiring approval by the State of Wisconsin Dept. of Safety and Professional Services must be approved or have pending approval at the time of shop drawing submission.

1.06 SHOP DRAWINGS

- A. Include data concerning dimensions, capacities, materials of construction, ratings, certifications, weights, manufacturer's installation requirements, manufacturer's performance limitations, and appropriate identification.

PART 2 PRODUCTS

2.01 CLEANOUTS

- A. Manufacturers: Smith, Wade, Josam, Zurn.
- B. Interior Concrete Floor Areas: Enameled cast iron body with round or square adjustable scoriated polished nickel bronze cover, tapered threaded bronze closure plug.
Zurn ZN-1400-BP / ZN-1400-T-BP.
- C. Interior Carpeted Floor Areas: Enameled cast iron body with round adjustable scoriated nickel bronze cover and secured carpet marker, tapered threaded bronze closure plug.
Zurn Z-1400-CM-BP.
- D. Interior Finished Wall Areas: Line type cleanout tee with tapered threaded bronze cleanout plug, square, smooth nickel bronze secured wall access. Zurn Z-1447-BP.
- E. Interior Exposed Vertical Stacks: Line type cleanout tee with tapered threaded bronze closure plug. Zurn Z-1445-BP.
- F. Interior Horizontal Lines: Cast iron hub with tapped ferrule and tapered threaded bronze closure plug, or no-hub coupling and blind plug.
- G. Interior Concrete Floor Areas: Enameled cast iron body, membrane flange, round or square adjustable scoriated polished nickel bronze cover, tapered threaded bronze closure plug and 30" diameter safing material. Zurn ZN-1400-BP-KC.

2.02 WATER HAMMER ARRESTORS

- A. Manufacturers: PPP Industries, Sioux Chief, Wade.
- B. ANSI A112.26.1, ASSE 1010; sized in accordance with PDI WH-201, precharged piston type constructed of hard drawn Type K copper, threaded brass adapter, brass piston with o-ring seals, FDA approved silicone lubricant, suitable for operation in temperature range 35°F to 150°F, maximum 250 psig working pressure, 1500 psig surge pressure.
PPP Part No. SC-500 through SC-4000.
- C. Water hammer arrestor(s) to be installed in base cabinet for dishwasher connection

PART 3 EXECUTION

3.01 INSTALLATION

- A. Coordinate location and setting of plumbing specialties with adjacent construction. Install in accordance with manufacturer's recommendations.
- B. Set cleanouts level and plumb adjusted to finished floor elevation, roof elevation or finished wall location. Locate where serviceable. Allow minimum of 18" clearance around cleanouts for rodding. Lubricate threaded cleanout plugs with graphite and oil, teflon tape or waterproof grease.

SECTION 22 05 15

PIPING SPECIALTIES

PART 1 GENERAL

1.01 SCOPE

- A. This section contains specifications for plumbing piping specialties for all piping systems. Included are the following topics:

- PART 1 - GENERAL

- Scope

- Related Work

- Reference

- Reference Standards

- Shop Drawings

- Design Criteria

- PART 2 - PRODUCTS

- Thermometers

- Thermometer Sockets

- Test Wells

- Test Plugs

- PART 3 - EXECUTION

- Thermometers

- Thermometer Sockets

- Test Wells

- Test Plugs

1.02 RELATED WORK

- A. Section 22 11 00 - Facility Water Distribution
- B. Section 22 13 00 - Facility Sanitary Sewerage
- C. Section 22 05 23 - General-Duty Valves for Plumbing Piping
- D. Section 22 07 00 - Plumbing Insulation

1.03 REFERENCE

- A. Applicable provisions of Division 01 govern work under this section.

1.04 REFERENCE STANDARDS

- A. ASTM B650 Electrodeposited Engineering Chromium Coatings on Ferrous Substrates

1.05 SHOP DRAWINGS

- A. Required for all items in this section. Include materials of construction, dimensional data, ratings/capacities/ranges, approvals, test data, pressure drop data where appropriate, and identification as referenced in this section and/or on the drawings.

1.06 DESIGN CRITERIA

- A. All piping specialties are to be rated for the highest pressures and temperatures in the respective system in accordance with ANSI B31, but not less than 125 psig unless specifically indicated otherwise.

PART 2 PRODUCTS

2.01 THERMOMETERS

- A. Manufacturers: Ashcroft, Marsh, Taylor, H.O. Trerice, U.S. Gauge, Weiss, Wika, Weksler.
- B. Stem Type: Cast aluminum case, 9" scale, clear acrylic window. adjustable angle brass stem with stem of sufficient length so the end of the stem is near the middle of a pipe without reducing the thickness of any insulation, red or blue organic indicating fluid (no mercury type), black lettering against a white background. (Trerice #A405 with #138-0015.2 separable socket) Scale ranges as follows:

<u>Service</u>	<u>Hot Water</u>
Scale Range, °F	30 – 180
Increment, °F	2

2.02 THERMOMETER SOCKETS

- A. Brass with threaded connections suitable for thermometer stems and temperature control sensing elements in pipeline. Furnish with extension necks for insulated piping systems.

2.03 TEST WELLS

- A. Similar to thermometer sockets except with a brass cap that threads into the inside of the test well to prevent dirt from accumulating. Secure cap to body with a short chain. Furnish with extension necks, where appropriate, to accommodate the pipeline insulation.

2.04 TEST PLUGS

- A. Brass threaded pressure and temperature test plug with neoprene self-closing valve, valve retainer, brass threaded cap, rated for 150 psi and 0-200°F.

PART 3 EXECUTION

3.01 THERMOMETERS

- A. Stem Type: Install in piping systems as indicated on the drawings and/or details using a separable socket in each location.

3.02 THERMOMETER SOCKETS

- A. Install at each point where a thermometer or temperature control sensing element is located in a pipeline.

3.03 TEST WELLS

- A. Install in piping systems as indicated on the drawings and/or details wherever provisions are needed for inserting a thermometer at a later date.

3.04 TEST PLUGS

- A. Install in piping systems as indicated on the drawings and/or details wherever provisions are needed for short-term measurement of pressure or temperature.

GENERAL-DUTY VALVES FOR PLUMBING PIPING

PART 1 GENERAL

1.01 SCOPE

- A. This section includes valve specifications for all Plumbing systems except where indicated under Related Work. Included are the following topics:

PART 1 - GENERAL

Scope

Related Work

Reference

Quality Assurance

Submittals

Design Criteria

PART 2 - PRODUCTS

Water System Valves

Ball Valves

Swing Check Valves

PART 3 - EXECUTION

General

Shut-off Valves

Drain Valves

Swing Check Valves

1.02 RELATED WORK

- A. Section 22 05 14 - Plumbing Specialties

1.03 REFERENCE

- A. Applicable provisions of Division 01 govern work under this section.

1.04 QUALITY ASSURANCE

- A. Substitution of Materials: Refer to Section GC - General Conditions of the Contract, Article 7.

1.05 SUBMITTALS

- A. Schedule of all valves indicating type of service, dimensions, materials of construction, and pressure/temperature ratings for all valves to be used on the project. Temperature ratings specified are for continuous operation.

1.06 DESIGN CRITERIA

- A. ANSI/NSF 372 - Lead-Free Products
- B. Where valve types (ball, etc.) are specified for individual plumbing services (i.e., domestic water, etc.), each valve type shall be of the same manufacturer unless prior written approval is obtained from the Owner.
- C. Valves to be line size unless specifically noted otherwise.

PART 2 PRODUCTS

2.01 WATER SYSTEM VALVES

- A. All water system valves to be rated at not less than 125 water working pressure at 240°F unless noted otherwise.
- B. Ball Valves:
 - 1. 2" and Smaller: Two-piece, full port, bronze body; sweat ends, stainless steel Type 316 ball; glass filled teflon seat; teflon packing and threaded packing nut; blowout-proof stainless steel stem; 600 psig WOG. Provide valve stem extensions for valves installed in all piping with insulation. Nibco S-585-70-66, Apollo, Grinnell, Hammond, Jomar, Milwaukee, Watts.
 - 2. Ball valves will not be accepted in sizes over 2".
- C. Swing Check Valves:
 - 1. 3" and Smaller: Bronze body, sweat ends, Y-pattern, regrindable bronze seat, renewable bronze disc, Class 125, suitable for installation in a horizontal or vertical line with flow upward. Crane 1342, Grinnell 3300SJ, Hammond IB941, Jomar S-511G, Nibco S413B, Watts CVYS.
- D. Balance Valves:
 - 1. 2" and Smaller: Bronze or copper alloy body with calibrated ball, globe or venturi/valve arrangement, integral pointer and calibrated scale to register degree of valve opening, memory stop, drain tapping, threaded or soldered ends, with or without integral unions, P/T or Shraeder pressure taps with integral check valves and seals, adjustable memory stop, suitable for 200 psig water working pressure at 250°F.
 - a. Armstrong CBV, Bell & Gossett Circuit Setter Plus, Griswald Quickset, Illinois 6000 Series, Jomar TGG, Nexus Orturi, Nibco 1710 Series, Taco Accu-Flo, Tour & Anderson STAS/STAD.
 - 2. Hot Water Recirculation Valve:
 - a. Lead-free recirculation assembly consisting of isolation valves, inline check valve, direct read balancing valve, 0.5 gpm, Jomar Valve Model TRAB.

D. Drain Valves:

1. 3/4" ball valve with integral threaded hose adapter, sweat or threaded inlet connections, with threaded cap and chain on hose threads, Watts B-6000-CC/B-6001-CC Series.

PART 3 EXECUTION

3.01 GENERAL

- A. Properly align piping before installation of valves. Install and test valves in strict accordance with valve manufacturer's installation recommendations. Do not support weight of piping system on valve ends.
- B. Mount valves in locations which allow access for operation, servicing and replacement.
- C. Provide valve handle extensions for all valves installed in insulated piping.
- D. Install all valves with the stem in the upright or horizontal position. Valves installed with the stems down will not be accepted.
- E. Prior to flushing of piping systems, place all valves in the full-open position.
- F. Provide access panels for valves installed in pipe chases and walls. Reference Section 22 05 00.

3.02 SHUT-OFF VALVES

- A. Install shut-off valves at each piece of equipment, at each branch take-off from mains for isolation or repair and elsewhere as indicated.

3.03 DRAIN VALVES

- A. Provide drain valves for complete drainage of all systems. Locations of drain valves include low points of piping systems, downstream of riser isolation valves, equipment locations specified or detailed, other locations required for drainage of systems and elsewhere as indicated.

3.04 SWING CHECK VALVES

- A. Install swing check valves in recirculation branch lines and elsewhere as indicated.

SECTION 22 05 29

HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SCOPE

- A. This section includes specifications for supports of all plumbing equipment and materials as well as piping system anchors. Included are the following topics:

PART 1 - GENERAL

- Scope

- Related Work

- Reference

- Reference Standards

- Quality Assurance

- Description

- Shop Drawings

- Design Criteria

PART 2 - PRODUCTS

- Pipe Hangers, Supports and Anchors

- Pipe Hanger Rods

- Beam Clamps

- Concrete Inserts

- Anchors

- Corrosive Atmosphere Coatings

PART 3 - EXECUTION

- Installation

- Hanger and Support Spacing

- Beam Clamps

- Anchors

1.02 RELATED WORK

- A. Section 05 05 20 - Fasteners and Metal Fastenings
- B. Section 22 07 00 - Plumbing Insulation for insulation protection at support devices

1.03 REFERENCE

- A. Applicable provisions of Division 01 shall govern work under this section.

1.04 REFERENCE STANDARDS

- A. MSS SP-58
- B. MSS SP-69

1.05 QUALITY ASSURANCE

- A. Refer to Division 01, General Conditions, Equals and Substitutions.

1.06 DESCRIPTION

- A. Provide all supporting devices as required for the installation of mechanical equipment and materials. All supports and installation procedures are to conform to the latest requirements of the ANSI Code for building piping.
- B. Do not hang any mechanical item directly from a metal deck or run piping so it rests on the bottom chord of any truss or joist.
- C. Fasteners depending on soft lead for holding power or requiring powder actuation will not be accepted.
- D. Support apparatus and material under all conditions of operation, variations in installed and operating weight of equipment and piping, to prevent excess stress, and allow for proper expansion and contraction.
- E. Protect insulation at all hanger points; see Related Work above.

1.07 SHOP DRAWINGS

- A. Schedule of all hanger and support devices indicating attachment methods and type of device for each pipe size and type of service.

1.08 DESIGN CRITERIA

- A. Materials and application of pipe hangers and supports shall be in accordance with MSS Standard Practice SP-58 and SP-69 unless noted otherwise.
- B. Allow sufficient space between adjacent pipes for insulation, valve operation and routine maintenance.
- C. Concrete anchors shall be applied to the side of concrete beams, joists or tee stems. Do not anchor from the bottom of these structural elements.
- D. Concrete anchors shall be applied to the side of precast concrete tee stems at 2" below the bottom of the flange.
- E. Concrete expansion anchors shall be applied to the centerline of joist 5" and greater in width for tile and joist structure. The tile shall be removed and concrete anchors applied to the side of the joist from 4" wide joists. Tile to be patched by General Contractor. No anchor shall be installed into the filler tile.

PART 2 PRODUCTS

2.01 PIPE HANGERS, SUPPORTS, AND ANCHORS

A. Uninsulated Pipe – Hanger

2" and Smaller: Malleable iron, adjustable swivel, B-Line B3171

3" and Larger: Carbon steel, adjustable swivel, B-Line B3100

B. Insulated Pipe – Hanger

2" and Smaller: Carbon steel, adjustable swivel ring with metal saddles, B-Line B3170NF

2-1/2" and Larger: Carbon steel, adjustable swivel with metal saddles B-Line B3100

All insulated piping systems hangers shall fit to (O.D.) outside diameter of the pipe insulation.

C. Uninsulated Copper – Hanger

Up to 4": Carbon steel, vertical adjustable clevis, copper colored finish with plastic coating, B-Line B3104CTC

D. Insulated Copper – Hanger

Same as insulated pipe specified above at Paragraph B.

E. Insulated Copper Pipe Supports

1. All supports, fasteners, clamps, etc. directly connected to copper piping shall be copper plated or polyvinylchloride coated. Where steel channels are used, provide isolation collar between supports/clamps/fasteners and copper piping.
2. Isolation collars shall be installed on copper tubing prior to being clamped in place. Isolation collar shall be #B3195CT-Size-ZNPLT complete with felt isolator and zinc-plated containment sleeve. Note: After collar is installed, split insulation to fit over clamp and pipe with no gaps in the insulation and jacketing material and glue all seams in elastomeric pipe insulation.

F. Hanger Rod

3/8" to 1-1/4": Carbon steel, threaded both ends, threaded one end, or continuous threaded, with adjusting and locking nuts, and electro-galvanized finish, B-Line B-3205

Total weight of equipment, including valves, fittings, pipe, pipe content, and insulation, is not to exceed the limits indicated.

Maximum Load (lbs) (650-degree F Maximum Temp)	Rod Diameter (inches)
610	3/8
1130	1/2
1810	5/8

G. Insulated Pipe Shields

3" and Smaller: 12" long - 18 gauge galvanized carbon steel - 180° arc., B-Line B3153-1X to 11X

H. Vertical Support

3/4" and Larger: (non-insulated pipe) - carbon steel standard black finished, B-Line B3373
1/2" to 4": (non-insulated copper) - carbon steel copper colored finish with plastic coating, B-Line B3373-CTC

I. Spring Hangers

1. All Piping: Locate at top and bottom of all risers where vertical thermal movement is expected. Size for load tolerance as recommended by manufacturer for pipe served, B-Line B3262.

J. Parallel Piping Runs

1. Parallel piping runs may be supported on approved size trapeze type hanger systems of channels and rods.
2. Trapeze hangers shall be constructed from 12 gauge roll formed ASTM A570 Gr. 33 structural steel channel, 1-5/8" x 1-5/8" minimum, B-Line B22 strut or stronger as required.
3. Mount pipes to trapeze with two-piece pipe straps sized for outside diameter of pipe, B-Line B2000 Series.

K. Concrete Inserts

Up to 3" Pipe: Carbon steel body and nut, B-Line B2500 with N2500 nut
3" to 8" Pipe: Malleable iron body and nut, B-Line B3014 with B3014N nut

- L. Carbon steel stud type expansion anchors, vibration resistant, as manufactured by Rawl Plug Company Inc., Hilti Fastening Systems, or approved equal, Rawl or Redtread, may be used for piping support in cast-in-place concrete and/or precast concrete as specified in Part 3 - Execution. Zinc plating shall conform to ASTM B633. Expansion anchors size and load capacities shall conform with manufacturer's recommendations. Use drill bits of the same manufacturer as the anchor.

2.02 PIPE HANGER RODS

A. Steel Hanger Rods

1. Threaded both ends, threaded one end, or continuous threaded, complete with adjusting and lock nuts. B-Line B-3205, Grinnell 140/146.
2. Size rods for individual hangers and trapeze support as indicated in the following schedule.
3. Total weight of equipment, including valves, fittings, pipe, pipe content, and insulation, are not to exceed the limits indicated.

Maximum Load (Lbs.) (650°F Maximum Temp.)	Rod Diameter (inches)
610	3/8
1130	1/2
1810	5/8
2710	3/4

2.03 BEAM CLAMPS

- A. MSS SP-69 Types 19 and 23 malleable black iron clamp for attachment to beam flange to 0.62" thick with a retaining ring and threaded rod of 3/8", 1/2", and 5/8" diameter. Furnish with a hardened steel cup point set screw. B-Line B3036L/B3034, Grinnell 86/92.
- B. MSS SP-69 Type 28 or Type 29 forged steel jaw type clamp with a tie rod to lock clamp in place, suitable for rod sizes to 1-1/2" diameter. B-Line B3054, Grinnell 228.

2.04 CONCRETE INSERTS

- A. Refer to Section 05 05 20 - Fasteners and Metal Fastenings.
- B. Drilled Fasteners
 1. Carbon steel expansion anchors, vibration resistant, with ASTM B633 zinc plating. Use drill bit of same manufacturer as anchor. Hilti, Rawl, Redhead.

2.05 ANCHORS

- A. Use welding steel shapes, plates, and bars to secure piping to the structure.

ACCEPTABLE MANUFACTURERS

- A. Hilti Inc.; Tulsa, Oklahoma
- B. DeWalt; Brewster, New York
- C. Simpson Strong-Tie Anchor Systems, Inc.; Pleasanton, California
- D. Red Head; Wood Dale, Illinois
- E. Unistrut; Wayne, Michigan
- F. Eaton (B-Line Division); Highland, Illinois

MATERIALS

A. Mechanical Anchors

1. Vertical Installation Overhead - Anchors must be certified by ICC (International Code Council) for use in "cracked or un-cracked concrete".
 - a. HILTI KWIK BOLT-TZ2 EXPANSION ANCHOR PER ICC ESR-4561
 - b. "HILTI HSL-4 Heavy Duty Expansion Anchor" PER (ICC-ES ESR-4386
 - c. "STRONG-BOLT 2" by Simpson Strong-Tie (ICC-ES ESR-3037)
 - d. "TITEN HD" by Simpson Strong-Tie (ICC-ES ESR-2713)
 - e. "POWER-STUD + SD2" by DeWalt (ICC-ES ESR-2502)
 - f. "POWER-BOLT+" by DeWalt (ICC-ES ESR-3260)
 - g. "SCREW-BOLT+" by DeWalt (ICC-ES ESR-3889)
 - h. "SNAKE +" (internally threaded screw anchor) by DeWalt (ICC-ES ESR-2272)
 - i. "TITEN HD THREADED ROD HANGER" (internally threaded screw anchor) by Simpson Strong-Tie (ICC-ES ESR-2713)
 - j. "KWIK HUS-EZ SCREW ANCHOR" by Hilti (ICC-ES ESR-3027)
 - k. "KH-EZ I SCREW ANCHOR" (internally threaded screw anchor) by Hilti (ICC-ES ESR-3027)
 - l. "HANGER-MATE+ ROD HANGER SCREW ANCHOR" by DeWalt (ICC-ES ESR-3889)

2. Horizontal or Non-Overhead Vertical Installation
 - a. HILTI KWIK BOLT-1 EXPANSION ANCHOR PER IAPMO ER-67
 - b. "POWER STUD+SD1" by DeWalt (ICC-ES ESR-2818)
 - c. "WEDGE-ALL" by Simpson Strong-Tie (ICC-ES ESR-1396)
 - d. "TRUBOLT" by Red Head (ICC-ES ESR-2251)
 - e. All anchors listed for vertical installation in Sub-paragraph 1.
- B. Screw Anchors
 1. "KWIK HUS SCREW ANCHOR" by Hilti
 2. "SCREW-BOLT" by DeWalt (ICC-ES ESR-3889)
 3. "TITEN HD" by Simpson Strong-Tie (ICC-ES ESR-2713)
 4. "LDT (Large Diameter Tapcon)" by Red Head.
- C. Drop-In Anchors
 1. "HILTI HDI-TZ Per ICC ESR 4236
 2. "STEEL DROPIN" by DeWalt
 3. "DROP-IN (DIAB)" By Simpson Strong-Tie
 4. "MULTI-SET II" by Red Head
- D. Drop-In Anchors for Hollowcore Precast Plank
 1. "HILTI HDI-P TZ" Per ICC ESR 4236
 2. "MINI DROPIN" by DeWalt
 3. "HOLLOW-SET DROPIN" by DeWalt
 4. "MINI-UNDERCUT+" by DeWalt (ICC-ES ESR-3912)
 5. "HOLLOW DROP-IN (HDIA)" by Simpson Strong-Tie
 6. "RX DROP-IN ANCHOR" by Red Head
- E. Epoxy Anchors
 1. "HIT-HY 100 ADHESIVE ANCHOR" by Hilti (ICC-ES ESR-3574)
 2. "PURE220+" by DeWalt (ICC-ES ESR-5144)
 3. "ET-HP" by Simpson Strong-Tie (ICC-ES ESR-3372)
 4. "REDHEAD C6 +" by Red Head (ICC-ES ESR-4046) and ESR-4109

F. Concrete Screws

1. "KWIK-CON II+" by Hilti
2. HILTI KWIK HUS-EZ (KH-EZ), KH-EZ CRC, KH-EZ SS316, KH-EZ C, KH-EZ E, KH-EZ I, AND KH-EZ P SCREW ANCHOR SAFE SET SYSTEM WITH HOLLOW DRILL BIT AND VACUUM PER ICC-ES ESR-3027 (For pre-drill requirements or reusable temporary fastening.)
3. "ULTRACON+" by DeWalt (ICC-ES ESR-3068)
4. "TITEN / TITEN2" by Simpson Strong-Tie
5. "TAPCON" by Red Head (ICC-ES ESR-2202)

G. Toggle Anchors

1. "TOGGLE BOLT" by DeWalt
2. "HTB TOGGLE BOLT" by Hilti

H. Concrete Inserts

1. "P3254 through P3270" by Unistrut
2. "B52-I Series" by Eaton B-Line

2.06 CORROSIVE ATMOSPHERE COATINGS

- A. Factory coat supports and anchors used in corrosive atmospheres with hot-dip galvanizing after fabrication, ASTM A123, 1.5 ounces/square foot of surface each side. Mechanical galvanize threaded products, ASTM B695 Class 50, 2.0 mil coating. Field cuts and damaged finishes to be field covered with zinc-rich paint of comparable thickness to factory coating.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Size, apply and install supports and anchors in compliance with manufacturer's recommendations.
- B. Install supports to provide for free expansion of the piping system. Support all piping from the structure using concrete inserts, beam clamps, ceiling plates, wall brackets, or floor stands. Fasten ceiling plates and wall brackets securely to the structure and test to demonstrate the adequacy of the fastening.
- C. Coordinate hanger and support installation to properly group piping of all trades.

- D. Where piping can be conveniently grouped to allow the use of trapeze type supports, use standard structural shapes or continuous insert channels for the supporting steel. Where continuous insert channels are used, pipe supporting devices made specifically for use with the channels may be substituted for the specified supporting devices provided that similar types are used and all data is submitted for prior approval.
- E. Size and install hangers and supports, except for riser clamps, for installation on the exterior of piping insulation. Where a vapor barrier is not required, hangers may be installed either on the exterior of pipe insulation or directly on piping.
- F. Perform welding in accordance with standards of the American Welding Society.

3.02 HANGER AND SUPPORT SPACING

- A. Install hangers to provide minimum 1/2" space between finished covering and adjacent work.
- B. Use hangers with 1-1/2" minimum vertical adjustment.
- C. Where several pipes can be installed in parallel and at the same elevation, provide multiple or trapeze hangers.
- D. Support riser piping independently of connected horizontal piping.
- E. Adjust hangers to obtain the slope specified in the piping section of these specifications.
- F. Space hangers for pipe as follows:

<u>Pipe Material</u>	<u>Pipe Size</u>	<u>Max. Horiz. Spacing</u>	<u>Max. Vert. Spacing</u>
Copper	1/2" through 3/4"	5'-0"	10'-0"
Copper	1" through 1-1/4"	6'-0"	10'-0"
Copper	1-1/2" through 2-1/2"	8'-0"	10'-0"
Plastic	Drain and Vent	4'-0"	10'-0"

- G. Hanger, supports, and sheet metal shields for insulated piping, where directed to be used, shall not injure or pierce insulation.
- H. Support piping from concrete structure using inserts of malleable iron as scheduled under Part 2 Products. Where inserts are omitted, use two expansion shields per hanger of size and type for load approved to fasten angle supports for handling piping as noted under Part 2 Products. Ram set support may be used for light loads, 2" and smaller pipe, with written approval by Architect.

- I. Support piping from steel joist structure using the following methods:
 - 1. Piping 1" and smaller may be hung from the bottom chord of bar joists with C-clamps.
 - 2. All piping 1-1/4" and over hung from bar joists shall be hung from the top chord of the joists as follows:
 - a. Piping 1-1/4" through 3" may be hung individually from the top chord of joists with top beam clamps.
 - b. Piping 1-1/4" through 3" may also be hung from 2" x 2" x 3/16" angles for joist spacing up through 2'-0" o.c., or 3" x 3" x 1/4" angles for joist spacing 2'-1" through 4'-6" o.c. Cope angles so angle rests on top of joist with leg down or, in the case of composite, joist angle shall be welded to bottom of top angles. Length of angles shall be joist spacing plus 3".
 - 3. Where several pipes occur adjacent to one another, pipes may be racked on a trapeze, providing none of the pipes are larger than 3". Construct trapeze of 2" x 2" x 3/16" angles for spans of 2'-0" or less, and 3" x 3" x 1/4" angles for spans of 2'-1" through 4'-6". Suspend angle from 1/2" diameter rods. Support rods off top chords of joists with angles as specified above.
- J. Piping support for precast concrete structure shall be installed in field. Use expansion anchors, of size and type for loads, approved to fasten angle supports for hanging piping as noted under Part 2 Products. In no case shall an expansion anchor be installed in the lower 6" of precast joist. Support angles shall be of similar sizes and lengths specified for steel joist construction.
- K. Piping support for precast concrete plank structure shall be as follows:
 - 1. Single pipes of size up to 2" may be supported with toggle bolt hangers installed into void of planks.
 - 2. Where piping runs are parallel with plank system, furnish steel support angles between a minimum of two (2) tee-bar hangers.
 - 3. Support angles shall be similar of sizes and lengths specified for steel joist construction.

3.03 BEAM CLAMPS

- A. Support vertical piping with clamps secured to the piping and resting on the building structure or secured to the building structure below at each floor.

3.04 ANCHORS

- A. Install where indicated on the drawings and details. Where not specifically indicated, install anchors at ends of principal pipe runs and at intermediate points in pipe runs between expansion loops. Make provisions for preset of anchors as required to accommodate both expansion and contraction of piping.

SECTION 22 07 00

PLUMBING INSULATION

PART 1 GENERAL

1.01 SCOPE

- A. This section includes insulation specifications for plumbing piping. Included are the following topics:

- PART 1 - GENERAL

- Scope

- Related Work

- Reference

- Reference Standards

- Quality Assurance

- Description

- Definitions

- Shop Drawings

- PART 2 - PRODUCTS

- Materials

- Insulation and Jackets

- Insulation Inserts and Pipe Shields

- Accessories

- PART 3 - EXECUTION

- Installation

- Piping, Valve and Fitting Insulation

1.02 RELATED WORK

- A. Section 22 05 00 - Common Work Results for Plumbing
- B. Section 22 11 00 - Facility Water Distribution
- C. Section 22 13 00 - Facility Sanitary Sewerage
- D. Section 22 05 29 - Hangers and Supports for Plumbing Piping and Equipment

1.03 REFERENCE

- A. Applicable provisions of Division 01 govern work under this section.

1.04 REFERENCE STANDARDS

ASTM B209	Aluminum and Aluminum Alloy Sheet and Plate
ASTM C165	Test Method for Compressive Properties of Thermal Insulations
ASTM C177	Heat Flux and Thermal Transmission Properties
ASTM C195	Mineral Fiber Thermal Insulation Cement
ASTM C240	Cellular Glass Insulation Block
ASTM C302	Density of Preformed Pipe Insulation
ASTM C303	Density of Preformed Block Insulation
ASTM C449	Mineral Fiber Hydraulic Setting Thermal Insulation Cement
ASTM C518	Heat Flux and Thermal Transmission Properties
ASTM C533	Calcium Silicate Block and Pipe Thermal Insulation
ASTM C534	Preformed Flexible Elastomeric Thermal Insulation
ASTM C547	Mineral Fiber Preformed Pipe Insulation
ASTM C552	Cellular Glass Block and Pipe Thermal Insulation
ASTM C553	Mineral Fiber Blanket and Felt Insulation
ASTM C578	Preformed, Block Type Cellular Polystyrene Thermal Insulation
ASTM C591	Preformed Rigid Cellular Polyurethane Thermal Insulation
ASTM C610	Expanded Perlite Block and Thermal Pipe Insulation
ASTM C612	Mineral Fiber Block and Board Thermal Insulation
ASTM C921	Properties of Jacketing Materials for Thermal Insulation
ASTM C1136	Flexible Low Permeance Vapor Retarders for Thermal Insulation
ASTM E84	Surface Burning Characteristics of Building Materials
MICA	National Commercial & Industrial Insulation Standards
NFPA 225	Surface Burning Characteristics of Building Materials
UL 723	Surface Burning Characteristics of Building Materials

1.05 QUALITY ASSURANCE

- A. Substitution of Materials: Refer to Section GC - General Conditions, Equals and Substitutions.
- B. Label all insulating products delivered to the construction site with the manufacturer's name and description of materials.

1.06 DESCRIPTION

- A. Furnish and install all insulating materials and accessories as specified or as required for a complete installation. The following types of insulation are specified in this section:
 - Pipe Insulation
- B. Install all insulation in accordance with the latest edition of MICA (Midwest Insulation Contractors Association) Standard and manufacturer's installation instructions. Exceptions to these standards will only be accepted where specifically modified in these specifications or where prior written approval has been obtained from the Architect/Engineer.

1.07 DEFINITIONS

- A. Concealed: Shafts, furred spaces, space above finished ceilings, utility tunnels and crawl spaces. All other areas, including walk-through tunnels, shall be considered as exposed.
- B. Insulate the following piping systems with glass fiber pipe insulation: All distribution mains, branch distribution mains, to fixture groups, hot water recirculation mains shall include glass fiber pipe insulation.
- C. Insulate the following piping systems with elastomeric thermal pipe insulation: Apply elastomeric thermal pipe insulation on fixture branch distribution lines from mains and branches concealed in construction pipe chases with short risers, distribution branches to fixtures, exposed piping in base cabinet.

1.08 SHOP DRAWINGS

- A. Refer to Division 01, General Conditions, Submittals.
- B. Submit a schedule of all insulating materials to be used on the project, including adhesives, fastening methods, fitting materials along with material safety data sheets and intended use of each material. Include manufacturer's technical data sheets indicating density, thermal characteristics, jacket type, and manufacturer's installation instructions.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Materials or accessories containing hazardous materials will not be accepted.
- B. Use composite insulation systems (insulation, jackets, sealants, mastics, and adhesives) that have a flame spread rating of 25 or less and smoke developed rating of 50 or less, with the following exceptions:
 - 1. Insulation which is not located in an air plenum may have a flame spread rating not over 25 and a smoke developed rating no higher than 150.

2.02 INSULATION AND JACKETS

- A. Manufacturers: Armacell, Certainteed, Manson, Knauf Earthwool With Ecosse, Owens-Corning, Johns Mansville, or approved equal.
- B. Insulating materials shall be fire retardant, moisture and mildew resistant, and vermin-proof. Insulation shall be suitable to receive jackets, adhesives and coatings as indicated.

C. Rigid Fiberglass Insulation:

1. Minimum nominal density of 3 lbs. per cu. ft., and thermal conductivity of not more than 0.23 at 75°F, minimum compressive strength of 25 PSF at 10% deformation, rated for service to 450°F.
2. White kraft reinforced foil vapor barrier all service jacket, factory applied to insulation with a self-sealing pressure sensitive adhesive lap, maximum permeance of 0.02 perms and minimum beach puncture resistance of 50 units.

D. Semi-Rigid Fiberglass Insulation:

1. Minimum nominal density of 3 lbs. per cu. ft., thermal conductivity of not more than 0.28 at 75°F, minimum compressive strength of 125 PSF at 10% deformation, rated for service to 450°F. Insulation fibers perpendicular to jacket and scored for wrapping cylindrical surfaces.
2. White kraft reinforced foil vapor barrier all service jacket, factory applied to insulation with a maximum permeance of 0.02 perms and minimum beach puncture resistance of 50 units.

E. Calcium Silicate Insulation:

1. Rigid hydrous calcium silicate, ASTM C533, Type I, minimum dry density of 12.5 lbs. per cu. ft., thermal conductivity of not more than 0.44 at 300 degrees F, maximum water absorption of 90% by volume, minimum compressive strength 140 psi at 5% deformation, rated for service range of 0°F to 1,200°F. Material to be visually coded or marked to indicate it is hazardous material-free.

F. Elastomeric Insulation:

1. Flexible closed cell, minimum nominal density of 5.5 lbs. per cu. ft., thermal conductivity of not more than 0.27 at 75°F, minimum compressive strength of 4.5 psi at 25% deformation, maximum water vapor transmission of 0.17 perm inch, maximum water absorption of 6% by weight, rated for service range of -20°F to 220°F on piping and 180°F where adhered to equipment. Manufacturer: Armacell Armaflex or equal.

G. Fireproofing Insulation:

1. Mineral fiber with nominal density of 8 lbs. per cu. ft., flame spread index of 15, fuel contribution index of 0, and smoke developed index of 0, thermal conductivity of not more than 0.23 at 75°F.
2. Jacket material shall be the same as jacket for adjacent insulation.

H. PVC Fitting Covers and Jackets:

1. White PVC film, gloss finish one side, semi-gloss other side, FS LP-535D, Composition A, Type II, Grade GU. Ultraviolet inhibited indoor/outdoor grade to be used where exposed to high humidity, ultraviolet radiation, in kitchens or food processing areas or installed outdoors. Jacket thickness to be 0.02" (20 mil).

2.03 INSULATION INSERTS AND PIPE SHIELDS

- A. Manufacturers: B-Line, Pipe Shields, Value Engineered Products.
- B. Construct inserts with calcium silicate, minimum 140 psi compressive strength. Piping 12" and larger, supplement with high density 600 psi structural calcium silicate insert. Provide galvanized steel shield. Insert and shield to be minimum 180 degree coverage on bottom of supported piping and full 360 degree coverage on clamped piping. On roller mounted piping and piping designed to slide on support, provide additional load distribution steel plate.
- C. Where Contractor proposes shop/site fabricated inserts and shields, submit schedule of materials, thicknesses, gauges and lengths for each pipe size to demonstrate equivalency to pre-engineered pre-manufactured product described above. On low temperature systems, extruded polystyrene may be substituted for calcium silicate provided insert and shield length and gauge are increased to compensate for lower insulation compressive strength.
- D. Precompressed 20# density molded fiberglass blocks, Hamfab or equal, of same thickness as adjacent insulation may be substituted for calcium silicate inserts with one 1" x 6" block for piping through 2-1/2" and three 1" x 6" blocks for piping through 4". Submit shield schedule to demonstrate equivalency to pre-engineered/pre-manufactured product described above.
- E. Wood blocks will not be accepted.

2.04 ACCESSORIES

- A. All products shall be compatible with surfaces and materials on which they are applied and be suitable for use at operating temperatures of the systems to which they are applied.
- B. Adhesives, sealants, and protective finishes shall be as recommended by insulation manufacturer for applications specified.
- C. Insulation bands to be 3/4" wide, constructed of aluminum or stainless steel. Minimum thickness to be 0.015" for aluminum and 0.010" for stainless steel.
- D. Tack fasteners to be stainless steel ring grooved shank tacks.
- E. Staples to be clinch style.
- F. Insulating cement to be ANSI/ASTM C195, hydraulic setting mineral wool.
- G. Finishing cement to be ASTM C449.
- H. Fibrous glass or canvas fabric reinforcing shall have a minimum untreated weight of 6 oz./sq. yd.

- I. Bedding compounds to be non-shrinking and permanently flexible.
- J. Vapor barrier coatings to be non-flammable, fire resistant, polymeric resin.
- K. Fungicidal water base coating (Foster 40-20 or equal) to be compatible with vapor barrier coating.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install insulation, jackets, and accessories in accordance with manufacturer's instructions and under ambient temperatures and conditions recommended by manufacturer. Surfaces to be insulated must be clean and dry.
- B. Do not insulate systems or equipment which are specified to be pressure tested or inspected, until testing, inspection and any necessary repairs have been successfully completed.
- C. Install insulation with smooth and even surfaces. Poorly fitted joints or use of filler in voids will not be accepted. Cover and seal exposed fiberglass insulation when insulation is terminated; no raw fiberglass insulation is allowed. Provide neat and coated terminations at all nameplates, uninsulated fittings, or at other locations where insulation terminates. Install with longitudinal joints facing wall or ceiling.
- D. Install fabric reinforcing without wrinkles. Overlap seams a minimum of 2".
- E. Use full-length material (as delivered from manufacturer) wherever possible. Scrap piecing of insulation or pieces cut undersize and stretched to fit will not be accepted.
- F. Insulation shall be continuous through sleeves and openings. Vapor barriers shall be maintained continuous through all penetrations.
- G. At junction between glass fiber and elastomeric insulation, seal the end of the glass fiber with manufacturer recommended sealing product and join the elastomeric insulation to the sealed glass fiber with adhesive.
- H. Provide a complete vapor barrier for insulation on the following systems:
 - Cold water (potable and non-potable)

3.02 PIPING, VALVE, AND FITTING INSULATION

A. General:

1. Install insulation with butt joints and longitudinal seams closed tightly. Provide minimum 2" lap on jacket seams and 2" tape on butt joints, firmly cemented with lap adhesive. Additionally secure with staples along seams and butt joints. Coat staples with vapor barrier mastic on systems requiring vapor barrier.
2. Water supply piping insulation shall be continuous throughout the building and installed adjacent to and within building walls to a point directly behind the fixture that is being supplied.
3. Install insulation continuous through pipe hangers and supports with hangers and supports on the exterior of insulation. Where a vapor barrier is not required, hangers and supports may be attached directly to piping with insulation completely covering hanger or support and jacket sealed at support rod penetration. Where riser clamps are required to be attached directly to piping requiring vapor barrier, extend insulation and vapor barrier jacketing/coating around riser clamp.

B. Insulation Inserts and Pipe Shields:

1. Provide insulation inserts and pipe shields at all hanger and support locations. Inserts may be omitted on 3/4" and smaller copper piping provided 12" long 22 gauge pipe shields are used.

C. Fittings and Valves:

1. Fittings, valves, unions, flanges, couplings and specialties shall be insulated with factory molded or built-up insulation of the same thickness as adjoining insulation. Cover insulation with fabric reinforcing and mastic or where temperatures do not exceed 150 degrees, PVC fitting covers. Secure PVC fitting covers with tack fasteners and 1-1/2" band of mastic over ends, throat, seams or penetrations. On systems requiring vapor barrier, use vapor barrier mastic.

D. Elastomeric:

1. Where practical, slip insulation on piping during pipe installation when pipe ends are open. Miter cut fittings allowing sufficient length to prevent stretching. Completely seal seams and joints for vapor tight installation. For elastomeric insulation, apply full bed of adhesive to both surfaces. Taping of joints will not be permitted.
2. Elastomeric to be installed continuous. Horizontal and vertical pipe clamps to be installed over outside of insulation with felt isolator.

E. Protective Jackets:

1. Provide a protective PVC jacket for ALL insulated piping system which is in exposed spaces from finished floor to finished ceiling. Provide PVC jacket on ALL horizontal piping below the ceiling/structure in occupied areas. Lap seams a minimum of 2".
2. Lap seams and joints a minimum of 2" and continuously seal with welding solvent recommended by jacket manufacturer. Lap slip joint ends 4" without fasteners where required to absorb expansion and contraction. For sections where vapor barrier is not required and jacket requires routine removal, tack fasteners may be used.

F. Pipe Insulation Schedule:

1. Provide insulation on new and existing remodeled piping as indicated in the following schedule:

Service	Insulation Types	Insulation Thickness by Pipe Size		
		1" and smaller	1-1/4" to 2"	2-1/2" to 4"
Hot Water Supply	Rigid Fiberglass **	1"	1"	1.5"
Hot Water Circulating	Rigid Fiberglass **	1"	1"	1"
Cold Water	Rigid Fiberglass **	1"	1"	1"
Tempered Water	Rigid Fiberglass **	1"	1"	1"
Water Piping in Base Cabinet (Hot, Cold, Tepid)	Elastomeric	0.5"	0.5"	0.5"

* = Elastomeric types are acceptable

** = Elastomeric (0.5") may be substituted for branch distribution lines concealed in construction.

2. The following piping and fittings are not to be insulated:
 - Chrome plated exposed supplies and stops (except where specifically noted).
 - Piping unions and flanges for systems not requiring a vapor barrier.

SECTION 22 11 00

FACILITY WATER DISTRIBUTION

PART 1 GENERAL

1.01 SCOPE

- A. This section contains specifications for plumbing pipe and pipe fittings for this project.

Included are the following topics:

PART 1 - GENERAL

- Scope
- Related Work
- Reference
- Reference Standards
- Shop Drawings
- Quality Assurance
- Delivery, Storage, and Handling
- Design Criteria
- Welder Qualifications

PART 2 - PRODUCTS

- Domestic Water
- Dielectric Unions and Flanges
- Unions and Flanges

PART 3 - EXECUTION

- General
- Preparation
- Erection
- Copper Pipe Joints
- Welded Pipe Joints
- Threaded Pipe Joints
- Domestic Water
- Testing, Adjusting and Balancing
- Dielectric Unions and Flanges
- Unions and Flanges
- Piping System Leak Tests

1.02 RELATED WORK

- A. Section 22 05 00 - Common Work Results for Plumbing
- B. Section 22 05 29 - Hangers and Supports for Plumbing Piping and Equipment
- C. Section 22 05 14 - Plumbing Specialties

1.03 REFERENCE

- A. Applicable provisions of Division 01 govern work under this section.

1.04 REFERENCE STANDARDS

ANSI B16.22	Wrought Copper and Wrought Copper Alloy Solder Joint Pressure Fittings
ANSI B16.29	Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings-DWV
ASTM A234	Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures
ASTM B32	Solder Metal
ASTM B88	Seamless Copper Water Tube
ASTM B280	Seamless Copper Tube for Air Conditioning and Refrigeration Field Service
ASTM B813	Liquid and Paste Fluxes for Soldering Applications of Copper and Copper Alloy Tube
AWS A5.8	Brazing Filler Metal
AWWA C651	Disinfecting Water Mains

1.05 SHOP DRAWINGS

- A. Schedule from the contractor indicating the ASTM, AWWA or CISPI specification number of the pipe being proposed along with its type and grade if known at the time of submittal, and sufficient information to indicate the type and rating of fittings for each service.
- B. Refer to 22 05 00, Submittals.
- C. Statement from manufacturer on his letterhead that pipe furnished meets the ASTM, AWWA, or CISPI specification contained in this section.

1.06 QUALITY ASSURANCE

- A. Order all copper pipe with each length marked with the name or trademark of the manufacturer and type of pipe; with each shipping unit marked with the purchase order number, metal or alloy designation, temper, size, and name of supplier.
- B. Any installed material not meeting the specification requirements must be replaced with material that meets these specifications without additional cost.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Promptly inspect shipments to ensure that the material is undamaged and complies with specifications.
- B. Cover pipe to prevent corrosion or deterioration while allowing sufficient ventilation to avoid condensation. Do not store materials directly on grade. Protect pipe, tube, and fitting ends so they are not damaged. Where end caps are provided or specified, take precautions so the caps remain in place. Protect fittings, flanges, and unions by storage inside or by durable, waterproof, above ground packaging.
- C. Offsite storage agreements will not relieve the Contractor from using proper storage techniques.
- D. Storage and protection methods must allow inspection to verify products.

1.08 DESIGN CRITERIA

- A. Use only new material, free of defects, rust and scale, and meeting the latest revision of ASTM, AWWA or CISPI specifications as listed in this specification.
- B. Construct all piping for the highest pressures and temperatures in the respective system.
- C. Where weld fittings or mechanical grooved fittings are used, use only long radius elbows having a centerline radius of 1.5 pipe diameters.
- D. Where ASTM B88, Type L H (drawn) temper copper tubing is specified, ASTM B88, Type K H (drawn) temper copper tubing may be substituted at Contractor's option.

1.09 WELDER QUALIFICATIONS

- A. Welding procedures, welders, and welding operators for all building service piping to be in accordance with certified welding procedures of the National Certified Pipe Welding Bureau and Section 927.5 of ASME B31.9 Building Services Piping or AWS 10.9 Qualification of Welding Procedures and Welders for Piping and Tubing. Before any metallic welding is performed, Contractor to submit his Standard Welding Procedure Specification together with the Procedure Qualification Record as required by Section 927.6 of ASME B31.9 Building Services Piping.
- B. The Architect or Engineer reserves the right to test the work of any welder employed on the project. If the work of the welder is found to be unsatisfactory, the welder shall be prevented from doing further welding on the project and all defective welds replaced.

PART 2 PRODUCTS

2.01 DOMESTIC WATER

- A. Above Ground:
 - 1. Type L copper water tube, H (drawn) temper, ASTM B88; wrought copper pressure fittings, ANSI B16.22; lead-free (<0.2%) solder, ASTM B32; flux, ASTM B813; copper phosphorous brazing alloy, AWS A5.8 BCuP. Copper mechanical grooved fittings and couplings on roll grooved pipe may be used in lieu of soldered fittings. Note: Pulled tee, pro-press, or hole cut connection(s) are not allowed.
 - 2. Copper Press Fittings:
 - a. Manufacturers: Viega ProPress, NIBCO Press System, Mueller Industries, or approved equal.
 - b. The Contractor may use copper and copper alloy press fittings conforming to the material requirements of ASME B16.18 or ASME B16.22 and performance criteria of IAPMO PS 117 for line sizes 1/2" through 2". Sealing elements for press fittings for hot and cold water applicators shall be factory installed EPDM.

- c. The following services may use copper press fitting connections within the building in mechanical spaces and above accessible ceilings. Mechanical chases are not considered accessible.
 - Hot water
 - Cold water
 - Hot water return
- d. Mechanical press fitting connections shall not be used in walls or mechanical chases.
- e. Fittings and couplings must be suitable for the temperature and pressure involved. In no case is the final system to have a pressure rating of less than 125 psig at the design temperature of the fluid.
- f. All ball valve(s) shall be soldered connection 600 psi. See Section 22 05 23 – General Duty Valves for Plumbing Piping. Pro-press valves will not be allowed in system.
- g. Copper press fittings to be warrantied for fifty (50) years from installation. Include warranty letter with shop drawing submittal.

2.02 DIELECTRIC UNIONS AND FLANGES

- A. Watts Regulator Company, Lochinvar, Wilkins or EPCO Sales, Inc., dielectric unions 2" and smaller; dielectric flanges 2" and larger; with iron female pipe thread to copper solder joint or brass female pipe thread end connections, non-asbestos gaskets, having a pressure rating of not less than 175 psig at 180 degrees.

2.03 UNIONS AND FLANGES

- A. Unions, flanges and gasket materials to have a pressure rating of not less than 150 psig at 180 degrees. Gasket material for flanges and flanged fittings shall be teflon type. Treated paper gaskets are not acceptable.
- B. 2" and Smaller Steel: ASTM A197/ANSI B16.3 malleable iron unions with brass seats. Use black malleable iron on black steel piping and galvanized malleable iron on galvanized steel piping.
- C. 2" and Smaller Copper: ANSI B16.18 cast bronze union coupling or ANSI B15.24 Class 150 cast bronze flanges.
- D. 2-1/2" and Larger Steel: ASTM A181 or A105, Grade 1 hot forged steel flanges of threaded, welding neck, or slip-on pattern on black steel. Use raised face flanges ANSI B16.5 for mating with other raised face flanges or equipment with flat ring or full face gaskets. Use ANSI B16.1 flat face flanges with full face teflon gaskets for mating with other flat face flanges on equipment. Gaskets shall be teflon type.
- E. 2-1/2" and Larger Copper: ANSI B15.24 Class 150 cast bronze flanges with full face teflon gaskets.

PART 3 EXECUTION

3.01 GENERAL

- A. Install pipe and fittings in accordance with reference standards, manufacturer's recommendations and recognized industry practices.

3.02 PREPARATION

- A. Cut pipe ends square. Ream ends of piping to remove burrs. Clean scale and dirt from interior and exterior of each section of pipe and fitting prior to assembly.

3.03 ERECTION

- A. Install all piping parallel to building walls and ceilings and at heights which do not obstruct any portion of a window, doorway, stairway, or passageway. Where interferences develop in the field, offset or reroute piping as required to clear such interferences. Coordinate locations of plumbing piping with piping, ductwork, conduit and equipment of other trades to allow sufficient clearances. In all cases, consult drawings for exact location of pipe spaces, ceiling heights, door and window openings, or other architectural details before installing piping.
- B. Where copper piping is embedded in masonry or concrete, provide protective sleeve covering of elastomeric pipe insulation.
- C. Maintain piping in clean condition internally during construction.
- D. Provide clearance for installation of insulation, access to valves and piping specialties.
- E. Provide anchors, expansion joints, swing joints and/or expansion loops so that piping may expand and contract without damage to itself, equipment, or building.
- F. Do not route piping through transformer vaults or above transformers, panelboards, or switchboards, including the required service space for this equipment, unless the piping is serving this equipment
- G. Install all valves and piping specialties, including items furnished by others, as specified and/or detailed. Provide access to valves and specialties for maintenance. Make connections to all equipment, fixtures and systems installed by others where same requires the piping services indicated in this section.

3.04 COPPER PIPE JOINTS

- A. Remove all slivers and burrs remaining from the cutting operation by reaming and filing both pipe surfaces. Clean fitting and tube with metal brush, emery cloth or sandpaper. Remove residue from the cleaning operation, apply flux and assemble joint to socket stop. Apply flame to fitting until solder melts when placed at joint. Remove flame and feed solder into joint until full penetration of cup and ring of solder appears. Wipe excess solder and flux from joint.

3.05 WELDED PIPE JOINTS

- A. Make all welded joints by fusion welding in accordance with ASME Codes, ANSI B31, and State Codes where applicable. "Weldolets" and "Threadolets" may be used for branch takeoffs up to one-half (1/2) the diameter of the main.

3.06 THREADED PIPE JOINTS

- A. Use a thread lubricant or teflon tape when making joints; no hard setting pipe thread cement or caulking will be allowed.

3.07 DOMESTIC WATER

- A. Maintain piping system in clean condition during installation. Remove dirt and debris from assembly of piping as work progresses. Cap open pipe ends where left unattended or subject to contamination.
- B. Install interior water piping with drain valves where indicated and at low points of system to allow complete drainage. Install shutoff valves where indicated and at the base of risers to allow isolation of portions of system for repair. Do not install water piping within exterior walls. Install automatic air vents on top of all risers and high points of horizontal distribution systems.
- C. Prior to use, isolate and fill system with potable water. Allow to stand 24 hours. Flush each outlet proceeding from the service entrance to the furthest outlet for minimum of 1 minute and until water appears clear. Fill system with a solution of water and chlorine containing at least 50 parts per million of chlorine and allow to stand for 24 hours. Alternately, a solution containing at least 200 parts per million of chlorine may be used and allowed to stand for 3 hours. Flush system with potable water until chlorine concentration is no higher than source water level.
- D. Wait 24 hours after final flushing. Take samples of water for lab testing. The number and location of samples shall be representative of the system size and configuration and are subject to approval by Engineer. Test shall show the absence of coliform bacteria. If test fails, repeat disinfection and testing procedures until no coliform bacteria are detected. Submit test report indicating date and time of test along with test results.

3.08 TESTING, ADJUSTING AND BALANCING

- A. The work covered includes the providing of all labor, materials, tools, equipment, transportation, permits, certificates, and temporary protection necessary for or incidental to executing and completing the testing and balancing of the hot and recirculation water distribution systems as herein specified or as indicated on the drawings.
- B. The balancing work shall be done by the Plumbing Contractor.
- C. The work includes hot water distribution and recirculation system serving the piping system described or shown as the scope of the contract work. System initial rate of flow settings information has been designated at each new circuit setter balancing valve.
- D. A system inspection shall be conducted before implementing the water balance to ensure:
 - 1. System has been flushed and vented of air.
 - 2. All manual valves are open or in their normal operating position.
- E. All hot water recirculation loop return balance valves shall be adjusted to $\pm 5\%$ of the design flow. The shortest runs shall be set first, followed by the longest.
- F. This Trade shall certify in writing that all work has been completed and that building temperature hot water is available at each fixture within 30 seconds.

3.09 DIELECTRIC UNIONS AND FLANGES

- A. Install dielectric unions or flanges at each point where a copper-to-steel pipe connection is required in domestic water systems.

3.10 UNIONS AND FLANGES

- A. Install a union or flange at each connection to each piece of equipment and at other items which may require removal for maintenance, repair, or replacement. Where a valve is located at a piece of equipment, locate the flange or union connection on the equipment side of the valve. Concealed unions or flanges are not acceptable.

3.11 PIPING SYSTEM LEAK TESTS

- A. Isolate or remove components from system which are not rated for test pressure. Perform final testing for medical and lab gas with all system components in place. Test piping in sections or entire system as required by sequence of construction. Do not insulate or conceal pipe until it has been successfully tested.
- B. If required for the additional pressure load under test, provide temporary restraints at fittings or expansion joints. Backfill underground water mains prior to testing with the exception of thrust restrained valves which may be exposed to isolate potential leaks.

- C. For hydrostatic tests, use clean water and remove all air from the piping being tested by means of air vents or loosening of flanges/unions. Measure and record test pressure at the high point in the system.
- D. Inspect system for leaks. Where leaks occur, repair the area with new materials and repeat the test; caulking will not be acceptable.
- E. Entire test must be witnessed by the Owner. All pressure tests are to be documented on Berners-Schober Associates, Inc. forms to be provided to the Contractor.

<u>System</u>	<u>Test Medium</u>	<u>Initial Test</u>		<u>Final Test</u>	
		Pressure	Duration	Pressure	Duration
Above Ground Domestic Water	Water	N/A		100 psig	8 hr

PIPING SYSTEM TEST REPORT

Berners-Schober Associates, Inc.
310 Pine Street
Green Bay, WI 54301

Date Submitted: _____

Project Name: _____

Location: _____ **Commission No:** _____

Contractor: _____

☐ Plumbing ☐ Fire Sprinkler

Test Medium: ☐ Air ☐ Water ☐ Other _____

Test performed per specification section No. _____

Specified Test Duration _____ Hours Specified Test Pressure _____ PSIG

System Identification: _____

Describe Location: _____

Test Date: _____

Start Test Time: _____ Initial Pressure: _____ PSIG

Stop Test Time: _____ Final Pressure: _____ PSIG

Tested By: _____

Witnessed By: _____

Title: _____

Title: _____

Signed: _____

Signed: _____

Date: _____

Date: _____

Comments: _____

SECTION 22 13 00

FACILITY SANITARY SEWERAGE

PART 1 GENERAL

1.01 SCOPE

- A. This section contains specifications for plumbing pipe and pipe fittings for this project. Included are the following topics:

- PART 1 - GENERAL

- Scope

- Related Work

- Reference

- Reference Standards

- Shop Drawings

- Quality Assurance

- Delivery, Storage, and Handling

- Design Criteria

- PART 2 - PRODUCTS

- Sanitary Waste and Vent

- PART 3 - EXECUTION

- General

- Preparation

- Erection

- Threaded Pipe Joints

- Solvent Welded Pipe Joints

- Sanitary Waste and Vent

- Piping System Leak Tests

1.02 RELATED WORK

- A. Section 22 05 29 - Hangers and Supports for Plumbing Piping and Equipment
- B. Section 22 05 14 - Plumbing Specialties

1.03 REFERENCE

- A. Applicable provisions of Division 01 govern work under this section.

1.04 REFERENCE STANDARDS

ASTM D1785	Poly Vinyl Chloride (PVC) Plastic Pipe
ASTM D2241	Poly Vinyl Chloride (PVC) Pressure-Rated Pipe (SDR Series)
ASTM D2466	Poly Vinyl Chloride (PVC) Plastic Pipe Fittings, Schedule 40
ASTM D2564	Solvent Cements for Poly Vinyl Chloride (PVC) Plastic Pipe and Fittings
ASTM D2665	Poly Vinyl Chloride (PVC) Plastic Drain, Waste and Vent Pipe and Fittings
ASTM D2729	Poly Vinyl Chloride (PVC) Sewer Pipe and Fittings
ASTM D2855	Making Solvent Cemented Joints with Poly Vinyl Chloride (PVC) Pipe and Fittings
ASTM D3034	Type PSM Poly Vinyl Chloride (PVC) Sewer Pipe and Fittings
ASTM D3139	Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals
ASTM D3212	Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
ASTM D3222	Unmodified Poly Vinylidene Fluoride (PVDF) Molding Extrusion and Coating Materials
ASTM D3311	Drain, Waste and Vent (DWV) Plastic Fitting Patterns
AWS A5.8	Brazing Filler Metal

1.05 SHOP DRAWINGS

- A. Schedule from the Contractor indicating the ASTM or CISPI specification number of the pipe being proposed along with its type and grade if known at the time of submittal, and sufficient information to indicate the type and rating of fittings for each service.
- B. Statement from manufacturer on his letterhead that pipe furnished meets the ASTM or CISPI specification contained in this section.

1.06 QUALITY ASSURANCE

- A. Order all PVC pipe with each length marked with the name or trademark of the manufacturer and type of pipe; with each shipping unit marked with the purchase order number, temper, size, and name of supplier.
- B. Any installed material not meeting the specification requirements must be replaced with material that meets these specifications without additional cost to the Owner.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Promptly inspect shipments to ensure that the material is undamaged and complies with specifications.
- B. Cover pipe to prevent corrosion or deterioration while allowing sufficient ventilation to avoid condensation. Do not store materials directly on grade. Protect pipe, tube, and fitting ends so they are not damaged. Where end caps are provided or specified, take precautions so the caps remain in place. Protect fittings, flanges, and unions by storage inside or by durable, waterproof, above ground packaging.
- C. Offsite storage agreements will not relieve the Contractor from using proper storage techniques.
- D. Storage and protection methods must allow inspection to verify products.

1.08 DESIGN CRITERIA

- A. Use only new material, free of defects, rust and scale, and meeting the latest revision of ASTM or CISPI specifications as listed in this specification.
- B. Construct all piping for the highest pressures and temperatures in the respective system.
- C. Non-metallic piping will be acceptable only for the services indicated. It will not be acceptable in ventilation plenum spaces, including plenum ceilings.

PART 2 PRODUCTS

2.01 SANITARY WASTE AND VENT

- A. Interior Above Ground:
 - 1. PVC plastic pipe, Schedule 40, Class 12454-B (PVC 1120), ASTM D1785; PVC plastic drain, waste and vent pipe and fittings, ASTM D2665; socket fitting patterns, ASTM D3311; primer, ASTM F656; solvent cement, ASTM D2564.
- B. Interior Below Ground:
 - 1. PVC plastic pipe, Schedule 40, Class 12454-B (PVC 1120), ASTM D1785; PVC plastic drain, waste and vent pipe and fittings, ASTM D2665; socket fitting patterns, ASTM D3311; primer, ASTM F656; solvent cement, ASTM D2564.

PART 3 EXECUTION

3.01 GENERAL

- A. Install pipe and fittings in accordance with reference standards, manufacturer's recommendations, and recognized industry practices.

3.02 PREPARATION

- A. Cut pipe ends square. Ream ends of piping to remove burrs. Clean scale and dirt from interior and exterior of each section of pipe and fitting prior to assembly.

3.03 ERECTION

- A. Install all piping parallel to building walls and ceilings and at heights which do not obstruct any portion of a window, doorway, stairway, or passageway. Where interferences develop in the field, offset or reroute piping as required to clear such interferences. Coordinate locations of plumbing piping with piping, ductwork, conduit and equipment of other trades to allow sufficient clearances. In all cases, consult drawings for exact location of pipe spaces, ceiling heights, door and window openings, or other architectural details before installing piping.
- B. Maintain piping in clean condition internally during construction.
- C. Provide clearance for installation of insulation, access to valves and piping specialties.
- D. Provide anchors, expansion joints, swing joints, and/or expansion loops so that piping may expand and contract without damage to itself, equipment, or building.
- E. Do not route piping through transformer vaults or above transformers, panelboards, or switchboards, including the required service space for this equipment, unless the piping is serving this equipment.
- F. Install all valves and piping specialties, including items furnished by others, as specified and/or detailed. Provide access to valves and specialties for maintenance. Make connections to all equipment, fixtures, and systems installed by others where same requires the piping services indicated in this section.

3.04 SOLVENT WELDED PIPE JOINTS

- A. Install in accordance with ASTM D2855 "Making Solvent Cemented Joints With PVC Pipe and Fittings". Saw cut piping square and smooth. Tube cutters may be used if they are fitted with wheels designed for use with PVC/CPVC pipe that do not leave a raised bead on pipe exterior. Support and restrain pipe during cutting to prevent nicks and scratches. Bevel ends 10-15 degrees and deburr interior. Remove dust, drips, moisture, grease, and other superfluous materials from pipe interior and exterior. Check dry fit of pipe and fittings. Reject materials which are out of round or do not fit within close tolerance. Use heavy body solvent cement for large diameter fittings.
- B. Maintain pipe, fittings, primer, and cement between 40 and 100 degrees during application and curing. Apply primer and solvent using separate daubers (3" and smaller piping only) or clean natural bristle brushes about 1/2 the size of the pipe diameter. Apply primer to the fitting socket and pipe surface with a scrubbing motion. Check for penetration and reapply as needed to dissolve surface to a depth of 4-5 thousandths. Apply solvent cement to the fitting socket and pipe in an amount greater than needed to fill any gap. While both surfaces are wet, insert pipe into socket fitting with a quarter turn to the bottom of the socket. Solvent cement application and insertion must be completed in less than 1 minute. Minimum of 2 installers is required on piping 4" and larger. Hold joint for 30 seconds or until set. Reference manufacturer's recommendations for initial set time before handling and for full curing time before pressure testing. Cold weather solvent/cement may be utilized only under unusual circumstances and when specifically approved by the Architect/Engineer.

3.05 SANITARY WASTE AND VENT

- A. Verify invert elevations and building elevations prior to installation. Camera/video of existing sanitary sewer to be included in Plumbing Contractor's work as needed.
- B. Flush piping inlets (floor drains, hub drains, mop basins, fixtures, etc.) with high flow of water at completion of project to demonstrate full flow capacity. Remove blockages and make necessary repairs where flow is found to be impeded.
- C. General Trade to sawcut and remove existing concrete slab as required to install new sanitary piping to new sink location. General Trade to patch and match concrete depth and metal reinforcing.

3.06 PIPING SYSTEM LEAK TESTS

- A. Isolate or remove components from system which are not rated for test pressure. Test piping in sections or entire system as required by sequence of construction. Do not insulate or conceal pipe until it has been successfully tested.
- B. If required for the additional pressure load under test, provide temporary restraints at fittings or expansion joints. Backfill underground water mains prior to testing with the exception of thrust restrained valves which may be exposed to isolate potential leaks.
- C. For hydrostatic tests, use clean water and remove all air from the piping being tested by means of air vents or loosening of flanges/unions. Measure and record test pressure at the high point in the system.
- D. Inspect system for leaks. Where leaks occur, repair the area with new materials and repeat the test; caulking will not be acceptable.
- E. Entire test must be witnessed by the Owner. All pressure tests are to be documented on Berners-Schober Associates forms to be provided to the Contractor.

<u>System</u>	<u>Test</u> Medium	<u>Initial Test</u>		<u>Final Test</u>	
		Pressure	Duration	Pressure	Duration
Sanitary Waste and Vent	Water	N/A		10' water	2 hr

PIPING SYSTEM TEST REPORT

Berners-Schober Associates, Inc.
310 Pine Street
Green Bay, WI 54301

Date Submitted: _____

Project Name: _____

Location: _____ **Commission No:** _____

Contractor: _____

☐ Plumbing ☐ Fire Sprinkler

Test Medium: ☐ Air ☐ Water ☐ Other _____

Test performed per specification section No. _____

Specified Test Duration _____ Hours Specified Test Pressure _____ PSIG

System Identification: _____

Describe Location: _____

Test Date: _____

Start Test Time: _____ Initial Pressure: _____ PSIG

Stop Test Time: _____ Final Pressure: _____ PSIG

Tested By: _____

Witnessed By: _____

Title: _____

Title: _____

Signed: _____

Signed: _____

Date: _____

Date: _____

Comments: _____

SECTION 22 42 00

COMMERCIAL PLUMBING FIXTURES

PART 1 GENERAL

1.01 SCOPE

- A. This section includes specifications for plumbing fixtures, faucets and trim.

- PART 1 - GENERAL

- Scope

- Related Work

- Quality Assurance

- Shop Drawings

- Design Criteria

- PART 2 - PRODUCTS

- Plumbing Fixtures

- Plumbing Fixtures Schedule

- Substitute Fixtures and Products

- PART 3 - EXECUTION

- Installation

1.02 RELATED WORK

- A. Section 22 05 14 - Plumbing Specialties
- B. Section 22 05 29 - Hangers and Supports for Plumbing Piping and Equipment
- C. Section 22 11 00 - Facility Water Distribution
- D. Section 22 13 00 - Facility Sanitary Sewerage

1.03 REFERENCE

- A. Applicable provisions of Division 01 shall govern work under this section.

1.04 QUALITY ASSURANCE

- A. Substitution of Materials: Refer to Division 01, General Conditions, Equals and Substitutions.
- B. Plumbing products requiring approval by the State of Wisconsin Dept. of Safety and Professional Services must be approved or have pending approval at the time of shop drawing submission.

1.05 SHOP DRAWINGS

- A. Refer to Division 01, General Conditions, Submittals.
- B. Refer to Section 22 05 00, Submittals.
- C. Include data concerning sizes, utility sizes, rough in-dimensions, capacities, materials of construction, ratings, weights, trim, finishes, manufacturer's installation requirements, manufacturer's performance limitations, and appropriate identification.

1.06 DESIGN CRITERIA

ANSI A112.6.1M-88 - Supports for Off-the Floor Plumbing Fixtures for Public Use.

ANSI A112.18.1-94 - Finished and Rough Brass Plumbing Fixture Fittings.

ADA 4.19.4, ADAAG 606.5, GSA and DOD's ABA 606.5 and ICC/ANSI A117.1, ASTM C1822 - Under-lavatory Pipe and Supply Cover.

ADA 2010 Access Design 4.19.4, IBC, ADAAG 606.5, GSA and DOD's ABA 606.5, ICC/ANSI A117.1 606.6 and UPC-IAPMO PS 94-2008, ASTM C1822 - Under-lavatory ADA Insulator Protector (Lav-Shield).

PART 2 PRODUCTS

2.01 PLUMBING FIXTURES

- A. Vitreous china fixtures shall be best quality, twice fired white china conforming to "Regular Selection" in accordance with the uniform grading rules for "Vitreous China" fixtures adopted by the Manufacturer's Advisory Committee.
- B. Faucets, exposed fittings and trim shall be chromium plated nickel.
 - 1. Faucets shall indicate whether for hot or cold water.
 - 2. Provide union tailpieces for connection to supplies.
 - 3. Provide chrome plated escutcheon plates where chrome plated piping from fixtures enters walls.
 - 4. All faucets shall meet NSF Standard 61, Section 9 for drinking water faucets. The product shall be manufactured from brass construction. Brass components which contact water within the faucet shall be from brass which contains no more than 3% lead by dry weight.
- C. Plumbing fixtures shall be set-in and/or caulked with a sanitary silicone sealant. Sealant caulk shall be mildew resistant for sanitary application and white in color as manufactured by General Electric #SCS 1702 or equal.
- D. Where scheduled fixture installation requires cutting openings in cabinet tops, the Plumbing Contractor shall provide a template of the fixture to the Contractor to aid in cutting the fixture opening.

2.02 PLUMBING FIXTURE SCHEDULE

A. Sinks:

1. S-1: Solid surface countertop with drop-in ADA compliant stainless-steel sink, (1) one faucet hole centered on sink. Coordinate with casework.

Fixture: Elkay LRAD2219 (18" x 14" x 6" ID)
Faucet: Kohler K-23764 (Tone) polished chrome finish, 1.5gpm, pulldown 3-function spray head, temp. memory, docking system, boost technology
Drain: stainless steel flange and stopper for garbage disposal
Garb. Disp: InSinkErator Evolution 1300, 3/4hp, 120V, 9.5 amps, garbage disposal with dishwasher connector kit
P-Trap: PVC-schedule 40 p-trap with threaded connections with required PVC piping back to wall connection as required.
Stops: McGuire H170LK (1/2" x 3/8") (sweat x comp.)

2. S-2: Solid surface countertop with drop-in single compartment ADA compliant stainless-steel sink, (3) three faucet holes, 8" o/c. Coordinate with casework.

Fixture: Elkay LRAD1720 (14" x 14" x 6" ID)
Faucet: Chicago Faucet 786-HA8A-E36-369-ABCP, 8" high arch swing spout, lever handles, 1.5gpm laminar flow aerator
Drain: Elkay LKAD-35 (1-1/2" basket strainer) offset drain
P-Trap: Kohler K-9000 (1-1/2") (17 gauge)
Stops: McGuire H170LK (1/2" x 3/8") (sweat x comp.)
Safety Covers: Truebro 103-EZ, (2) stops and p-trap

B. Dishwasher:

1. DW-1: Existing undercounter residential dishwasher to be removed and relocated in coordination with new casework. Coordinate with casework.

Fixture: Existing dishwasher – remove and re-install
Water: 1/2" valved cold water connection w/ WHA
WHA: see specification section: Plumbing Specialties; 22 05 14
Drain: Route dishwasher drain line to new garbage disposal in base cabinet, with dishwasher connection

2.03 SUBSTITUTE FIXTURES AND PRODUCTS

A. Substitute Fixtures and Products

- Faucets - Chicago Faucet, Kohler, Speakman, Symmons, T&S Brass, Zurn
- Drains - Chicago Faucet, Engineered Brass Co., Kohler, McGuire
- Stops and Supplies - Chicago Faucet Co., T&S Brass, McGuire, Keeney (heavy duty type only)
- Traps - Kohler, McGuire, Dearborn, Engineered Brass Co., Keeney (17 gauge minimum)
- Sinks - American Standard, Just, Kohler, Elkay
- TMV - Lawler, Bradley, Holby

- B. Substitute materials, products, or fixtures shall conform to base bid specifications and shall be equal to specified items in quality, performance, design, and suitability for intended use.
- C. Where materials or equipment are specified by patent, proprietary name, or name of manufacturer, such specification shall be deemed to be used for the purpose of establishing a standard for that particular item. Any bidder may offer for approval any material, item of equipment, or process which he thinks is equal in every respect to that indicated or specified.
- D. See "Instructions to Bidders" for methods of approval of materials or equipment not named in the specifications. Request for approval shall be accompanied by supplemental technical information, and/or samples where required, as may be necessary for evaluation of the product.
- E. If, in the opinion of the Architect, the suggested substitution is equal to the material or equipment originally specified, or otherwise fulfills the requirements of the project, the approval will be confirmed by an Addendum issued to all parties of record having bidding documents. Approval of proposed substitutions shall not be held to have relieved the Contractor of responsibility for the proper execution of the work, nor from guarantee and maintenance requirements imposed by the contract documents.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install plumbing fixtures in accordance with manufacturer's instructions. Set level and plumb. Secure in place to counters, floors and walls providing solid bearing and secure mounting. Bolt fixture carriers to floor and wall. Secure rough-in fixture piping to prevent movement of exposed piping.
- B. Install each fixture with trap easily removable for servicing and cleaning. Install fixture stops in readily accessible location for servicing.
- C. Install barrier-free fixtures in compliance with Wisconsin Enrolled Commercial Building Code-2003 and Federal ADA Accessibility Guidelines. Install barrier-free lavatory traps parallel and adjacent to wall and supplies and stops elevated to 27" above floor to avoid contact by wheelchair users.
- D. Each fixture shall have a stop valve installation to control the fixture. Stop valves shall be heavy duty type with brass stems and screwed or sweat inlet connections. Compression type inlets are not acceptable.
- E. Cover pipe penetrations with escutcheons. Exposed traps, stops, piping and escutcheons to be chrome plated brass, same items in concealed locations may be of rough brass finish.

- F. Set counter mounted lavs and sinks; lav and sink faucets and drains with full setting bed of flexible non-staining plumber's putty.
- G. Seal openings between walls, floors and fixtures with mildew-resistant silicone sealant same color as fixture.
- H. Install water hammer arrestors where indicated and at all quick closing valve installations (i.e., solenoid valves, dishwasher connection, etc.).
- I. Test fixtures to demonstrate proper operation. Replace malfunctioning units or components. Adjust valves for intended water flow rate to fixtures without splashing, noise or overflow.
- J. Protect fixtures during construction. At completion, clean plumbing fixtures and trim using manufacturer's recommended cleaning methods and materials.
- K. Existing Fixtures: Where existing fixtures and fittings are indicated to be reused or relocated, this contractor is responsible for documenting condition prior to construction and for damages incurred during construction.

SECTION 23 01 30.51

HVAC AIR DUCT CLEANING

PART 1 GENERAL

1.01 SCOPE

- A. This section includes specifications for cleaning duct and HVAC systems on this project. Included are the following topics:

- PART 1 - GENERAL

- Scope

- Related Work

- Reference

- Quality Assurance

- Shop Drawings

- PART 2 - PRODUCTS

- General

- Equipment

- Access Doors

- PART 3 - EXECUTION

- General

- Cleaning

- Access Doors

1.02 RELATED WORK

- A. Section 23 31 00 - HVAC Ducts and Casing
- B. Section 23 33 00 - Air Duct Accessories
- C. Section 23 05 93 - Testing, Adjusting, and Balancing for HVAC

1.03 REFERENCE

- A. Applicable provisions of Division 01 govern work under this Section.

1.04 QUALITY ASSURANCE

- A. Refer to Division 01, Instructions to Bidders - Qualifications of Bidder and General Conditions - Equals and Substitutions.
- B. Duct cleaning shall be performed by one of the following:
 - 1. Self-performed by the Sheet Metal Trade
 - 2. Performed by a qualified contractor as defined by Paragraph C
- C. Demonstrate prior experience on duct cleaning projects of similar nature and scope of that being bid, through the submission of letters of reference from building owners including the name, address, and telephone numbers of the contact persons who are specifically familiar with the referenced projects. At least three previous users of this service shall be submitted. Include descriptions of projects. Submit a description of all major duct cleaning equipment owned by the prospective Contractor which is available for use on this project.

1.05 SHOP DRAWINGS

- A. Refer to Division 01, General Conditions, Submittals.
- B. Include manufacturer's data and/or Contractor data for the following:
 - List of equipment to be used.
 - Access doors.

PART 2 PRODUCTS

2.01 GENERAL

- A. Use products which conform to NFPA 90A, possessing a flame spread rating of not over 25 and a smoke developed rating no higher than 50.

2.02 EQUIPMENT

- A. Particulate Collection Equipment: Fan/filter unit sized to create sufficient quantity of negative pressure for capture and filtration of air and contaminants dislodged during duct cleaning. Equipment to include prefiltration and HEPA final filtration with 99.97% collection efficiency for 0.3 micron size particles.
- B. Portable pressure washers to be capable of 500 psig to 1000 psig operation.
- C. Power brush systems designed specifically for duct cleaning.

2.03 ACCESS DOORS

- A. Construction to be suitable for the pressure class of the duct in which the door is to be installed. Materials of construction to be identical to adjacent ductwork. Doors in exposed areas shall be hinged type with sash lock. Doors in concealed spaces may be secured in place with cam latches. Gasket all access doors. Use insulated doors when installed in insulated ductwork. Access doors constructed with sheet metal screw fasteners will not be accepted.
- B. Access doors shall be provided by the HVAC Contractor in accordance with Section 23 33 00. Additional openings required for duct cleaning shall be the responsibility of This Trade.
- C. Access doors shall be utilized for insulated ductwork access. Cut and patched openings are not acceptable on insulated duct systems. For non-insulated ductwork, cut and patched openings are acceptable for additional access points beyond those provided by Section 23 33 00.

PART 3 EXECUTION

3.01 GENERAL

- A. Use products and equipment in accordance with manufacturers' instructions.

3.02 CLEANING

- A. Clean ductwork systems and associated turning vanes, dampers, coils, VAV boxes, drain pans, plenums, diffusers, registers, grilles and louvers; air handling units and associated fans, coils, drain pans, plenums and dampers; fans; terminal units and other equipment described below:

<u>System/Component*</u>	<u>Location*</u>	<u>Action*</u>
Supply Duct Systems	Where Indicated	Clean
Return Duct Systems	Where Indicated	Clean
Exhaust Duct Systems	Where Indicated	Clean
Transfer Duct Systems	Where Indicated	Clean

- * In addition, all new duct systems not wiped clean and protected from construction dust and debris as specified in Section 23 31 00 shall be cleaned using equipment and methods specified in this section.
- B. Visually inspect systems and site prior to cleaning. Document and report damaged system components to Owner's Construction Representative prior to cleaning. Mark damper and other component positions prior to cleaning and reset after cleaning to original position. Establish a specific, coordinated plan detailing how each area of the building will be protected during the various phases of work.

- C. Protect building occupants, components, and furnishings from cleaning activities. Use polyethylene sheeting covers and barriers where cleaning will disperse debris outside the HVAC systems. Install critical barriers within the building, at inlets/outlets, and within the system to prevent migration of dust and debris to clean areas.
- D. Use particulate collection equipment to remove and capture debris. Connect to system downstream of cleaning operations. Wherever possible, duct exhaust to the exterior of the building. Avoid discharge near air intakes and points of entry. Arrange source of makeup air to flow from clean area to work area negatively pressurizing work area. Take measures to control offensive odors and vapors during the cleaning process.
- E. Clean systems using mechanical cleaning methods, such as vacuum cleaning, compressed air sweeping and mechanical brushing, designed to extract contaminants from within the HVAC system and safely remove contaminants from the facility. No cleaning methods are to be used which damage components of the system or negatively alter the integrity of the system.
- F. Clean fibrous glass thermal or acoustical insulation with HEPA vacuuming equipment. Document locations of damage, deterioration, delamination, mold, fungus growth, or excessive moisture which cannot be restored by cleaning or resurfacing with repair coating. Report locations and conditions to Architect/Engineer and Owner's Project Representative for determination of removal and/or replacement.
- G. Verification of HVAC system cleanliness will be performed after cleaning and prior to application of biocides and encapsulants. The Contractor shall notify the Owner's Construction Representative and Architect/Engineer in advance of verification. Verification will consist of inspection by the Contractor, Owner's Construction Representative, and/or Architect/Engineer. If surfaces are visibly clean, no contaminants are evident through visual inspection, and coils are within 10% of design pressure drop, the HVAC system shall be considered clean. However, the Owner reserves the right to further verify system cleanliness through third party gravimetric or wipe testing analysis per NADCA standards.

3.03 ACCESS DOORS

- A. Install access doors where indicated on the drawings and in locations where access is required for cleaning or inspection.
- B. Size and numbers of duct access doors to be sufficient to perform the intended service. Access door size shall be minimum 1/2 of the duct face size (i.e. 24" duct, 12" x 12" A.D.) and a minimum size of 8" x 8", up to 24" x 24", larger sizes as indicated.
- C. Access doors will be installed by the HVAC Contractor in accordance with Section 23 33 00. Access doors required by This Contractor, in addition to those provided by Section 23 33 00, will be the responsibility of This Trade.

SECTION 23 05 00

COMMON WORK RESULTS FOR HVAC

PART 1 GENERAL

1.01 SCOPE

- A. This section includes information common to two or more technical specification sections or items that are of a general nature, not conveniently fitting into other technical sections. Included are the following topics:

PART 1 - GENERAL

- Scope
- Related Work
- Reference
- Quality Assurance
- Protection of Finished Surfaces
- Sleeves and Openings
- System Description
- Submittals
- Certificates and Inspections
- Operating and Maintenance Instructions
- Training of Owner Personnel
- Record Drawings
- Data and Drawings
- Electronic File Requests

PART 2 - PRODUCTS

- Identification
- Sealing

PART 3 - EXECUTION

- Cutting and Patching
- Building Access
- Equipment Access
- Coordination
- Identification
- Sleeves
- Sealing

1.02 RELATED WORK

- A. Section 05 05 20 - Fasteners and Metal Fastenings
- B. Section 13 48 00 - Vibration Isolation for HVAC Piping and Equipment
- C. Section 23 05 93 - Testing, Adjusting, and Balancing for HVAC
- D. Divisions 26, 27, and 28 - Electrical
 - 1. Unless otherwise specified, the Electrical Trade shall furnish and install electrical feeders of proper size, the disconnects or manual starters, the magnetic starters or contactors with integral or remote pushbutton stations where required, and all power wiring including final connections for each motor.
 - 2. For equipment with integral starters or multiple starters and motors on the unit, the Electrical Trade shall wire to the line side of the starter or one set of terminal blocks. The wiring on the load side of starters or terminal block shall be factory wired or field wired to all other required terminals in the unit by the Heating and Air Conditioning Trade.
 - 3. The Electrical Trade shall furnish only the wiring shown on the electrical drawings. All other wiring required for the heating system shall be furnished by the Heating Trade.
 - 4. Consult with the Electrical Trade before the installation of equipment to coordinate the motor type, voltage and sizes with the starter type voltage and sizes, holding coil voltage, thermal overload capacities, interlocks, etc. The Heating Trade and the Electrical Trade shall be equally responsible to ensure that the equipment installed is of proper size, etc.

1.03 REFERENCE

- A. Applicable provisions of Division 01 govern work under this section.

1.04 QUALITY ASSURANCE

- A. Refer to Division 01, General Conditions, Equals and Substitutions.
- B. Where equipment or accessories are used which differ in arrangement, configuration, dimensions, ratings, or engineering parameters from those indicated on the contract documents, the Contractor is responsible for all costs involved in integrating the equipment or accessories into the system and for obtaining the performance from the system into which these items are placed. This may include changes found necessary during the testing, adjusting, and balancing phase of the project.
- C. All work shall be installed in accordance with the specifications and National, State, and local codes. Where the code or ordinance is more exacting than the specifications, the code or ordinance shall govern.

- D. The installation shall be complete in every respect in accordance with the intent of the drawings and specifications. All equipment shall be installed in accordance with manufacturers' installation instructions. Systems shall be ready for satisfactory use.
- 1. Systems and equipment requiring maintenance shall be installed with sufficient clearances to perform such work.

1.05 PROTECTION OF FINISHED SURFACES

- A. Refer to Division 01, General Requirements, Protection of Finished Surfaces.

1.06 SLEEVES AND OPENINGS

- A. Refer to Division 01, General Requirements, Sleeves and Openings.

1.07 SYSTEM DESCRIPTION

- A. Ductwork and piping systems will be modified to serve the new x-ray room.
- B. Reheat coils will replace existing devices.
- C. Hot water piping will be modified to serve the renovated areas and relocated and new equipment.
- D. Grilles and flexible ductwork will be replaced. Ductwork will be modified to serve the renovated area.
- E. The air and water systems will be balanced in accordance with the quantities defined on the construction documents.

1.08 SUBMITTALS

- A. Refer to Division 01, General Conditions, Submittals.
- B. Submit for all equipment and systems as indicated in the respective specification sections, marking each submittal with that specification section number. Mark general catalog sheets and drawings to indicate specific items being submitted and proper identification of equipment by name and/or number, as indicated in the contract documents.
- C. Before submitting electrically powered equipment, verify that the electrical power and control requirements for the equipment are in agreement with the motor starter schedule on the electrical drawings. Include a statement on the shop drawing transmittal to the Architect/Engineer that the equipment submitted and the motor starter schedule are in agreement or indicate any discrepancies. See related comments in Section 23 05 13 in Part 1 under Electrical Coordination.
- D. Include wiring diagrams of electrically powered equipment.

- E. Submit shop drawings for the following items in accordance with the provisions of Division 01. Provide fan and pump curves and sound data.

1. Pipe and fittings
2. Valves
3. Insulation
4. Grilles
5. Reheat coils

1.09 CERTIFICATES AND INSPECTIONS

- A. Refer also to Division 01, General Conditions, Permits, Regulations, Utilities and Taxes.
- B. Obtain and pay for all required State installation inspections except those provided by the Owner or Architect/Engineer in accordance with Wis. Adm. Code Section ILHR 50.12, State and Local Codes, Ordinances, and Authorities with Jurisdiction. Include copies of the certificates in the Operating and Maintenance Instructions.
- C. The Installing Contractor(s) is required to certify in writing the installation of the systems and equipment. See Conditions of Contract regarding progress payments defining Substantial Completion and Section 01 70 00 Execution and Closeout Requirements for certification requirements. The Installing Contractor shall certify that, to the best of his knowledge, the following has been achieved:
1. The HVAC system has been installed, complying with the specifications, National, State, and local codes and specifically NFPA-90A.
 2. Smoke and fire separation penetrations have been installed in accordance with the UL assembly requirements and in accordance with the product manufacturer's requirements.
 4. The air conditioning and ventilating systems are balanced and meet applicable licensing requirements in accordance with NFPA-90A and/or NFPA-99.
- D. Each Contractor is required to supply the appropriate support documentation and UL listings to substantiate the certifications.

1.10 OPERATING AND MAINTENANCE INSTRUCTIONS

- A. Refer to Division 01, General Requirements, Operating and Maintenance Instructions.
- B. Provide electronic or paper copies as indicated in Division 01. Paper copy material shall be assembled in three-ring or post binders, using an index at the front of each volume and tabs for each system or item identified below. Electronic copies shall be submitted in PDF format utilizing separate files for each item identified below.

In addition to the data indicated in the General Requirements, include the following information:

- Copy of the final air balance report.
 - Copies of all approved shop drawings.
 - Manufacturer's wiring diagrams for electrically powered equipment
 - Records of tests performed to certify compliance with system requirements
 - Certificates of inspection by regulatory agencies
 - Temperature control record drawings and control sequences
 - Parts lists for manufactured equipment
 - Valve schedules
 - Lubrication instructions, including list/frequency of lubrication done during construction
 - Warranties
 - Additional information as indicated in the technical specification sections
- C. In addition to the manufacturer's operating and service instructions, prepare typewritten operating instructions for the overall system. The instructions shall be prepared for this specific project and shall describe the system and the sequence of operation for the various equipment.

1.11 TRAINING OF OWNER PERSONNEL

- A. Instruct Owner personnel in the proper operation and maintenance of systems and equipment provided as part of this project; record all training sessions.
 - 1. Demonstrate maintenance access and routine maintenance procedures for all equipment.

1.12 RECORD DRAWINGS

- A. Refer to Division 01, General Requirements, Record Drawings.
- B. In addition to the data indicated in the General Requirements, maintain temperature control record drawings on originals prepared by the installing contractor/subcontractor. Include copies of these record drawings with the Operating and Maintenance manuals.

1.13 DATA AND DRAWINGS

- A. See Instructions to Bidders regarding examination of site and special site conditions.
- B. The information given herein and on the drawings is as exact as can be secured. Its accuracy is not guaranteed. Examination of site will be required to verify all existing piping, measurements, distances, levels, elevations, and existing installation conditions before starting the work.
- C. New system elevations are indicated for bidding purposes and to aid contractors in achieving coordinated system installations. Their accuracy is not guaranteed. Where conflicts arise, contractors shall coordinate the installations and offset systems as required to install without additional cost. In all cases, contractors shall make every attempt possible to install systems at the elevations indicated. When deviations are necessary, identify changes on record documents.
- D. The location of piping or equipment which is governed by architectural features shall be established by reference to dimensions on architectural-structural drawings. Consult complete drawings and details for dimensions of all partitions, their construction, and location.
- E. The Architect reserves the right to change the location of any equipment 5 feet and piping 10 feet in any direction without these changes being made subject of an extra charge, provided such changes are made before the rough-in, piping, or sleeves have been installed.
- F. Deviations or changes in location of equipment and/or piping made in the field shall be carefully recorded on field set of drawings and the Architect shall be informed of all deviations and changes.
- G. Deviations in the routing of HVAC systems, from that drawn, to conform to the building as constructed or to fit the work of other trades shall be made without extra cost.

1.14 ELECTRONIC FILE REQUEST

- A. See Section 01 00 00 for instructions for electronic file requests.

PART 2 PRODUCTS

2.01 IDENTIFICATION

- A. Stencils: Not less than 1" high letters/numbers for marking pipe and equipment.
- B. Snap-On Pipe Markers: Cylindrical self-coiling plastic sheet that snaps over piping insulation and is held tightly in place without the use of adhesive, tape or straps. Not less than 1" high letters/numbers and flow direction arrows for piping marking. W.H. Brady, Seton, Marking Services, or equal.

2.02 SEALING

A. Non-Rated Penetrations:

1. Pipe Penetrations: At pipe penetrations of non-rated interior partitions, floors and exterior walls above grade, use urethane caulk in annular space between pipe insulation and sleeve/wall.
2. Duct Penetrations: Annular space between duct (with or without insulation) and the non-rated partition or floor opening shall not be larger than 1/2". Where existing openings have an annular space larger than 1/2", the space shall be patched to match existing construction to within 1/2" around the duct. Gaps 1/2" and smaller shall be caulked.

PART 3 EXECUTION

3.01 CUTTING AND PATCHING

- A. Refer to Division 01, General Requirements, Cutting and Patching.
- B. This Contractor shall furnish and mark location for the curb. General Trade shall cut the hole through the new and existing construction and set the curb. The General Contractor shall roof the curb into the system. This Contractor shall install the equipment on the curb to prevent water from getting into the building or shall cover the curb to prevent water from entering the building.
- C. This Contractor shall mark and set sleeves for openings through new construction. All holes not sleeved shall be cut by This Trade.
- D. This Contractor shall mark the openings for new pipe penetrations. The General Trade will cut holes for new pipes as shown on the structural plans. All other holes are the responsibility of This Trade.
- E. This Contractor shall cut all holes for pipes and ducts through walls. The General Trade shall patch openings.

3.02 BUILDING ACCESS

- A. Arrange for the necessary openings in the building to allow for admittance of all apparatus. When the building access was not previously arranged and must be provided by This Contractor, restore any opening to its original condition after the apparatus has been brought into the building.
- B. Refer to the General Conditions for job site requirements. Review phasing of the work as shown in the drawings or noted in the specification.

3.03 EQUIPMENT ACCESS

- A. Install all piping, conduit, ductwork, and accessories to permit access to equipment for maintenance and service. Coordinate the exact location of wall and ceiling access panels and doors with the General Contractor, making sure that access is available for all equipment and specialties. Where access is required in plaster walls or ceilings, furnish the access doors to the General Contractor.
- B. Provide color-coded thumb tacks or screws, depending on the surface, for use in accessible ceilings which do not require access panels.
- C. Deliver materials to the site in their original containers with shipping labels intact so that the source can be identified.
- D. Handle prefinished items with care to avoid damage to finished surfaces. Protect from damage before, during, and after installation.
- E. Materials to be installed inside the building shall be stored in a suitable, protected location. Materials to be installed outside shall be stored in a manner which will provide protection from damage by the elements.
- F. Where lifting with hoists or slings is required, lift only as directed by the manufacturer.

3.04 COORDINATION

- A. Verify that all devices are compatible for the surfaces on which they will be used. This includes, but is not limited to, diffusers, register, grilles, and recessed or semi-recessed heating, and/or cooling terminal units installed in/on architectural surfaces.
- B. Coordinate all work with other contractors prior to installation. Any installed work that is not coordinated and that interferes with other contractor's work shall be removed or relocated at the installing contractor's expense.
- C. Cooperate with the test and balance agency in ensuring Section 23 05 93 specification compliance. Verify system completion to the test and balance agency (flushing, pressure testing, chemical treatment, filling of liquid systems, proper pressurization and air venting of hydronic systems, clean filters, clean strainers, duct and pipe systems cleaned, controls adjusted and calibrated, controls cycled through their sequences, etc.), ready for testing, adjusting and balancing work. Install dampers, shutoff and balancing valves, flow measuring devices, gauges, temperature controls, etc., required for functional and balanced systems. Demonstrate the starting, interlocking, and control features of each system so the test and balance agency can perform its work.

3.05 IDENTIFICATION

- A. Identify equipment in mechanical equipment rooms by stenciling equipment number and service with one coat of black enamel against a light background or white enamel against a dark background. Use a primer where necessary for proper paint adhesion. Do not label equipment such as cabinet heaters and ceiling fans in occupied spaces.
- B. Where stenciling is not appropriate for equipment identification, engraved name plates may be used.
- C. Identify piping not less than once every 25 feet, not less than once in each room, adjacent to each access door or panel, and on both sides of the partition where exposed piping passes through walls, floors or roofs. Place flow directional arrows at each pipe identification location. Use one coat of black enamel against a light background or white enamel against a dark background for stenciling, or provide snap-on pipe markers as specified in Part 2 - Products.

3.06 SLEEVES

- A. Pipe Sleeves:
 - 1. Provide galvanized sheet metal sleeves for all pipe penetrations through interior and exterior walls to provide a backing for sealant or firestopping. Patch wall around sleeve to match adjacent wall construction and finish. Grout area around sleeve in masonry construction. In finished spaces where pipe penetration through wall is exposed to view, sheet metal sleeve shall be installed flush with face of wall.
 - 2. Pipe sleeves are not required in interior non-rated drywall or wood partitions. Sleeves are not required in existing poured concrete walls or masonry walls where penetrations are core drilled.
 - 3. Pipe sleeves in new poured concrete construction shall be Schedule 40 steel pipe (sized to allow insulated pipe to run through sleeve), cast in place.
- B. Duct Sleeves:
 - 1. Duct sleeves are not required in non-rated partitions or floors.
 - 2. Provide sleeve required for fire dampers in fire-rated partitions and floors. Reference fire damper details on drawings.

3.07 SEALING

- A. Non-Rated Penetrations:
 - 1. Gaps of not more than 1/2" shall be caulked. Gaps of more than 1/2" shall be patched to match adjacent construction.

SECTION 23 05 15

PIPING SPECIALTIES

PART 1 GENERAL

1.01 SCOPE

- A. This section contains specifications for HVAC piping specialties for all piping systems. Included are the following topics:

- PART 1 - GENERAL

- Scope

- Related Work

- Reference

- Quality Assurance

- Shop Drawings

- Design Criteria

- PART 2 - PRODUCTS

- Air Vents

- PART 3 - EXECUTION

- Air Vents

1.02 RELATED WORK

- A. Section 23 20 00 - Pipe and Pipe Fittings
- B. Section 23 05 23 - General-Duty Valves for HVAC Piping
- C. Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment
- D. Section 23 07 00 - HVAC Insulation

1.03 REFERENCE

- A. Applicable provisions of Division 01 govern work under this section.

1.04 QUALITY ASSURANCE

- A. Refer to Division 01, General Conditions, Equals and Substitutions.

1.05 SHOP DRAWINGS

- A. Refer to Division 01, General Conditions, Submittals.
- B. Required for all items in this section. Include materials of construction, dimensional data, ratings/capacities/ranges, pressure drop data where appropriate, and identification as referenced in this section and/or on the drawings.

1.06 DESIGN CRITERIA

- A. All piping specialties are to be rated for the highest pressures and temperatures in the respective system in accordance with ANSI B31, but not less than 125 psig unless specifically indicated otherwise.

PART 2 PRODUCTS

2.01 AIR VENTS

- A. Manual Key Type Vents:
 - 1. Manufacturers: Bell and Gossett Model 4V; Eaton/Dole Model 9, 9B, or 14A.
 - 2. Bronze body with non-ferrous internal parts, screwdriver operated, designed to relieve air from the system when vent is opened, rated at not less than 125 psig at 220°F.

PART 3 EXECUTION

3.01 AIR VENTS

- A. Manual Key Type Vents: Install at all high points where air may collect and not be carried by the system fluid. Use a soft Type L copper "pigtail" so the vent can be positioned for venting and collecting any water that might escape.

SECTION 23 05 23

GENERAL-DUTY VALVES FOR HVAC PIPING

PART 1 GENERAL

1.01 SCOPE

- A. This section includes valve specifications for all HVAC systems except where indicated under Related Work. Included are the following topics:

- PART 1 - GENERAL

- Scope

- Related Work

- Reference

- Quality Assurance

- Submittals

- Design Criteria

- PART 2 - PRODUCTS

- Water System Valves

- Specialty Valves and Valve Accessories

- PART 3 - EXECUTION

- General

- Shut-off Valves

- Drain Valves

- Balancing Valves

1.02 RELATED WORK

- A. Section 23 05 15 - Piping Specialties
- B. Section 23 09 93 - Sequence of Operation for HVAC Controls

1.03 REFERENCE

- A. Applicable provisions of Division 01 govern work under this section.

1.04 QUALITY ASSURANCE

- A. Refer to Division 01, General Conditions, Equals and Substitutions.

1.05 SUBMITTALS

- A. Refer to Division 01, General Conditions, Submittals.
- B. Contractors shall submit a schedule of all valves indicating type of service, dimensions, materials of construction, and pressure/temperature ratings for all valves to be used on the project. Temperature ratings specified are for continuous operation.

1.06 DESIGN CRITERIA

- A. Where valves are specified for individual mechanical services (i.e. hot water heating, steam, etc.), all valves shall be of the same manufacturer unless prior written approval is obtained from Architect/Engineer.
- B. Where grooved fittings are specified, all grooved end valves shall be of the same manufacturer as the adjoining couplings.

PART 2 PRODUCTS

2.01 WATER SYSTEM VALVES

- A. All water system valves to be rated at not less than 125 psig water working pressure at 240°F unless noted otherwise.
- B. Gate Valves:
 - 1. 2" and Smaller: Use ball valves; gate valves will not be accepted in sizes 2" and smaller.
- C. Ball Valves:
 - 1. 2" and Smaller: Two piece bronze body; threaded or soldered ends, as appropriate to the pipe material; stainless steel or chrome plated brass/bronze ball; full port; glass filled teflon seat; threaded packing gland follower; blowout-proof stem; 600 psig WOG.
 - a. Valve stems shall allow operators to clear insulation without interference. Provide stem extensions where valve operators interfere with pipe insulation.
 - b. Apollo 77-100/200 Series, Hammond 8301/8311, Jamesbury A11-TT, Milwaukee BA400/450, Nibco T/S 585-70, Stockham S206/216.
 - c. Two piece, standard port, forged brass body; Vic-Press ends, chrome-plated brass ball and stem, PTFE seats, blowout-proof stem; 300 psig CWP. Victaulic Series P589.
 - 2. 2-1/2" and Over: Ball valves will not be accepted in sizes over 2".
- D. Globe Valves:
 - 1. Do not use globe valves for water service, except in temperature control applications.

E. Balance Valves:

1. 2" and Smaller: DZR brass (Ametal), Bronze or copper alloy body with calibrated ball, globe or venturi/valve arrangement, integral pointer and calibrated scale to register degree of valve opening, memory stop, drain tapping, threaded or soldered ends, with or without integral unions, P/T or Shraeder pressure taps with integral check valves and seals, adjustable memory stop, suitable for 200 psig water working pressure at 230°F. Balance valve assemblies shall have a maximum 1 psi drop at design flow.
 - a. Armstrong CBV, Bell & Gossett Circuit Setter Plus, Griswald Quickset, Illinois 6000 Series, Nexus Orturi, Nibco 1710 Series, Taco Accu-Flo, Tour & Anderson STAS/STAD, Victaulic Series 786/787.
 - b. Coil-Hook-up Connections: Victaulic Koil-Kits Series 799 or 79V (or equal) may be used at coil connections. The kit shall include a Series 786/787/78K circuit balancing valve, Series 78Y Strainer-Ball, Series 78U Union-Port fitting, with Series 78T ball valve and required coil hoses. A Style 793 and/or 794 differential pressure controller shall be provided as required. A meter shall be provided by the valve manufacturer that shall remain with the building owner after commissioning. Balance valve assemblies including hoses, shall have a maximum 1 psi drop at design flow.

F. Drain Valves:

1. Use 3/4" ball valve with threaded hose adapter except strainer blowdown valves to be the same size as the blowdown connection. Provide caps with chains on all valves.

2.02 SPECIALTY VALVES AND VALVE ACCESSORIES

A. Stem Extensions:

1. Provide stem extensions when valve handles and operators interfere with pipe insulation.

PART 3 EXECUTION

3.01 GENERAL

- A. Properly align piping before installation of valves in an upright position; operators installed below the valves will not be accepted.
- B. Install valves in strict accordance with valve manufacturer's installation recommendations. Do not support weight of piping system on valve ends.
- C. Install all temperature control valves.
- D. Install all valves with the stem in the upright position. Valves may be installed with the stem in the horizontal position only where space limitations do not allow installation in an upright position or where large valves are provided with chain wheel operators. Valves installed with the stems down will not be accepted.
- E. Install stem extensions when shipped loose from valve.
- F. Prior to flushing of piping systems, place all valves in the full-open position.

3.02 SHUT-OFF VALVES

- A. Install shut-off valves at all equipment, at each branch take-off from mains, and at each automatic valve for isolation or repair.

3.03 DRAIN VALVES

- A. Provide drain valves for complete drainage of all systems. Locations of drain valves include low points of piping systems, equipment locations specified or detailed including reheat coils, other locations required for drainage of systems.

3.04 BALANCING VALVES

- A. Provide balancing valves for all major equipment and at each major branch takeoff and at the discharge of each pump as indicated on drawings and details. Do not use a balancing valve on equipment with less than 1.5 GPM and a 2-way control valve.

SECTION 23 05 29

HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SCOPE

- A. This section includes specifications for supports of all HVAC equipment and materials as well as piping system anchors. Included are the following topics:

PART 1 - GENERAL

- Scope
- Related Work
- Reference
- Quality Assurance
- Description
- Shop Drawings
- Design Criteria

PART 2 - PRODUCTS

- Pipe Hanger and Support Manufacturers
- Structural Supports
- Pipe Hangers and Supports
- Corrosive Atmosphere Coatings

PART 3 - EXECUTION

- Installation
- Hanger and Support Spacing

1.02 RELATED WORK

- A. Section 13 48 00 - Vibration Controls for HVAC Piping and Equipment
- B. Section 23 07 00 - HVAC Insulation
- C. Section 05 05 20 - Fasteners and Metal Fastenings

1.03 REFERENCE

- A. Applicable provisions of Division 01 shall govern work under this section.

1.04 QUALITY ASSURANCE

- A. Refer to Division 01, General Conditions, Equals and Substitutions.

1.05 DESCRIPTION

- A. Provide all supporting devices as required for the installation of mechanical equipment and materials. All supports and installation procedures are to conform to the latest requirements of the ANSI Code for pressure piping.
- B. Do not hang any mechanical item directly from a metal deck or run piping so it rests on the bottom chord of any truss or joist.
- C. Support apparatus and material under all conditions of operation, variations in installed and operating weight of equipment and piping, to prevent excess stress, and allow for proper expansion and contraction.
- D. Protect insulation at all hanger points; see Related Work above.

1.06 SHOP DRAWINGS

- A. Refer to Division 01, General Conditions, Submittals.
- B. Schedule of all hanger and support devices indicating shields, attachment methods, and type of device for each pipe size and type of service. Reference Section 23 05 00.

1.07 DESIGN CRITERIA

- A. Materials and application of pipe hangers and supports shall be in accordance with MSS Standard Practice SP-58 and SP-69 unless noted otherwise.
- B. Piping supported by laying on the bottom chord of joists or trusses will not be accepted.
- C. Fasteners depending on soft lead for holding power or requiring power actuation will not be accepted.
- D. Allow sufficient space between adjacent pipes and ducts for insulation, valve operation, routine maintenance, etc.

PART 2 PRODUCTS

2.01 PIPE HANGER AND SUPPORT MANUFACTURERS

- A. B-Line, Fee and Mason, Anvil – Grinnell, Kindorf, Michigan Hanger, Piping Technology and Products, Tolco Unistrut, or approved equal. Grinnell figure numbers are listed below; equivalent material by other manufacturers is acceptable.

2.02 STRUCTURAL SUPPORTS

- A. Provide all supporting steel required for the installation of mechanical equipment and materials, whether or not it is specifically indicated or sized, including angles, channels, beams, etc. to suspend or floor support tanks and equipment. Steel to conform to ASTM Specifications A6 and A36.

2.03 PIPE HANGERS AND SUPPORTS

- A. Hangers for Undesignated Steel Pipe Sizes 1/2" through 2": Carbon steel, adjustable, clevis, black finish. Grinnell #65, 260, or 300. Install clevis inside insulation.
- B. Hangers for Chilled Water, Make-up Water, Steam and Steam Condensate Steel and Copper Pipe Sizes 1/2" through 2": Carbon steel, adjustable, clevis, black finish. Grinnell #65 or 260 with #167 pipe covering. Install clevis outside insulation.
- C. Hangers for Chilled Water Steel Pipe Sizes 2-1/2" and Over: Carbon steel, adjustable, clevis, black finish. Grinnell #260 with #167 pipe covering. Install clevis outside insulation.
- D. Hangers for Steam and Hot Water and Steam Condensate Pipe Sizes 2-1/2" and Over: Carbon steel, adjustable yoke, cast iron roll. Grinnell #181 with #162 pipe protection saddle.
- E. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods if calculations are submitted. Unistrut P series channel 1-5/8" deep, 12 gauge, single or double height as required. Use roller chair support #175 with #162 saddle.
- F. Copper Pipe Support: Carbon steel ring, adjustable, copper plated or polyvinylchloride coated. Use where there is direct contact to copper piping.
- G. Insulation Protection Shields: Galvanized carbon steel of not less than 18 gauge for use on insulated pipe 2-1/2" and larger. Minimum shield length is 12". Provide flared or rolled edges and ends with cutout for hanger. Equal to Grinnell #167.

H. Steel Hanger Rods:

1. Threaded both ends, threaded one end, or continuous threaded, black finish.
2. Size rods for individual hangers and trapeze support as indicated in the following schedule.
3. Total weight of equipment, including valves, fittings, pipe, pipe content, and insulation, are not to exceed the limits indicated.

Maximum Load (Lbs.) (650°F Maximum Temp.)	Rod Diameter (inches)
610	3/8
1130	1/2
1810	5/8
2710	3/4

4. Provide rods complete with adjusting and lock nuts.

2.04 CORROSIVE ATMOSPHERE COATING

- A. Factory coat supports and anchors used in corrosive atmospheres with hot-dip galvanizing after fabrication, ASTM A123, 1.5 ounces/square foot of surface, each side. Mechanical galvanize threaded products, ASTM B695 Class 150, 2.0 mil coating. Field cuts and damaged finishes to be field covered with zinc-rich paint of comparable thickness to factory coating.
- B. Corrosive atmospheres include the following locations:
 - Exterior locations

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install supports to provide for free expansion of the piping and duct system. Support all piping from the structure using concrete inserts, beam clamps, ceiling plates, wall brackets, or floor stands. Fasten ceiling plates and wall brackets securely to the structure and test to demonstrate the adequacy of the fastening. **Refer to Section 05 05 20 - Fasteners and Metal Fastenings for hanger attachment to concrete structures.**
- B. Coordinate hanger and support installation to properly group piping of all trades.

- C. Where piping can be conveniently grouped to allow the use of trapeze type supports, use standard structural shapes or continuous insert channels for the supporting steel. Where continuous insert channels are used, pipe supporting devices made specifically for use with the channels may be substituted for the specified supporting devices provided that similar types are used and all data is submitted for prior approval.
- D. Perform all welding in accordance with standards of the American Welding Society. Clean surfaces of loose scale, rust, paint, or other foreign matter and properly align before welding. Use wire brush on welds after welding. Welds shall show uniform section, smoothness of weld metal, and freedom from porosity and clinkers. Where necessary to achieve smooth connections, joints shall be dressed smooth.

3.02 HANGER AND SUPPORT SPACING

- A. Place a hanger within 24" of each horizontal elbow, valve, strainer, or similar piping specialty item.
- B. Where several pipes can be installed in parallel and at the same elevation, provide multiple or trapeze hangers.
- C. Support riser piping independently of connected horizontal piping.
- D. Adjust hangers to obtain the slope specified in the piping section of this specification.
- E. Space hangers for pipe as follows:

<u>Pipe Material</u>	<u>Pipe Size</u>	<u>Max. Spacing</u>
Steel	1/2" through 1-1/4"	6'-6"
Steel	1-1/2" through 6"	10'-0"
Copper	1/2" through 1-1/4"	5'-0"
Copper	1-1/2" and larger	8'-0"

SECTION 23 05 93

TESTING, ADJUSTING AND BALANCING FOR HVAC

PART 1 GENERAL

1.01 SCOPE

- A. This section includes all air and water testing, adjusting and balancing for the entire project. Included are the following topics:

- PART 1 - GENERAL

- Scope

- Reference

- Description

- Related Work

- Pre-Balance Conference

- Submittals

- PART 2 - PRODUCTS

- Instrumentation

- PART 3 - EXECUTION

- Daily Reports

- Preliminary Procedures

- Performing Testing, Adjusting, and Balancing

- Deficiencies

1.02 REFERENCE

- A. Applicable provisions of the General Conditions, Supplementary General Conditions and General Requirements in Division 01 govern work under this section.

1.03 DESCRIPTION

- A. Provide total mechanical systems testing, adjusting, and balancing. Requirements include the balance of air and water distribution, adjustment of new and existing systems to provide design quantities indicated on the drawings, electrical measurement and verification of performance of all equipment, all in accordance with standards published by AABC or NEBB.
- B. Test, adjust, and balance all air and hydronic systems so that each room, piece of equipment or terminal device is using the quantities indicated on the drawings and in the specifications.
- C. Accomplish testing, adjusting, and balancing work in a timely manner that allows partial occupancy of major buildings, occupancy of one building when the project involves many buildings, and completion of the entire project in the time stated in the Instruction to Bidders and in accordance with the completion schedule established for this project. Refer to the phasing plan in Division 01.

- D. The test and balance agency is encouraged to make periodic site visits to make sure that provisions are being made to accomplish the specified testing, adjusting, and balancing work. If problems are found, handle as specified in Part 3 under Deficiencies.
- E. The installing contractor(s) is required to certify in writing the installations of the systems and equipment. (See Conditions of Contract regarding progress payments defining Substantial Completion and Section 01 70 00 Execution and Closeout Requirements for certification requirements.) The installing contractor shall certify that, to the best of his knowledge, the following has been achieved:
 - 1. The air conditioning and ventilating systems are balanced and meet applicable licensing requirements in accordance with NFPA-90A and/or NFPA-99.
- F. This Contractor is required to supply the appropriate support documentation and UL listings to substantiate the certifications.

1.04 RELATED WORK

- A. Section 23 05 00 - Common Work Results for HVAC for shop drawings to be given to the test and balance agency for coordination between the Division 23 Contractor and the firm performing the work in this section.
- B. Division 23 drawings and specifications which define the scope of the systems to be balanced. Refer to construction bulletins for proposed changes and to change orders for changes that have been accepted.
- C. Division 26 drawings and specifications which define the scope of the electrical systems that serve the mechanical equipment.

1.05 PRE-BALANCE CONFERENCE

- A. Prior to beginning testing, adjusting and balancing, schedule and conduct a conference with the Architect/Engineer representative, Owner's project representative, and the mechanical system and temperature control system installing Contractors. The objective is final coordination and verification of system operation and readiness for testing, adjusting, and balancing procedures and scheduling procedures with the above mentioned parties. Indicate work required to be completed prior to testing, adjusting, and balancing and identify the party responsible for completion of that work.

1.06 SUBMITTALS

- A. See also Related Work in this section.
- B. Submit testing, adjusting, and balancing reports bearing the seal and signature of the NEBB or AABC Certified Test and Balance Supervisor. The certified test reports shall substantiate that the systems have been tested, adjusted and balanced in accordance with the referenced standards; are an accurate representation of how the systems have been installed and are operating; and are an accurate record of all final quantities measured to establish normal operating values of the systems.
- C. Submission: Submit one (1) preliminary report immediately to the Architect/Engineer to be included in the Health Care Request for Occupancy. Then submit a complete final set of reports. If information is incomplete or further testing, adjusting and balancing is deemed necessary, correct and then resubmit one (1) final complete set. Include a copy of the final approved air balance report in the O & M Manual.
- D. Projects constructed in phases are required to have an in-progress air balance report each time the construction zone changes with phasing. The in-progress balance report shall be submitted as required to achieve occupancy permit(s). At the conclusion of all phases of construction, all grilles and systems shall be balanced to ensure early construction phases were not affected by subsequent work. See Section 01 35 13 also.
- E. Format: Bind report forms in three-ring binders or portfolio binders. Label edge or front with label identifying project name, project number and descriptive title of contents. Divide the contents of the report into the below listed divisions, separated by divider tabs:

General Information

Summary

Air Systems

Hydronic Systems

Special Systems

F. Contents: Provide the following minimum information, forms and data:

1. General Information: Inside cover sheet identifying Test and Balance Agency, Contractor, Architect, Engineer, Project Name and Project Number. Include addresses, contact names, and telephone numbers. Also include a certification sheet containing the seal and signature of the Test and Balance Supervisor.
2. Summary: Provide summary sheet describing mechanical system deficiencies. Describe objectionable noise or drafts found during testing, adjusting and balancing. Provide recommendations for correcting unsatisfactory performances and indicate whether modifications required are within the scope of the contract, are design related or installation related. Include a summary of corrections made during the balance. List instrumentation used during testing, adjusting, and balancing procedures.
3. Each fan system shall include 3 sections of data. The submittal report shall contain all information requested. Reporting of/usage of A_k factors, flow factors, correction factors, grille discharge velocities are unacceptable. All data taken and recorded shall be actual equipment readings. The reported airflow readings for grilles and diffusers shall be backpressure compensated by the airflow measuring hood. Manual flow compensation independent of the hood calculation capabilities is unacceptable.
 - a. Section 1: The readings for the design and actual conditions shall include: supply CFM at the fan, total grille CFM, outside air CFM, return and/or exhaust CFM, fan static pressures along with a diagram showing the static pressures between the coils, filters and fan, fan RPM, pulley size, motor horsepower, amps, voltage, RPM. The fan and motor manufacturer nameplate information, along with the size and serial number, shall be included.
 - b. Section 2: For duct traverses, the readings shall include air quantities, velocity, static pressure, duct size, area, design velocity and CFM, actual velocity and CFM and static pressure. Record location of duct traverses. Individual pitot tube point readings shall be included.
 - c. Section 3: The supply air and exhaust air system grilles shall all be checked and results recorded on forms to indicate room number, size, type of grille, design CFM and actual CFM. The quantities shall be checked using a Shortridge hood. For situations where the hood is not applicable, use a duct traverse near the air inlet location.

4. Each pump system shall include 2 sections of data.
 - a. Section 1: Readings at the pump for the design and actual conditions, including GPM, total developed head, shutoff head, motor horsepower, amps, volts, RPM, motor manufacturer nameplate data.
 - b. Section 2: Readings for the branch/device design and actual flow conditions including GPM, balance valve CV with flow curve and body size, measured differential pressure.
5. The remainder of the report to contain the appropriate standard NEBB or AABC forms for each respective item and system. Fill out forms completely. Where information cannot be obtained or is not applicable, indicate same.

PART 2 PRODUCTS

2.01 INSTRUMENTATION

- A. Provide all required instrumentation to obtain proper measurements. Application of instruments and accuracy of instruments and measurements to be in accordance with the requirements of NEBB or AABC Standards and instrument manufacturer's specifications.
- B. All instruments used for measurements shall be accurate, and calibration histories for each instrument to be available for examination by Architect/Engineer upon request. Calibration and maintenance of all instruments to be in accordance with the requirements of NEBB or AABC Standards.
- C. Duct traverses shall be taken using a digital manometer.
- D. The speed of fan equipment shall be adjusted and checked with an eddy current (hand) tachometer. Where this is not possible, use a strobe tachometer.
- E. The motor voltage and amperage shall be checked with a voltmeter and ammeter.
- F. Grilles shall be checked using a digital airflow measuring hood as manufactured by Alnor or Shortridge.
- G. Water flow shall be read using a differential pressure meter having an accuracy of $\pm 1\%$ of full scale.

PART 3 EXECUTION

3.01 DAILY REPORTS

- A. Submit to Architect/Engineer's project representative daily work activity reports for each day on which testing and balancing work is performed. Reports shall include description of day's activities and description of any system deficiencies.

3.02 PRELIMINARY PROCEDURES

- A. Obtain preconstruction meeting report, applicable construction bulletins, applicable change orders, and approved shop drawings of equipment, outlets/inlets, and temperature controls.
- B. Check filters for cleanliness, dampers and valves for correct positioning, equipment for proper rotation and belt tension, temperature controls for completion of installation and hydronic systems for proper charge and purging of air.
- C. Notify Architect/Engineer's project representative on a daily basis during balancing. Identify deficiencies preventing completion of testing, adjusting, and balancing procedures. Do not proceed until systems are fully operational with all components necessary for complete testing, adjusting and balancing. Installing Contractors are required to provide personnel to check and verify system completion, readiness for balancing and assist Balancing Agency in providing specified system performance.

3.03 PERFORMING TESTING, ADJUSTING AND BALANCING

- A. Perform testing, adjusting, and balancing procedures on each system identified, in accordance with the detailed procedures outlined in the referenced standards except as may be modified below.
- B. Unless specifically instructed in writing, all work in this specification section is to be performed during the normal workday.
 - The existing MRI will require a temporary balance during the three day switchover period. The switch over period is 72 round the clock, continuous work hours. This contractor will be required to perform the work upon installation of the new ductwork systems, during this 72 hour period.
- C. In areas containing ceilings, remove ceiling tile to accomplish balancing work; replace tile when work is complete, and provide new tile for any tile that are damaged by this procedure. If the ceiling construction is such that access panels are required for the work of this section and the panels have not been provided, inform the Architect/Engineer's project representative.
- D. Cut insulation, ductwork, and piping for installation of test probes to the minimum extent necessary for adequate performance of procedures. Patch using materials identical to those removed, maintaining vapor barrier integrity and pressure rating of systems.

- E. In air systems employing filters, blank off sufficient filter area to simulate a pressure drop that is midway between that of a clean filter and that of a dirty filter. The balancer may also work with the Architect/Engineer to increase the fan RPM to compensate for a dirty filter and/or wet coil.
- F. Measure and record system measurements at the fan and/or pump to determine total flow. Adjust equipment as required to yield specified total flow at terminals. Proceed taking measurements in mains and branches as required for final terminal balancing. Perform terminal balancing to specified flows balancing branch dampers, deflectors, extractors and valves prior to adjustment of terminals.
- G. Measure and record static air pressure conditions across fans, coils and filters. Indicate in report if cooling coil measurements were made on a wet or dry coil and if filter measurements were made on a clean or dirty filter. Spot check static air pressure conditions directly ahead of terminal units.
- H. Adjust outside air, return air and relief air dampers for design conditions at both the minimum and maximum settings and record both sets of data. Balance modulating dampers at extreme conditions and record both sets of data. Balance variable air volume systems at maximum air flow rate, full cooling, and minimum flow rate, full heating; record all data.
- I. Adjust register, grille, and diffuser vanes and accessories to achieve proper air distribution patterns and uniform space temperatures free from objectionable noise and drafts within the capabilities of the installed system.
- J. Provide fan and motor drive sheave adjustments necessary to obtain design performance. Drive changes noted on drawings and specifications shall be included in the Contractor's bid. If work (not stipulated with plan or specification notes) indicates that any drive or motor is inadequate for the application, advise the Architect/Engineer's project representative by giving the representative properly sized motor/drive information (in accordance with manufacturer's original service factor and installed motor horsepower requirements); make sure that any change will keep the duct/piping system within its design limitations with respect to speed of the device and pressure classification of the distribution system. Time and material for motor/drive changes that are not specifically noted or specified will be considered a reimbursable expense and will require an itemized cost breakdown of all time and drive changes submitted to Architect/Engineer's project representative; prior authorization is needed before this work is started.
- K. After fans with adjustable pitch sheaves are balanced, This Contractor shall provide fixed pitch sheaves to replace adjustable sheaves on all fans with motors larger than 1HP. Turn removed items over to Owner. This work shall be included in the Contractor's bid.
- L. Areas or rooms designed to maintain positive, negative, or balanced air pressures with respect to adjacent spaces, as indicated by the design air quantities, require special attention. Adjust fan drives, distribution dampers, terminals and controls to maintain indicated pressure relationship.

M. Final air system measurements to be within the following range of specified cfm:

Fans	+5% to +10%
Supply grilles, registers, diffusers	0% to +10%
Return/exhaust grilles, registers	0% to -10% (0% to +5% in negatively pressurized room)
Pressurized rooms	-5% to +5% of CFM differential

N. Final water system measurements must be within the following range of specified gpm:

Heating flow rates	0% to -10%
Cooling flow rates	-5% to +5%

O. Contact the temperature control Contractor for assistance in operation and adjustment of controls during testing, adjusting, and balancing procedures. Cycle controls and verify proper operation and setpoints. Include in report description of temperature control operation and any deficiencies found.

P. Permanently mark equipment settings, including damper and valve positions, control settings, and similar devices allowing settings to be restored. Set and lock memory stops.

Q. Leave systems in proper working order, replacing belt guards, closing access doors and electrical boxes, and restoring temperature controls to normal operating settings.

3.04 DEFICIENCIES

A. Division 23 Contractor to correct any installation deficiencies found by the test and balance agency that were specified and/or shown on the Contract Documents to be performed as part of that division of work. Test and balance agency will notify the Architect/Engineer's project representative of these items immediately and instructions will be issued to the Division 23 Contractor for correction of the deficient work. All corrective work to be done at no cost to the Owner.

SECTION 23 07 00

HVAC INSULATION

PART 1 GENERAL

1.01 SCOPE

- A. This section includes insulation specifications for heating, ventilating and air conditioning piping, ductwork and equipment. Included are the following topics:

PART 1 - GENERAL

- Scope
- Related Work
- Reference
- Quality Assurance
- Description
- Definitions
- Shop Drawings

PART 2 - PRODUCTS

- Materials
- Insulation and Jackets
- Accessories

PART 3 - EXECUTION

- Installation
- Piping, Valve and Fitting Insulation
- Duct Insulation
- Equipment Insulation

1.02 RELATED WORK

- A. Section 23 05 00 - Common Work Results for HVAC
- B. Section 23 20 00 - Pipe and Pipe Fittings
- C. Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment
- D. Section 23 31 00 - HVAC Ducts and Casings

1.03 REFERENCE

- A. Applicable provisions of Division 01 govern work under this section.

1.04 QUALITY ASSURANCE

- A. Refer to Division 01, General Conditions, Equals and Substitutions.
- B. Label all insulating products delivered to the construction site with the manufacturer's name and description of materials.

1.05 DESCRIPTION

- A. Furnish and install all insulating materials and accessories as specified or as required for a complete installation. The following types of insulation are specified in this section:
 - Pipe Insulation
 - Duct Insulation
 - Equipment Insulation
- B. Install all insulation in accordance with the latest edition of MICA (Midwest Insulation Contractors Association) Standard and manufacturer's installation instructions. Exceptions to these standards will only be accepted where specifically modified in these specifications or where prior written approval has been obtained from the Architect/Engineer.

1.06 DEFINITIONS

- A. Concealed: Shafts, furred spaces, space above finished ceilings, utility tunnels and crawl spaces. All other areas, including walk-through tunnels, shall be considered as exposed.

1.07 SHOP DRAWINGS

- A. Refer to Division 01, General Conditions, Submittals.
- B. Submit a schedule of all insulating materials to be used on the project, including adhesives, fastening methods, fitting materials along with material safety data sheets and intended use of each material. Include manufacturer's technical data sheets indicating density, thermal characteristics, jacket type, and manufacturer's installation instructions.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Materials or accessories containing asbestos will not be accepted.
- B. Use composite insulation systems (insulation, jackets, sealants, mastics, and adhesives) that have a flame spread rating of 25 or less and smoke developed rating of 50 or less.
- C. Pipe insulation which is not located in an air plenum may have a flame spread rating not over 25 and a smoke developed rating no higher than 150.

2.02 INSULATION AND JACKETS

- A. Manufacturers: Armacell, Certainteed, Manson, Childers, Dow, Extol, Fibrex, Halstead, H.B. Fuller, Imcoa, Johns Manville, Knauf, Owens-Corning, Partek, Pittsburgh Corning, K-Flex, or approved equal.
- B. Insulating materials shall be fire retardant, moisture and mildew-resistant, and vermin-proof. Insulation shall be suitable to receive jackets, adhesives, and coatings as indicated.
- C. Flexible Fiberglass Insulation:
 - 1. Johns Manville Microlite EQ FSK, Knauf Friendly Feel with Ecosse, or approved equal.
 - 2. Insulation shall be free of formaldehyde, phenol, acrylics, and artificial colors. Insulation shall utilize minimum 24% post-consumer recycled content.
 - 3. Minimum nominal density of 0.75 lbs. per cu. ft., and thermal conductivity of not more than 0.3 at 75°F, rated for service to 250°F.
 - 4. Foil-scrim-kraft vapor barrier jacket, factory applied to insulation, maximum permeance of 0.02 perms.
- D. Rigid Fiberglass Insulation:
 - 1. Minimum nominal density of 3 lbs. per cu. ft., and thermal conductivity of not more than 0.23 at 75°F, minimum compressive strength of 25 PSF at 10% deformation, rated for service to 450°F.
 - 2. Insulation shall be free of formaldehyde, phenol, acrylics, and artificial colors. Insulation shall utilize minimum 24% post-consumer recycled content.
 - 3. Piping: White kraft reinforced foil vapor barrier all service jacket, factory applied to insulation with a self-sealing pressure sensitive adhesive lap, maximum permeance of 0.02 perms and minimum beach puncture resistance of 50 units.
 - a. Manufacturer/Product: Knauf Earthwool with Ecosse, or approved equal
 - 4. Ductwork: Foil-scrim-kraft vapor barrier jacket, factory applied to insulation, maximum permeance of 0.02 perms.
 - a. Manufacturer/Product: Knauf Insulation Board with Ecosse, or approved equal
- E. Calcium Silicate Insulation: Rigid hydrous calcium silicate, ASTM C533, Type I, minimum dry density of 12.5 lbs. per cu. ft., thermal conductivity of not more than 0.44 at 300°F, maximum water absorption of 90% by volume, minimum compressive strength 140 psi at 5% deformation, rated for service range of 0°F to 1200°F. Material to be visually coded or marked to indicate it is asbestos-free.

- F. Elastomeric Insulation: Flexible closed cell, minimum nominal density of 5.5 lbs. per cu. ft., thermal conductivity of not more than 0.27 at 75°F, minimum compressive strength of 4.5 psi at 25% deformation, maximum water vapor permeability of 0.17 perm inch, maximum water absorption of 6% by weight, rated for service range of -20°F to 220°F on piping and 180°F where adhered to equipment.
- G. Polyolefin Insulation: Flexible closed cell, minimum nominal density of 1.5 lbs. per cu. ft., thermal conductivity of not more than 0.24 at 75°F, minimum compressive strength of 5 psi at 25% deformation, maximum water vapor permeability of 0.0 perm inch, maximum water absorption of 0% by weight and volume, rated for service range of -165°F to 210°F.
- H. PVC Fitting Covers and Jackets: White PVC film, gloss finish one side, semi-gloss other side, FS LP-535D, Composition A, Type II, Grade GU. Ultraviolet inhibited indoor/outdoor grade to be used where exposed to high humidity, ultraviolet radiation, in kitchens or food processing areas or installed outdoors. Jacket thickness to be minimum 0.02" indoors/0.03" outdoors for piping 12" and smaller, 0.03" indoors/0.04" outdoors for piping 15" and larger.
- I. Insulation Inserts and Pipe Shields:
1. Manufacturers: B-Line, Pipe Shields, Value Engineered Products
 2. Construct inserts with calcium silicate or polyisocyanurate (service temperatures below 300°F only), minimum 140 psi compressive strength. Piping 12" and larger, supplement with high density 600 psi structural calcium silicate insert. Provide galvanized steel shield. Insert and shield to be minimum 180 degree coverage on bottom supported piping and full 360 degree coverage on clamped piping. On roller mounted piping and piping designed to slide on support, provide additional load distribution steel plate.
 3. Where Contractor proposes shop/site fabricated inserts and shields, submit schedule of materials, thicknesses, gauges, and lengths for each pipe size to demonstrate equivalency to preengineered/premanufactured product described above. On low temperature systems, high density rigid polyisocyanurate may be substituted for calcium silicate provided insert and shield length and shield gauge are increased to compensate for lower insulation compressive strength.
 4. Precompressed 20# density molded fiberglass blocks, Hamfab or equal, of the same thickness as adjacent insulation may be substituted for calcium silicate inserts with one 1" x 6" block for piping through 2-1/2" and three 1" x 6" blocks for piping through 4". Submit shield schedule to demonstrate equivalency to preengineered/premanufactured product described above.
 5. Wood blocks will not be accepted.

2.03 ACCESSORIES

- A. All products shall be compatible with surfaces and materials on which they are applied and be suitable for use at operating temperatures of the systems to which they are applied.
- B. Adhesives, sealants, and protective finishes shall be as recommended by insulation manufacturer for applications specified.
- C. Insulation bands to be 3/4" wide, constructed of aluminum or stainless steel. Minimum thickness to be 0.015" for aluminum and 0.010" for stainless steel.
- D. Tack fasteners to be stainless steel ring grooved shank tacks.
- E. Staples to be clinch style.
- F. Insulating cement to be ANSI/ASTM C195, hydraulic setting mineral wool.
- G. Finishing cement to be ASTM C449.
- H. Fibrous glass or canvas fabric reinforcing shall have a minimum untreated weight of 6 oz./sq. yd.
- I. Bedding compounds to be non-shrinking and permanently flexible.
- J. Vapor barrier coatings and tapes to have maximum applied water vapor permeance of 0.05 perms.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install insulation, jackets, and accessories in accordance with manufacturers' instructions and under ambient temperatures and conditions recommended by manufacturer. Surfaces to be insulated must be clean and dry.
- B. Do not insulate systems or equipment which are specified to be pressure tested or inspected until testing, inspection, and any necessary repairs have been successfully completed.
- C. Install insulation with smooth and even surfaces. Poorly fitted joints or use of filler in voids will not be accepted. Provide neatly beveled and coated terminations at all nameplates, uninsulated fittings, or at other locations where insulation terminates.
- D. Install fabric reinforcing without wrinkles. Overlap seams a minimum of 2".
- E. Use full length material (as delivered from manufacturer) wherever possible. Scrap piecing of insulation or pieces cut undersize and stretched to fit will not be accepted.

- F. Insulation shall be continuous through sleeves and openings except where fire rated penetration materials require interruption of insulation. Vapor barriers shall be maintained continuous through all penetrations.
- G. Provide a complete vapor barrier for insulation on the following systems:
 - Cold Water Make-Up
 - Chilled Water
 - Insulated Duct
 - Equipment or piping with a surface temperature below 65°F

3.02 PIPING, VALVE, AND FITTING INSULATION

A. General:

1. Install insulation with butt joints and longitudinal seams closed tightly. Provide minimum 2" lap on jacket seams and 2" tape on butt joints, firmly cemented with lap adhesive. Additionally secure with staples along seams and butt joints. Coat staples, longitudinal and transverse seams with vapor barrier mastic on systems requiring vapor barrier.
2. Install insulation continuous through pipe hangers and supports with hangers and supports on the exterior of insulation. Where a vapor barrier is not required or where roller hangers are not being used, hangers and supports may be attached directly to piping with insulation completely covering hanger or support and jacket sealed at support rod penetration. Where riser clamps are required to be attached directly to piping requiring vapor barrier, extend insulation and vapor barrier jacketing/coating around riser clamp.
3. Fully insulate all reheat coil piping, fittings, and valves up to coil connection to prevent condensation when coil is inactive during cooling season. Unions on terminal reheat coils are not required to be insulated, except when closer than 12" to coil.
4. Insulate unions: Insulation thickness shall be a pronounced step-up from adjacent piping insulation such that the location of the union is easily identifiable. In addition, Contractor shall identify location with stenciling.
5. Insulate all shutoff valves, balancing valves, control valves, pressure reducing valves, strainers, steam traps, flanges, or any combination thereof.
6. All piping and equipment, including piping furnished with equipment shall be insulated to prevent condensation and/or heat loss into the mechanical room.

- B. Insulation Inserts and Pipe Shields: Provide insulation inserts and pipe shields at all chilled water and 2" and smaller low pressure steam and condensate pipe hanger locations. Inserts may be omitted on 3/4" and smaller copper piping provided 12" long 22 gauge pipe shields are used.

- C. Fittings and Valves: Fittings, all valves (hot and cold), prepipe valve assemblies (where allowed), unions, flanges, couplings and specialties may be insulated with factory molded or built-up insulation of the same thickness as adjoining insulation. Cover insulation with fabric reinforcing and mastic or where temperatures do not exceed 150°F, PVC fitting covers. Secure PVC fitting covers with tack fasteners and 1-1/2" band of mastic over ends, throat, seams, and penetrations. On systems requiring vapor barrier, use vapor barrier mastic.
- D. Elastomeric and Polyolefin: Where practical, slip insulation on piping during pipe installation when pipe ends are open. Miter cut fittings allowing sufficient length to prevent stretching. Completely seal seams and joints for vapor tight installation. For elastomeric insulation, apply full bed of adhesive to both surfaces. For polyolefin, seal factory pre-glued seams with roller and field seams and joints with full bed of hot melt polyolefin glue to both surfaces. Cover elastomeric insulation on systems operating below 40°F with vapor barrier mastic.
- E. Pipe Insulation Schedule:

1. Provide insulation on new and existing remodeled piping as indicated in the following schedule:

Service Types	Insulation	Insulation Thickness by Pipe Size				
		<1	1" to 1.25	1.5" to 3"	4" to 6"	8"+
Hot Water Heating	Rigid Fiberglass	1.5"	1.5"	2"	2"	2"

2. The thickness of insulation in some locations may have to be reduced due to space limitations. The insulation thickness may be reduced in these areas as agreed to with Architect's representative.
3. Provide 1/2" elastomeric/polyolefin on pressure gauge piping and thermometer runnout.

3.03 DUCT INSULATION

A. General:

1. Secure flexible duct insulation on sides and bottom of ductwork over 24" wide and all rigid duct insulation with weld pins or speed clips. Space fasteners 18" on center or less as required to prevent sagging for flexible duct insulation. Space fasteners not less than 3" from edge or corner and 12" on center or less for rigid duct insulation. Install weld pins without damage to the interior galvanized surface of the duct. Clip pins back to washer and cover penetrations with tape of same material as jacket. Firmly butt seams and joints and cover with 4" tape of same material as jacket. Seal tape with plastic applicator and secure with staples. All joints, seams, edges, and penetrations to be fully vapor sealed.
2. Stop and point insulation around access doors and damper operators to allow operation without disturbing insulation or jacket material.
3. Provide 50% coverage of Foster 85-20 adhesive for rigid insulation in addition to clips and pins.
4. The insulation on outside air ducts shall have butting edges kerfed to prevent straight through joints.

B. Duct Insulation Schedule:

1. Provide duct insulation on new and existing remodeled ductwork in the following schedule:

<u>Service</u>	<u>Insulation Type</u>	<u>Insulation Thickness</u>
Exposed supply ducts*	Rigid Fiberglass	2"
Concealed supply ducts	Flexible Fiberglass	1-1/2"
Exhaust and relief ducts downstream and within 3 ft. upstream of control dampers	Rigid Fiberglass	2"
All ducts exposed to weather	Rigid Fiberglass	3"

- * Exposed supply branch ducts located in the space they are serving do not require insulation. Exposed supply main ducts running through spaces they serve shall be insulated as exposed supply ducts scheduled above.

2. Standing seam shall be insulated with the same thickness as adjoining duct.

3.04 EQUIPMENT INSULATION

- A. General: Do not insulate over equipment access manholes, fittings, nameplates or ASME stamps. Bevel and seal insulation at these locations.

B. Equipment Insulation Schedule:

1. Provide equipment insulation as follows:

<u>Equipment</u>	<u>Insulation Type</u>	<u>Thickness</u>
Reheat coil casing in exposed supply ducts	Rigid Fiberglass	2"
Reheat coil casing in concealed supply ducts	Flexible Fiberglass	1-1/2"

ELECTRONIC AND DDC CONTROL COMPONENTS FOR HVAC

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Work in this section includes Direct Digital Control (DDC) panels, communication trunks, software programming, and other equipment and accessories necessary to constitute a completely coordinated extension of the existing campus Direct Digital Control (DDC) system, interfaced with electric controls utilizing Direct Digital Control signals to operate electrically actuated control devices to meet, in every respect, all operational and quality standards specified herein.
- B. Work in this section includes the control sequences and DDC point list to operate new, existing, and built-up systems. Included are the following topics:

PART 1 - GENERAL

Work Included
Related Work
General Notes

PART 2 - PRODUCTS

Temperature Control System
Direct Digital Controls
Operator Interface
Equipment

PART 3 - EXECUTION

General
Installation
Control Valves
Room Thermostats and Temperature Sensors

1.02 RELATED WORK

- A. Applicable provisions of Division 01 govern work in this section.
- B. Section 23 05 00 - Common Work Results for HVAC

1.03 GENERAL NOTES

- A. Furnish shop drawings for equipment furnished under this section as required by Division 01. Shop drawings shall be submitted and approved prior to commencing work on site.
- B. Extend an existing KMC BATI system. Contact Jnitz@bati-kmc.com or cnitz@bati-KMC.com, Phone: (1) 920-428-2175. System to be Direct Digital Logic with electric actuation.
- C. Contractor shall be responsible for storage and protection of equipment and materials on the site.

PART 2 PRODUCTS

2.01 TEMPERATURE CONTROL SYSTEM

- A. The Contractor shall furnish and install complete system of automatic temperature controls as hereinafter specified. The control system shall be DDC with electric operators, and all work shall be installed by mechanics of the control equipment manufacturer who is to be responsible for the proper installation and operation of the control equipment. All control apparatus shall be of a size to properly supply and/or operate and control the apparatus served, and all work shall be done in a neat and workmanlike manner to the satisfaction of the Architect. Thermostats shall be located by the control manufacturer subject to the approval of the Architect. Prior to starting any work, the control manufacturer shall submit drawings for approval. The temperature controls shall be guaranteed to maintain the temperature in rooms within 1 degree of the setting. Thermostats shall operate valves and dampers with true gradual motion, holding them at required intermediate position, except where specified to have a 2-position action. Temperature control and equipment suppliers shall furnish automatic control valves and automatic dampers for installation by the Heating and Sheet Metal Contractor.
- B. Wiring: The Temperature Control Trade shall provide all wiring for all electric temperature control devices. The Electrical Trade shall provide branch circuits within the electrical distribution panels for Temperature Control Trade use. All power wiring to motors will be installed by the Electrical Contractor.
 - 1. Both line and low voltage wiring shall be run in thin wall conduit (EMT) in exposed and inaccessible indoor areas and in rigid conduit when installed outdoors or in concrete or underground areas. All temperature control wiring shall be 120 volts or lower. For equipment started by temperature control system, the temperature control contacts shall be wired into the automatic side of the hand-off automatic switch furnished with the starter. For 120 volt motors, the temperature control contacts may be wired into the 120 volt circuit. Use 120 volt solenoids.
 - 2. Control wiring diagrams for each system showing starter, holding coil, overloads, hand-off automatic selector switch, control transformer and temperature control items such as freezestat, time clock, solenoid valves and interlocking devices shall be prepared by the Temperature Control Contractor and submitted for approval.
 - 3. Wiring materials and procedures shall be in accordance with Division 26 of the specification. Provide products which have been tested, listed, and labeled by UL and comply with NEMA standards. Controls shall comply with FCC rules on electrical interference.

- C. General Completion: All temperature control work shall be installed and tested complete by a factory trained technician in such a manner as to provide ready for operation and entire installation in accordance with the intent of the drawings and specifications.
 - 1. As areas of the building are being turned over to the Owner for Substantial Completion and occupancy, instructional sessions on equipment operation and control shall be occurring. Substantial Completion shall not occur until the Owner has received instructions on the systems turned over.
 - 2. Equipment shall be warranted for 3 years. Labor shall be warranted for 1 year. During the warranty period, the defective piece of equipment shall be replaced or repaired free of charge.

2.02 DIRECT DIGITAL CONTROLS

- A. The facility management system shall be capable of integrating multiple building functions, including equipment supervision and control, alarm management, energy management, and trend data collection.
- B. The DDC shall consist of Supervisory Controllers, Programmable Controllers, stand-alone Application Specific Controllers (ASCs), Operator Terminals, Operator Workstations, DDC system servers, and other operator interface devices.
- C. The system shall be modular in nature and shall permit expansion of both capacity and functionality through the addition of sensors, actuators, ASCs, and operator devices.
- D. The failure of any single component or network connection shall not interrupt the execution of control strategies at other operational devices.

2.03 OPERATOR INTERFACE

- A. Utilize the existing operator workstations. Provide text/graphical displays which matches the existing facilities standards

2.04 EQUIPMENT

A. Thermostats, Electric Sensors and Controllers:

1. Electronic sensors and controllers shall be the following:
 - a. Immersion type; proportional, RTD element, with separable brass bulb well, end-to-end accuracy of $\pm 1/2^{\circ}\text{F}$, including linearity and hysteresis. A well schedule shall be included in the shop drawing submittal, defining size, thread type, location, line size and function. An approved copy of the schedule shall be supplied to the Heating Trade. See Sections 23 05 00-23 37 13 for materials supplied by the Heating Trade.
 - b. Duct insertion type; proportional, RTD averaging type sensing element minimum 8 feet long.
 - c. Wall mounted type; proportional, 55°F to 85°F range, RTD element, end-to-end accuracy of $\pm 1/2^{\circ}\text{F}$, including linearity and hysteresis.
 - d. Outdoor surface mounted type; proportional with weather and dirt protected RTD element enclosed in corrosion resistant, vented metal case.
 - e. Current Relays: Proof of operation/status indication shall be provided with current relays as manufactured by Veris Industries, Inc., Hawkeye 708, or Neilsen-Kuljian Sentry SC250. Current relays shall be individually calibrated to detect broken belt/coupling condition (under current condition).
2. Standard room thermostat shall be a networked low voltage (24VAC) device with single temperature setpoint adjustment, at the device, with 65°F - 85°F graduated scale. Provide other setpoint scales as indicated. All thermostats shall have a thermometer or digital display mounted in the cover.
3. The setpoint for all indicators shall be selected in the middle of the range.
4. Provide open setpoint (flip cover is acceptable) in offices and staff locations. Provide concealed setpoint (locking cover is acceptable) in public spaces (waiting rooms, corridors, etc.).

- B. Automatic Control Valves: All valve operators shall be fully proportional, unless otherwise specified. Where valves are operated in sequence with other valves or dampers, they are to be equipped with a pilot positioner with adjustable ranges for both throttling range and starting point. All cabinet heater valves shall have operators sized to provide for fully concealing the valve behind the cover. Valves 2" and smaller shall be of the screwed type. All valves shall be equipped with throttling plugs to provide linear flow characteristics. Low pressure steam valves shall have stainless steel trim and removable seats. Provide complete stainless steel valves for medium and high pressure steam. Terminal unit control valves shall be bronze bodied globe or ball valves, Johnson Controls VG1000 Series or equal.
1. Valves must be selected to prevent overlap of operation and heating and cooling.
 2. Size for 4 to 6 psig drop on water and 50% inlet pressure for steam, unless indicated otherwise.
 3. Electronic Valve Actuators
 - a. Electronic valve actuators shall be manufactured by the valve manufacturer.
 - b. Each actuator shall have current limiting circuitry incorporated in its design to prevent damage to the actuator.
 - c. Modulating and two-position actuators shall be provided as required by the sequence of operations. Actuators shall provide the minimum torque required for proper valve close-off against the system pressure for the required application. The valve actuator shall be sized based on valve manufacturer's recommendations for flow and pressure differential. The spring return feature shall permit normally open or normally closed positions of the valves, as required. All heating valves shall fail open; all cooling valves shall fail closed. All direct shaft mount rotational actuators shall have external adjustable stops to limit the travel in either direction.
 - d. Modulating actuators shall accept 24VAC or FDC and 120VAC power supply and be UL listed. The control signal shall be 2-10VDC or 4-20 mA and the actuator shall provide a clamp position feedback signal of 2-10VDC. The feedback signal shall be independent of the input signal and may be used to parallel other actuators and provide true position indication. The feedback signal of each valve actuator (except terminal valves) shall be wired back to a terminal strip in the control panel for trouble-shooting purposes.
 - e. Two-position or open/closed actuators shall accept 24VAC or 120VAC power supply and be UL listed.
- C. The work involved is outlined with the drawings in the word and drawing section of the contract document.

PART 3 EXECUTION

3.01 GENERAL

- A. All electronic work required as an integral part of the Direct Digital Control system work is the responsibility of this section unless specifically indicated otherwise in this section, Section 23 09 93, or in Division 26.
- B. This contractor shall provide all labor, materials, engineering, software, permits, tools, checkout and certificates required to install a complete Direct Digital Control system as herein specified.
- C. Any and all points added with this project shall be grouped for display purposes into the system such that all points associated with a new or existing DDC system can appear together on the flat panel display or printed log. Assignment of points to a group shall not be restricted by hardware configuration of the points of direct digital control. It shall be possible to assign a point to appear in more than one system. An English descriptor and an alpha/numeric identifier shall identify each system.
- D. This Direct Digital Control system as herein specified shall be fully integrated and completely installed by this section. It shall include all required computer CPU software and hardware. Include the engineering, installation, supervision, calibration, software programming, and checkout necessary for a fully operational system.

3.02 INSTALLATION

- A. Install system with trained mechanics and electricians employed by the control equipment manufacturer or an authorized representative of the manufacturer. Where installing contractor is an authorized representative of the control manufacturer, such authorization shall have been in effect for a period of no less than three years.
- B. Install all control equipment, accessories and wiring in a neat and workmanlike manner. All control devices must be installed in accessible locations. All work and materials are to conform in every detail to the rules and requirements of the National Electrical Code and present manufacturing standards. All material shall be UL approved.
- C. Label all control devices with the exception of terminal unit devices with permanent printed labels that correspond to control drawings. Labeling for each device shall be unique within each mechanical system. Temperature control junction and pullboxes shall be identified utilizing spray painted green covers. Other electrical system identification shall follow the Division 26 specification.
 - 1. All electrical wiring shall be permanently tagged or labeled within 1" of terminal strip with a numbering system to correspond with the "Record Drawings", spares are to be labeled as "Spare".

- D. Provide all electrical relays and wiring, line and low voltage, for control systems, devices and components. Install all high voltage and low voltage wiring in metal conduit or EMT unless specifically called out in this section. All conduit and EMT must be installed in accordance with electrical sections (Division 26) of this specification and the National Electrical Code.
1. Low voltage wiring can be run without conduit above accessible lay-in tile ceilings. All wiring in mechanical rooms, above inaccessible hard ceilings, exterior locations, and in any exposed areas, and in all other locations shall be in conduit. Wire for wall sensors shall be run in conduit. Wiring for radiation valves shall be run in conduit where routed through walls. Where wiring is installed free-air, installation shall consider the following:
 - a. Wiring shall utilize dedicated cable tray when 20 or more wires are grouped together. Utilize Facilities Communications cable tray only with written permission from the Facility IT Manager or Director of Plant Services.
 - b. Wiring shall run at right angles and be kept clear of other trades work.
 - c. Wiring shall be supported utilizing "J-" or "Bridal-type" mounting rings anchored to ceiling concrete, piping supports or structural steel beams.
 - d. Supports shall be spaced at a maximum 4-foot interval unless limited by building construction. If wiring "sag" at mid-span exceeds 6", another support shall be used.
 - e. Wiring shall never be laid directly on the ceiling grid or attached in any manner to the ceiling grid wires.
 - f. Wall penetrations shall be sleeved.
 - g. Wiring shall not be attached to existing cabling, existing tubing, plumbing or steam piping; ductwork, ceiling supports or electrical or communications conduit.
 - h. Provide unique color-coded wire for temperature control functions.
- E. Division 23 control wiring required to be in conduits shall not be installed in Division 26 conduits. Control wiring shall be installed in dedicated Division 23 control conduits. In addition, 120 volt and higher voltage control system wiring shall be installed in separate conduit from all low voltage control wiring.
- F. Conduit may be a minimum of 1/2" for low voltage control provided the pipe fill does not exceed 40%.
- G. Minimum low voltage wiring gauge to be 18 AWG for outputs and 20 AWG for inputs. All low voltage wiring to be stranded.
- H. Wiring must be installed and supported in a manner as specified for exposed locations and acceptable to Architect/Engineer.

- I. After completion of installation, test and adjust control equipment.
Provide documentation to demonstrate that all points, input and output, have been checked out and verified operational, note any points not operating properly with notation of reason.

3.03 CONTROL VALVES

- A. All temperature control valves furnished by the control manufacturer are to be installed by the Mechanical Contractor under the coordinating control and supervision of the Control Contractor in locations shown on plans or where required to provide specified sequence of control.

3.04 ROOM THERMOSTATS AND TEMPERATURE SENSORS

- A. Check and verify location of thermostats, humidistats, and other exposed control sensors with plans and room details before installation. Locate room thermostats 48" above floor unless noted otherwise. Align with light switches and humidistats. For drywall installations, thermostat mounting shall use a back-box or plaster plate attached to a wall stud, drywall anchors are not acceptable.
- B. Any thermostats associated with radiation should be dual temperature type.
Any thermostat that is only controlling an air terminal or vestibule cabinet heater should be single temperature type.
- C. Any room thermostats or sensors mounted on an exterior wall shall be mounted on a thermally insulated sub-base. Subbase to provide a minimum of 1/2" of insulation.
- D. Where thermostats or sensors are mounted on exterior walls or in any location where air transfer will affect the measured temperature or humidity, seal the conduit and any other opening that will affect the measurement.

SEQUENCE OF OPERATION FOR HVAC CONTROLS

PART 1 GENERAL

1.01 SCOPE

- A. This section includes automatic control sequence specifications for systems found in other specification sections. Included are the following topics:

- PART 1 - GENERAL

- Scope

- Related Documents

- Description of Work

- Submittals

- PART 2 - PRODUCTS

- Not Applicable

- PART 3 - EXECUTION

- General

- Booster Coil Control

- DDC Points

- Electric Power

- System Commissioning Requirements

- Demolition

1.02 RELATED DOCUMENTS

- A. Applicable provisions of Division 01 shall govern work in this section.
- B. Division 23 - HVAC-Equipment provided to be controlled or monitored.
- C. Division 26 - Electrical-Equipment provided to be controlled or monitored.

1.03 DESCRIPTION OF WORK

- A. Control sequences are hereby defined as the manner and method by which automatic temperature controls function. Requirements for each type of operation are specified in this section.
- B. Operating equipment, devices and system components required for automatic temperature control systems are specified in other sections of these specifications.

1.04 SUBMITTALS

- A. Shop Drawings: Submit shop drawings for each system automatically controlled, containing the following information:
- Schematic flow diagram of system showing fans, pumps, coils, dampers, valves and control devices.
 - Label each control device with setting or adjustable range of control.
 - Indicate pneumatic piping; factory and field wiring.
 - Indicate each control panel required, with internal and external piping and wiring clearly indicated. Provide detail of panel face, including controls, instruments and labeling.
 - Include control narrative of the control sequence of each operation and interlocks with other operations.
- B. Maintain Data: Include copy of "As-Built" shop drawings in each maintenance manual. "As-Built" drawings shall identify the location of concealed control devices by room number and location description.
- C. Provide a copy of the controls and sequence of operation in each unit's control cabinet.

PART 2 PRODUCTS

- A. Not applicable to this section. Reference Section 23 09 33.

PART 3 EXECUTION

3.01 GENERAL

- A. Setpoints:
1. All setpoints indicated in the control specification are to be adjustable. The setpoints shall be readily available to be modified in the mechanical system software system summary (either textual or graphic based) and under the same software level as hardware points. Some less used setpoints may be provided on a lower software level, if requested by the User Agency for clarity.
 2. The setpoints indicated herein are only specified as a calculated starting point (or initial system operation). It is expected that setpoint adjustments and control loop tuning shall be required to provide optimum system operation based on requirements of the building. The control contractor shall work with the balancing contractor and the User Agency to provide the final system setpoint adjustments and control loop tuning after the system is in operation and building is in use. Document all final setpoints on the as-built control drawings. Any questions regarding the intended operation of the HVAC equipment and control systems shall be referred to the HVAC design engineer through the appropriate construction communication process.

3. The following setpoints should be used as initial setpoints unless otherwise specified in the individual control sequences or instructed by the user Agency. If the Contractor fails to check with the User Agency for final setpoints, they shall adjust setpoints at no additional cost.

Occupied Space Terminal Unit Heating: 72°F

Occupied Space Terminal Unit Cooling: 74°F

Unoccupied Space Terminal Unit Heating: 62°F

Unoccupied Space Terminal Unit Cooling: 82°F

B. Anti-cycling:

1. When HVAC equipment or a sequence is specified to be started and stopped by a temperature, humidity, pressure setpoint or any other controlled variable, there shall be an adjustable differential setpoint that shall be set to prevent short cycling of the systems and equipment due to minor changes in the controlled variable. Temperature differential setpoints shall be set at 2°F and non-temperature setpoints shall be set at 10% of the controlled range unless otherwise specified. Setpoints shall indicate at when the process should be turned on. Heating and cooling differentials shall be set for above setpoint and will be used to turn the process off. For example, an economizer sequence called to switch at 68°F would turn on at 68°F and off at 70°F since it is a cooling function. A heating lockout setpoint of 50°F would turn on heating control at 50°F and off at 52°F. Non-temperature differentials shall be set above setpoint if the setpoint is indicating a minimum value or below setpoint if the setpoint is indicating a maximum value.
2. Provide minimum runtime timers for loads that are cycled to prevent over-cycling. Timers shall be set as specified or as needed to prevent damage or excessive wear to the equipment. Unless otherwise specified in the individual control sequences, fans and pumps shall have a minimum runtime on timers of 15 minutes (adj.) and off timers of 5 minutes (adj.). Safeties shall override runtime timers.

C. Deadbands:

1. Provide deadbands for all DDC control loops to prevent constant hunting of output signals to controlled devices. Deadbands shall be set to provide adequate control around setpoint as follows unless otherwise specified in the individual control sequences:

Temperature Control: $\pm 0.5^\circ\text{F}$

D. Alarms:

1. Provide all alarmed points with adjustable time delays to prevent nuisance tripping under normal operation and on equipment start-up. For all commanded outputs that have status feedback, provide an alarm that will indicate the commanded output is not in its commanded state. Provide alarms on all points as indicated on point charts. For existing campus automations systems, add/delete what is called on the point charts for after consultation with User Agency to provide consistent alarming throughout the automation system.
2. For devices that have form "C" contacts available for alarm monitoring, use closed contacts for the Normal condition and open contacts on Alarm condition. This will provide a level of supervision by detecting a break in the wiring.

E. Thermostats and Sensors:

1. All devices and equipment including terminal units, specified to be controlled in a control sequence by a thermostat or sensor, shall be provided with a thermostat or sensor, whether or not the device is indicated on the plans. Consult the HVAC design engineer for the thermostat or sensor location.

F. DDC Controller Communication Bus Configuration:

1. The actively controlled primary mechanical equipment (AHU's, hot water, chilled water, boilers, etc.) DDC controllers shall be configured to be located on the same supervisory controller BACnet MSTP communication trunk unless the supervisory controller capacity prevents it. If this is the case, the primary mechanical equipment DDC controllers shall be separated onto supervisory controllers in such a way that the systems that need to share information for operation and interlocking shall reside on the same supervisory controllers.
2. When AHU systems have associated exhaust fan systems that are interlocked and designed to operate together as a combined air system within a building, these must be on the same BACnet MSTP trunk.
3. Peer to peer communication shall be used for interlocks and data sharing between the AHU and exhaust fans systems when possible to limit air system disruptions in the event of a supervisory controller failure.
4. Other critical building systems that require communication between DDC controllers to operate shall be on the same BACnet MSTP communication trunk. Terminal unit controllers shall be located on separate BACnet MSTP trunks if necessary to allow for primary equipment to reside on the same BACnet MSTP trunk.
5. If the DDC controllers used for control of primary mechanical equipment and interlocks or point information is required for proper operation as described above, do not use BACnet MSTP communication but use Ethernet communication; the DDC controllers shall be connected to the same Ethernet switch. If the controllers cannot be connected to the same switch, hardwired points between controllers shall be used to share information.

G. Controlled Variable Requirements:

1. All controlled variables, i.e. static pressure, differential pressure, temperature, humidity, etc., shall be wired directly to the DDC controller in which the software PID loop or other similar software loop resides unless the control sequence specifically allows the controlled variable to be routed over the network. Where a controlled variable is used for reset of a PID loop, the controlled variable shall be allowed to be shared over the network unless specified to be directly wired to the DDC controller.

3.02 BOOSTER COIL CONTROL

- A. Provide a wall mounted thermostat to control a modulating electric valve to maintain room temperature. The stat and valve shall be low voltage type unless otherwise noted. Low voltage DDC systems are indicated with the subscript "D" under the stat symbol.
- B. Control Description:
 - o As the room temperature decreases, modulate the control valve toward 100% open position to maintain the room temperature. On an increase in room temperature, reverse the cycle.

3.03 DDC POINTS

- A. Provide all control points necessary for the execution of control sequences (and attached Points List). Provide all software programming required, creating displays of the new control sequences and display points on the computer system. Control point identification and terminology shall be consistent with that currently used by the Hospital Staff.
- B. Include the cost to upgrade existing DDC system front end software/hardware in order to make the new DDC system integrate to the existing. Identify this cost and changes required with the Architect/Engineer.
- C. Provide for monitoring the following:
 - Each reheat terminal/space:
 - Room temperature
 - Room temperature setpoint

3.04 ELECTRIC POWER

- A. All air units and equipment indicated as being on emergency power shall have their respective DDC controls wired to emergency power. This includes the DDC panel for generator controls, fire alarm panels, and elevator panels. The Electrical Trade will extend power for all DDC control units to designated locations in mechanical rooms, storage rooms or other acceptable locations (coordinate with Owner) defined in Section 23 09 33. See electrical plans for quantity of power circuits provided by the Electrical Trade.

- B. All 120V power for field wired control devices shall be by the Temperature Control Trade. The Electrical Trade will provide a 120V circuit, located next to each control panel defined on the drawings. Refer to the electrical drawings for additional power extension for controllers in the occupied areas.
- C. The existing control system is electric with low voltage actuation. This contractor shall remove the equipment and wiring serving the demolished devices and renovated rooms. Utilize the existing control power circuits to serve new control devices.
- D. If additional power is needed beyond what is shown, This Trade shall extend the power from the appropriate electrical panels using spare 20amp breakers. Coordinate all power requirements with the Electrical Trade and Electrical Engineer.

3.05 SYSTEM COMMISSIONING REQUIREMENTS

- A. The Temperature Control and Air Balancing Trades shall allow adequate time to properly set up these systems prior to required start-up.
- B. The Temperature Control and Air Balancing Trades shall coordinate their work efforts to ensure damper positioning and control sequences are set up and operate properly.
- C. The Control Contractor shall test each damper, valve, and thermostat to ensure that the devices operate in accordance with the specified control sequences.
- D. After the Control Contractor has installed all equipment and system programming and has determined that the equipment and systems are functioning properly, the Control Contractor shall commission the air unit by manually changing setpoints and sensor readings to simulate a complete (1) year seasonal cycle and ensure that the control system operates the dampers and valves in the correct manner. Contractor shall schedule the commissioning to take place immediately prior to or after a regular project meeting so that the Owner and Architect/Engineer may be present to witness the commissioning process. If the project does not have regular progress meetings, provide a (2) week advanced notice of commissioning date and time.

3.06 DEMOLITION

- A. Provide for renovation and demolition of existing temperature control work as required for this building modification. Remove thermostats, humidistats, controllers and tubing as necessary in the remodeled area. No equipment or tubing shall be left in an abandoned state.
- B. Existing communication trunks and air lines that are abandoned shall be removed. Lines and tubes that must remain active shall be rerouted to ensure that all devices remain operational throughout the construction process and after construction is complete.

SECTION 23 20 00

PIPE AND PIPE FITTINGS

PART 1 GENERAL

1.01 SCOPE

- A. This section contains specifications for all HVAC pipe and pipe fittings for this project. Included are the following topics:

PART 1 - GENERAL

- Scope
- Related Work
- Reference
- Shop Drawings
- Quality Assurance
- Delivery, Storage, and Handling
- Design Criteria
- Welder Qualifications

PART 2 - PRODUCTS

- Heating Hot Water
- Vents
- Unions and Flanges
- Mechanical Grooved Pipe Connections
- Copper Press Fittings

PART 3 - EXECUTION

- Preparation
- Erection
- Threaded Pipe Joints
- Copper Pipe Joints
- Mechanical Grooved Pipe Connections
- Water System
- Vents
- Steam and Steam Condensate
- Unions and Flanges
- Piping Procedure

1.02 RELATED WORK

- A. Section 23 05 23 - General Duty Valves for HVAC Piping
- B. Section 23 05 15 - Piping Specialties
- C. Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment
- D. Section 23 07 00 - HVAC Insulation

1.03 REFERENCE

- A. Applicable provisions of Division 01 govern work under this section.

1.04 SHOP DRAWINGS

- A. Refer to Division 01, General Conditions, Submittals.
- B. Contractor shall submit schedule indicating the ASTM specification number of the pipe being proposed along with its type and grade and sufficient information to indicate the type and rating of fittings for each service.
- C. Type S Steel Pipe: Mill certification papers, also known as material test reports, for the pipe furnished for this project, in English. Heat numbers on these papers to match the heat numbers stencilled on the pipe. Chemical analysis indicated on the mill certification papers to meet or exceed the requirements of the referenced ASTM specification.
- D. Copper Tube: Statement from manufacturer on his letterhead that the pipe furnished meets the ASTM specification contained in this section.
- E. Grooved joint couplings and fittings may be shown on drawings and product submittals, and shall be specifically identified by the manufacturer's style or series designation.

1.05 QUALITY ASSURANCE

- A. Order all Type S steel pipe with heat numbers rolled, stamped, or stenciled to each length or each bundle, depending on the size of the pipe, and in accordance with the appropriate ASTM specification.
- B. Order all copper water tube with each length marked with the name or trademark of the manufacturer and type of tube; with each shipping unit marked with the purchase order number, metal or alloy designation, temper, size, and name of supplier; all in accordance with ASTM B88.
- C. 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.
- D. Any installed material not meeting the specification requirements must be replaced with material that meets these specifications without additional cost to the Owner.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Promptly inspect shipments to ensure that the material is undamaged and complies with specifications.
- B. Cover pipe to eliminate rust and corrosion while allowing sufficient ventilation to avoid condensation. Do not store materials directly on grade. Protect pipe, tube, and fitting ends so they are not damaged. Where end caps are provided or specified, take precautions so the caps remain in place. If end caps are not present on tube bearing the "ACR" designation, clean and re-cap in accordance with ASTM B280. Protect fittings, flanges, and unions by storage inside or by durable, waterproof, above ground packaging.
- C. Offsite storage agreements will not relieve the Contractor from using proper storage techniques.
- D. Storage and protection methods must allow inspection to verify products.

1.07 DESIGN CRITERIA

- A. Use only new material, free of defects, rust and scale, and meeting the latest revision of ASTM specifications as listed in this specification.
- B. Construct all piping for the highest pressures and temperatures in the respective system in accordance with ANSI B31, but not less than 125 psig unless specifically indicated otherwise.
- C. Non-metallic piping will be acceptable only for the services indicated. It will not be acceptable in occupied spaces and ventilation plenum spaces, including plenum ceilings.
- D. Where weld fittings are used, use only long radius elbows having a centerline radius of 1.5 pipe diameters.
- E. Where ASTM A53 Type F pipe is specified, ASTM A53 Grade A Type E or S, or ASTM A53 Grade B Type E or S may be substituted at Contractor's option. Where ASTM A53 Grade A pipe is specified, ASTM A53 Grade B pipe may be substituted at Contractor's option. Where the grade or type is not specified, Contractor may choose from those commercially available.
- F. Where ASTM B88, Type L hard temper copper tubing is specified, ASTM B88, Type K hard temper copper tubing may be substituted at Contractor's option.

1.08 WELDER QUALIFICATIONS

- A. Welding procedures, welders, and welding operators for all building service piping and steam piping less than or equal to 15 psig to be in accordance with certified welding procedures of the National Certified Pipe Welding Bureau.
- B. Welding procedures, welders, and welding operators for all steam system piping at service pressures above 15 psig to be qualified complying with the provisions of the latest revision of ANSI/ASME B 31.1-Power Piping or Section IX of the ASME Boiler and Pressure Vessel Code for boiler external piping.
- C. Before any metallic welding is performed, Contractor shall have on site his Standard Welding Procedure Specification together with the Procedure Qualification Record as required by Section IX of the ASME Boiler and Pressure Vessel Code and/or the National Certified Pipe Welding Bureau.
- D. The Architect/Engineer or Owner reserves the right to test the work of any welder employed on the project, at the Contractor's expense. If the work of the welder is found to be unsatisfactory, the welder shall be prevented from doing further welding on the project.

PART 2 PRODUCTS

2.01 HEATING HOT WATER

- A. 2" and Smaller: ASTM A53, Type F, standard weight (Schedule 40) black steel pipe with ASTM A126/ANSI B16.4, Class 125, standard weight cast iron threaded fittings.
- B. Contractor may use ASTM B88 seamless, Type L, hard temper copper tube with ANSI B16.22 wrought copper solder-joint fittings in lieu of steel pipe for all sizes.

2.02 VENTS VALVES

- A. Use pipe and pipe fittings as specified for the system to which the relief valve or vent is connected.

2.03 UNIONS AND FLANGES

- A. 2" and Smaller: ASTM A197/ANSI B16.3 malleable iron unions with brass seats. Use black malleable iron on black steel piping and galvanized malleable iron on galvanized steel piping. Use ANSI B16.18 cast copper alloy unions on copper piping. Use unions of a pressure class equal to or higher than that specified for the fittings of the respective piping service but not less than 250 psi.

2.04 MECHANICAL GROOVED PIPE CONNECTIONS

- A. Manufacturers: Victaulic, Anvil Corp., or Star Pipe Products, Inc.
- B. Mechanical grooved pipe couplings and fittings may be used with steel pipe, 2-1/2" and larger, on the systems indicated below. Either cut-groove or equivalent roll groove products are acceptable providing the system temperature and pressure requirements are met. Where forged steel fittings are indicated, they shall conform to ASTM A234, Grade WPB. Where factory-fabricated steel fittings are indicated, they shall conform to ASTM A53, Type E or S, Grade B in sizes 2-1/2" through 24". Ductile iron fittings shall conform to ASTM A536, Grade 65-45-12. Do not use fabricated fittings where ductile iron or forged steel fittings are available. Gaskets in all cases shall be EPDM suitable for temperatures to 230°F (min).
- C. The following services may use mechanical grooved pipe connections within the building in accessible mechanical spaces and above accessible ceilings. Mechanical chases are not considered accessible.
 - Heating Hot Water
- D. Mechanical grooved pipe connections shall not be used in heating plants or chiller plants or below grade utility distribution systems.
- E. Fittings and couplings must be suitable for the temperature and pressure involved. In no case is the final system to have a pressure rating of less than 125 psig at the design temperature of the fluid.
- F. Acceptable fittings and couplings are listed below, based on Victaulic. When used on galvanized piping, fittings and couplings shall be galvanized. When used on black steel piping, fittings and couplings shall have an enamel coating.
- G. Couplings: Grooved joint couplings shall consist of two ductile iron housing segments to ASTM A536, pressure responsive gasket to ASTM D2000, and zinc electroplated steel bolts and nuts to ASTM A449. Couplings shall comply with ASTM F1476 Standard Specification for the Performance of Gasketed Mechanical Couplings for Use In Piping Applications.
 - A. Rigid Type: Coupling housings shall be cast with offsetting, angle-pattern bolt pads to provide joint rigidity and support and hanging in accordance with ANSI B31.1 and B31.9.
 - a. Victaulic Style 107H, Installation-Ready, for direct stab installation without field disassembly, with grade EHP gasket, suitable for water service to +250 deg F.
 - b. Victaulic Style 07 "Zero-Flex"
 - 2. Flexible Type: For use in locations where vibration attenuation and stress relief are required, and for the elimination of flexible connectors. Victaulic Installation-Ready Style 177 or Style 77.

- H. Flanges: Ductile iron Style 741 or 742 except at lug type butterfly valves where standard welding flanges shall be used.
- I. Fittings: Ductile iron elbows and tees of the manufacturer's standard line may be used in all sizes except bullhead tees will not be accepted. Factory fabricated steel fittings may be used in all sizes where fitting wall thickness conforms to standard weight pipe.
- J. Mechanical grooved pipe couplings are not allowed as a substitute for expansion compensation specified in Section 23 05 48 unless approved by the engineer.
- K. Mechanical grooved flexible couplings are not allowed as a substitute for the flexible connectors specified in Section 23 05 48 at pump connections unless approved by the engineer.

2.05 COPPER PRESS FITTINGS

- A. Manufacturers: Viega ProPres, NIBCO Press System or approved Equal.
- B. The Contractor may use copper and copper alloy press fittings conforming to the material requirements of ASME B16.18 or ASME B16.22 and performance criteria of IAPMO PS 117 for line sizes 1/2" through 2". Sealing elements for press fittings for hot and cold water applications shall be factory installed EPDM.
- C. The following services may use copper press fitting connections within the building in accessible mechanical spaces and above accessible ceilings. Mechanical chases are not considered accessible.
 - Heating Hot Water
- D. Mechanical press fitting connections shall not be used in heating plants or chiller plants or below grade utility distribution systems.
- E. Fittings and couplings must be suitable for the temperature and pressure involved. In no case is the final system to have a pressure rating of less than 125 psig at the design temperature of the fluid.

PART 3 EXECUTION

3.01 PREPARATION

- A. Remove all foreign material from interior and exterior of pipe and fittings.

3.02 ERECTION

- A. Install all piping parallel to building walls and ceilings and at heights which do not obstruct any portion of a window, doorway, stairway, or passageway. Where interferences develop in the field, offset or reroute piping as required to clear such interferences. In all cases, consult drawings for exact location of pipe spaces, ceiling heights, door and window openings, or other architectural details before installing piping.

- B. Provide anchors, expansion joints, swing joints and/or expansion loops so that piping may expand and contract without damage to itself, equipment, or building.
- C. Mitered ells, notched tees, and orange peel reducers are not acceptable. On threaded piping, bushings are not acceptable.
- D. "Weldolets" and "Threadolets" may be used for branch takeoffs up to one-half (1/2) the diameter of the main.
- E. Install drains throughout the systems to permit complete drainage.
- F. Do not route piping through transformer vaults or above transformers, panelboards, or switchboards, including the required service space for this equipment, unless the piping is serving this equipment
- G. Install all valves, control valves, and piping specialties, including items furnished by others, as specified and/or detailed. Make connections to all equipment installed by others where that equipment requires the piping services indicated in this section. Provide 1/2" couplings and weld-o-lets in 2" or larger piping and tee in smaller as required by the Temperature Control Trade.
- H. At all transitions from steel pipe to copper, use a brass or bronze fitting, union, or valve as the dielectric break.
- I. Provide plastic cover or butyl cap over open ends of piping during construction. As a minimum, all piping ends shall be covered at the end of each day.

3.03 THREADED PIPE JOINTS

- A. Use a Teflon based thread lubricant or Teflon tape when making joints; no hard setting pipe thread cement or caulking will be allowed. Do not use Teflon tape on oil piping systems.

3.04 COPPER PIPE JOINTS

- A. Remove all slivers and burrs remaining from the cutting operation by reaming and filing both pipe surfaces. Clean fitting and tube with emery cloth or sandpaper. Remove residue from the cleaning operation, apply flux, and assemble joint. Use 95-5 solder or brazing to secure joint as specified for the specific piping service.
- B. Mechanically formed tee fittings and bending of copper is not allowed. All connections in copper pipe shall be made with full socket soldered joints. Press fittings will be allowed if the specification includes press products and the assembly method is indicated below.
- C. Press Fitting Connections: Copper press fitting joints shall be made in accordance with the manufacturer's installation instructions. The tubing shall be fully inserted into the fitting and the tubing marked at the shoulder of the fitting. The fitting alignment shall be checked against the mark on the tubing to assure the tubing is fully engaged (inserted) into the fitting. The joints shall be pressed using the tool approved by the manufacturer.

3.05 MECHANICAL GROOVED PIPE CONNECTIONS

- A. Use pipe factory grooved in accordance with the coupling manufacturer's specifications or field grooved pipe in accordance with the same specifications using specially designed tools available for the application.
- B. Lubricate pipe and coupling gasket, align pipe, and secure joint in accordance with the coupling manufacturer's specifications.
- C. Support pipe as indicated in Section 23 05 29 of these specifications except as modified below. Support each horizontal pipe section at least once between couplings and whenever a change in direction of line flow takes place. Support vertical pipe at every other floor or every other pipe length, whichever is most frequent. Set the base of the riser or the base fitting on a pedestal or foundation.
- D. Follow coupling manufacturer's installation recommendations if they are more stringent than the above requirements.
- E. Grooved ends shall be clean and free from indentations, projections, or roll marks.
- F. The gasket shall be molded and produced by the coupling manufacturer of an elastomer suitable for the intended service.

3.06 WATER SYSTEM

- A. Run water mains level or pitch horizontal mains up 1" in 40 feet in the direction of flow. Install manual air vents at all high points where air may collect. If vent is not in an accessible location, extend air vent piping to the nearest code acceptable drain location with vent valve located at the drain.
- B. Main branches and runouts to terminal equipment may be made at the top, side, or bottom of the main provided that there are drain valves suitably located for complete system drainage and manual air vents are located as described above.
- C. Use top or side connection to main for branches. Do not use bottom connections for mains. Connections at a main may be made with a tee and a 45 degree elbow.
- D. Use a minimum of two elbows in each pipe line to a piece of terminal equipment to provide flexibility for expansion and contraction of the piping systems. Offset pipe connections at equipment to allow for service, such as removal of the terminal device.
- E. Use eccentric fittings for changes in horizontal pipe sizes with the fittings installed for proper air venting. Concentric fittings may be used for changes in vertical pipe sizes.

3.07 VENTS VALVES

- A. Install vent and relief valve discharge lines as indicated on the drawings, as detailed, and as specified for each specific valve or piping specialty item. In no event is a termination to occur less than six feet above a roof line.

3.08 UNIONS AND FLANGES

- A. Install a union or flange, as required, at each automatic control valve and at each piping specialty or piece of equipment which may require removal for maintenance, repair, or replacement. Where a valve is located at a piece of equipment, locate the flange or union connection on the equipment side of the valve. Concealed unions or flanges are not acceptable.

3.09 PIPING PROCEDURE

- A. This Contractor shall be responsible for isolating, draining, filling, and venting heating and chilled water piping as necessary for making new connections. Should an extensive system drain be required for making new connections, every effort shall be made to make all new connections with a single drain/fill cycle. Work to drain, fill, and vent systems shall be coordinated and done at a time convenient with the Owner.
- B. Outage of the hot water piping system shall be coordinate with the owner, with at least two-week advanced notice. For bidding purposes assume outages are to occur at night or on the weekends with bidding inclusive of premium labor rates.

SECTION 23 31 00

HVAC DUCTS AND CASINGS

PART 1 GENERAL

1.01 SCOPE

- A. This section includes specifications for all duct systems used on this project. Included are the following topics:

PART 1 - GENERAL

- Scope
- Related Work
- Reference
- Quality Assurance
- Shop Drawings
- Design Criteria
- Delivery, Storage, and Handling

PART 2 - PRODUCTS

- General
- Ductwork Pressure Class
- Materials
- Duct Sealant
- Gaskets
- Duct Sealing Tape
- Flexible Duct
- High Pressure Ductwork (Pressure Class 3" and Over)
- Low Pressure Ductwork (Maximum 2" Pressure Class)

PART 3 - EXECUTION

- Installation
- Ductwork Support
- Flexible Duct
- Low Pressure Duct (Maximum 2" Pressure Class)
- High Pressure Duct (Pressure Class 3" and Over)
- Cleaning
- Sealing Existing Ductwork

1.02 RELATED WORK

- A. Section 23 01 30.51 - HVAC Air Duct Cleaning
- B. Section 23 33 00 - Air Duct Accessories
- C. Section 23 05 93 - Testing, Adjusting, and Balancing for HVAC

1.03 REFERENCE

- A. Applicable provisions of Division 01 govern work under this Section.

1.04 QUALITY ASSURANCE

- A. Refer to Division 01, General Conditions, Equals and Substitutions.

1.05 SHOP DRAWINGS

- A. Refer to Division 01, General Conditions, Submittals.
- B. Include manufacturer's data and/or Contractor data for the following:
 - Fabrication and installation drawings.
 - Schedule of duct systems including material of construction, gauge, pressure class, system class, method of reinforcement, joint construction, fitting construction, and support methods, all with details as appropriate.
 - Duct sealant and gasket material.

1.06 DESIGN CRITERIA

- A. Construct all ductwork to be free from vibration, chatter, objectionable pulsations and leakage under specified operating conditions.
- B. Use material, weight, thickness, gauge, construction and installation methods as outlined in the following SMACNA publications, unless noted otherwise:
 - HVAC Duct Construction Standards, Metal and Flexible, 2nd Edition, 1995
 - HVAC Air Duct Leakage Test Manual, 1st Edition, 1985
 - HVAC Systems - Duct Design, 3rd Edition, 1990
 - Rectangular Industrial Duct Construction Standards, 1st Edition, 1980
 - Round Industrial Duct Construction Standards, 2nd Edition, 1999
- C. Use products which conform to NFPA 90A, possessing a flame spread rating of not over 25 and a smoke developed rating no higher than 50.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Promptly inspect shipments to ensure that ductwork is undamaged and complies with the specification.
- B. Protect ductwork against damage.
- C. Protect ductwork by storing inside or by durable, waterproof, above ground packaging. Do not store material on grade. Protect ductwork from dirt, dust, construction debris, and foreign material. Where end caps/packaging is provided, take precautions so caps/packaging remain in place and free from damage.
- D. Offsite storage agreements do not relieve the Contractor from using proper storage techniques.
- E. Storage and protection methods must allow inspection to verify products.

PART 2 PRODUCTS

2.01 GENERAL

- A. All sheet metal used for construction of duct shall be 24 gauge or heavier except for round and spiral ductwork and spiral duct take-offs 12" and below may be 26 gauge where allowed in SMACNA HVAC Duct Construction Standards, Metal and Flexible, 2nd Edition, 1995.
- B. Duct sizes indicated on plans are net inside dimensions; where duct liner is specified, dimensions are net, inside of liner. The size of ducts may be changed to suit the space available, with the approval of the Architect/Engineer, provided the cross-sectional area is not reduced.
- C. Longitudinal seams shall be constructed using the Pittsburgh Lock Seam Method. Snaplock construction is not allowed. Top and bottom transverse joints shall be double S slip. Side transverse joints shall be drive slip. Drive slips shall fit snugly to provide a tight joint.
 - 1. Longitudinal seams and transverse joints shall be filled with duct sealant. Additionally, transverse joints shall be taped. All duct wall penetrations shall be sealed. This requires that all ducts have SMACNA Class A sealing, regardless of actual duct pressures.
 - 2. TDC/TDF duct construction is acceptable for duct sizes less than 72" width or 14 square feet internal free area. All outside air plenum ductwork shall be slip and drive. Provide gasket as per Article 2.05. Lap gasket and caulk in all 4 corners. Use metal clips minimum 6" length. Taping is not required on TDC/TDF joints.

2.02 DUCTWORK PRESSURE CLASS

- A. Minimum acceptable duct pressure class, for all ductwork except transfer ductwork, is 2" W.G. positive or negative, depending on the application. Transfer ductwork minimum acceptable duct pressure class is 1" W.G. positive or negative, depending on the application. Duct system pressure classes not indicated on the drawings to be as follows:

Supply duct upstream of VAV boxes or reheat coil	3 in. pressure class
Supply duct downstream of VAV boxes or reheat coil	2 in. pressure class
Exhaust ducts	2 in. pressure class
Return ducts	2 in. pressure class

2.03 MATERIALS

- A. Galvanized Steel Sheet: Use ASTM A 653 galvanized steel sheet of lock forming quality. Galvanized coating to be 1.25 ounces per square foot, both sides of sheet, G90 in accordance with ASTM A90.
- B. Aluminum Sheet: Use ANSI/ASTM B209 aluminum sheet, alloy 3003H-14, capable of double seaming without fracture.
- C. Stainless Steel Sheet: Use ASTM A167, Type 304 or 316 stainless steel sheet as specified, 316L if welded ductwork, with No. 2B finish for concealed work and No. 3 finish for exposed work.

2.04 DUCT SEALANT

- A. Manufacturers: 3M 800, 3M 900, H.B. Fuller/Foster, Hardcast, Hardcast Peal & Seal, Lockformer cold sealant, Mon-Eco Industries, United Sheet Metal, or approved equal. Silicone sealants are not allowed in any type of ductwork installation.
- B. Install sealants in strict accordance with manufacturer's recommendations, paying special attention to temperature limitations. Allow sealant to fully cure before pressure testing of ductwork, or before startup of air handling systems.

2.05 GASKETS

- A. 2" Pressure Class and Lower: Soft neoprene or butyl gaskets in combination with duct sealant for flanged joints.
- B. 3" Pressure Class and Higher: Butyl gaskets.

2.06 DUCT SEALING TAPE

- A. Polyken, Hardcast, or approved equal.
- B. Duct sealing tape shall incorporate butyl rubber-based adhesive, 15 mil thick (minimum), with foil backing and 100% solids. The tape shall be 3" wide. Tape shall have a smoke development listing of 35, flame spread listing of 10.
- C. Tapes and mastics used to seal fibrous glass ductwork shall comply with UL 181A and shall be marked "181 A-P" for pressure sensitive tape, "181 A-M" for mastic or "181 A-H" for heat sensitive tape. Tapes and mastics used to seal metallic and flexible air ducts and flexible air connectors shall comply with UL 181B and shall be marked "181B-FX" for pressure sensitive tape or "181 B-M" for mastic.

2.07 FLEXIBLE DUCT

- A. Manufacturers: Anco Products, Clevaflex, Thermaflex, Flexmaster, or approved equal.
- B. Factory fabricated, UL 181 listed as a class 1 duct, and having a flame spread of 25 or less and a smoke developed rating of 50 or under in accordance with NFPA 90A.
- C. Suitable for pressures and temperatures involved but not less than a 180°F service temperature and ± 2 " pressure class, depending on the application.
- D. Duct to be composed of polyester film, aluminum laminate or woven and coated fiberglass fabric bonded permanently to corrosion resistant coated steel wire helix. Two-ply, laminated, and corrugated aluminum construction may also be used.
- E. Where duct is specified to be insulated, provide a minimum 1" fiberglass insulation blanket with maximum thermal conductance of 0.23 K (75°F) and vapor barrier jacket of polyethylene or metalized reinforced film laminate. Maximum perm rating of vapor barrier jacket to be 0.1 perm.

2.08 HIGH PRESSURE DUCTWORK (Pressure Class 3" and Over)

- A. Manufacturers: Ajax, Semco, United Sheet Metal, or approved equal.
- B. Machine formed round and/or flat oval spiral lock seam duct constructed of galvanized steel.
- C. Rectangular high pressure duct using a transverse joint system as manufactured by Ductmate, Nexus, TDC, TDF, or approved equal, may be used at Contractor's option. Duct to be flanged, gasketed, and sealed.
- D. Contractor fabricated ductwork meeting specified construction standards is acceptable with prior approval of Architect/Engineer. Submit construction details, a description of materials to be used, type of service, reinforcing methods, and sealing procedures.
- E. Transform duct sizes gradually, not exceeding 15 degrees divergence and 30 degrees convergence.
- F. Use cemented slip joints with 2" minimum overlap, flanged connections, or welded/brazed connections, unless noted otherwise for special applications. Prime coat welded joints.
- G. Provide standard 90 degree conical tee takeoffs except for exhaust at velocities over 2000 feet per minute, use 45° lateral connections; straight taps or bullhead tees are not acceptable.
- H. Internal bracing will not be accepted on ductwork below 48".
- I. Use turning vanes as specified in Section 23 33 00.
- J. Provide bellmouth fittings or expanded fittings at each duct connection to air plenums.

2.09 LOW PRESSURE DUCTWORK (Maximum 2" Pressure Class)

- A. Fabricate and install ductwork in sizes indicated on the drawings and in accordance with SMACNA recommendations, except as modified below.
- B. Construct so that all interior surfaces are smooth. Use slip and drive or flanged and bolted construction when fabricating rectangular ductwork. Use spiral lock seam construction when fabricating round spiral ductwork. Sheet metal screws may be used on duct hangers, transverse joints and other SMACNA approved locations if the screw does not extend more than 1/2" into the duct.
- C. Use elbows and tees with a center line radius to width or diameter ratio of 1.5 wherever space permits. When a shorter radius must be used due to limited space, install single wall sheet metal splitter vanes in accordance with SMACNA publications, Type RE 3. Where space will not allow and the C value of the radius elbow, as given in SMACNA publications, exceeds 0.31, use rectangular elbows with turning vanes as specified in Section 23 33 00. Square throat-radius heel elbows will not be acceptable. Straight taps or bullhead tees are not acceptable.
- D. Where rectangular elbows are used, provide turning vanes in accordance with Section 23 33 00.
- E. Provide expanded take-offs or 45 degree entry fittings for branch duct connections with branch ductwork airflow velocities greater than 700 fpm. Square edge 90-degree take-off fittings or straight taps will not be accepted.
- F. Button punch snaplock construction will not be accepted.
- G. Round ducts may be substituted for rectangular ducts if sized in accordance with ASHRAE table of equivalent rectangular and round ducts. No variation of duct configuration or sizes permitted except by written permission of the Architect/Engineer.
- H. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible. Divergence upstream of equipment shall not exceed 30 degrees; convergence downstream shall not exceed 45 degrees.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Verify dimensions at the site, making field measurements and drawings necessary for fabrication and erection. Check plans showing work of other trades and consult with Architect in the event of any interference. Contractor shall make all adjustments to the ductwork to fit the space, at no additional expense to the Owner.

- B. Make allowances for beams, pipes or other obstructions in building construction and for work of other contractors. Transform, divide or offset ducts as required, in accordance with SMACNA HVAC Duct Construction Standards, Figure 2-7, except do not reduce duct to less than 6" in any dimension and do not exceed an 8:1 aspect ratio. Where it is necessary to take pipes or similar obstructions through ducts, construct easement as indicated in SMACNA HVAC Duct Construction Standards, Figure 2-8, Fig. E. In all cases, seal to prevent air leakage. Pipes or similar obstructions may not pass through high pressure or fume exhaust ductwork.
- C. Test openings for test and balance work will be provided under Section 23 05 93.
- D. Provide frames constructed of angles or channels for coils, filters, dampers or other devices installed in duct systems, and make all connections to such equipment including equipment furnished by others. Secure frames with gaskets and screws or nut, bolts and washers.
- E. Install duct to pitch toward outside air intakes and drain to outside of building. Solder or seal seams to form watertight joints.
- F. Where two different metal ducts meet, the joint shall be installed in such a manner that metal ducts do not contact each other by using proper seal or compound.
- G. Install all motor operated dampers and connect to or install all equipment furnished by others. Blank off all unused portions of louvers, as indicated on the drawings, with 1-1/2" board insulation with galvanized sheet metal backing on both sides.
- H. Do not install ductwork through dedicated electrical rooms or spaces unless the ductwork is serving this room or space.
- I. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.
- J. Provide adequate access to ductwork for cleaning purposes.
- K. Provide temporary capping of existing ductwork openings to prevent entry of dirt, dust, and foreign material.
- L. Protect diffusers, registers and grilles with plastic wrap or some other approved form of protection to maintain dirt and dust free and to prevent entry of dirt, dust and foreign material into the ductwork.
- M. During construction, provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system. Ductwork not protected will be cleaned at This Contractor's expense.

N. All ductwork shall be tight fitting and sealed to prevent air leakage.

1. At transverse joints:

- a. Fill S-slips with duct sealant and seal outside ends and edges of S-slip. Firmly tape all external S-slip joints.
- b. Fill drive slips with duct sealant. Fill interlocking bend on ductwork with duct sealant. Cut 3" tape in half and seal both edges of drive slip after assembly. Fill all duct corners with sealant before bending over corners of drive slips. Drive slip shall provide a minimum 1-1/2" bend over at corner. Finish drive slips by firmly applying duct tape on external surfaces to include corners.

NOTE: Tape adhesive and caulk sealant are to be compatible.

Allow sufficient time for duct sealants to cure before applying duct tape or pressurizing the duct system. Follow sealant manufacturer's guideline for curing period.

2. At longitudinal joints, fill Pittsburgh joint with duct sealant prior to assembly. At duct wall penetrations, provide sealant to joint.

3. All flanged and standing seam duct connections shall be taped with duct sealing tape. Split tape to cover both sides of exposed joint of seam or flange.

4. Cover all rods, joints, and screws with sealant after assembly.

5. All connections to equipment, including connections to dampers, electric duct heaters, fan and air units shall be sealed with duct sealant. Do not tape duct to removable equipment or fire dampers.

O. TDC construction may be substituted in lieu of slip and drive construction and taping ductwork. Apply sealant in all corners and provide butyl rubber gasket before connecting ductwork. TDC construction not acceptable on air intakes. Slip and drive construction shall be used whenever space conditions are limited.

P. Where supply air ducts divide as shown, provide tees, 150% expanded take-offs to flow branches or use parallel flow branches. Expanded take-off shall utilize a 45-degree clinch collar on rectangular or conical on rounds. Volume control shall be by branch dampers. Provide splitter damper as noted. Parallel flow branches shall incorporate turning vanes on square elbows or rounded elbows. The main duct to the branch ducts may be expanded to reduce pressure loss. No bullhead tees or straight taps are allowed.

Q. Exhaust ducts and return air ducts shall have rounded elbows on inside and outside radius. No square elbows with turning vanes on the suction side of fans shall be used unless approved by Architect. Where air exhaust or return branch ducts connect to main ducts, provide 150% expanded take-off by use of a 45-degree clinch collar.

3.02 DUCTWORK SUPPORT

- A. Support ductwork in accordance with SMACNA HVAC Duct Construction Standards, Figure 4-4, except supporting ductwork with secure wire method is not allowed.
Refer to Section 05 05 20 - Fasteners and Metal Fastenings for hanger attachment to concrete structures.
- B. Support with 3/32", 7 x 7, stainless steel air-craft cable, with matching fastener rated for 50% of actual load, will be allowed on round ductwork under 12" if installed as detailed, with cable double looped on duct and at point of support.
- C. Extend to ductwork using 1" x 16 gauge flat metal hangers screwed to duct or 3/8" hanger rods to angle iron under duct. Support at 8'-0" o.c. for straight runs and within 2'-0" of elbows and branches as a maximum. Provide 2 x 2 x 1/8 angle around duct for ducts through floor or roof.

3.03 FLEXIBLE DUCT

- A. Flexible duct may only be used for final connections of air inlets and outlets at diffuser, register, and grille locations. Where flexible duct is used, it shall be the minimum length required to make the final connections, but no greater than 6 feet in length, and have no more than one (1) 90 degree bend.
- B. Secure inner jacket of flexible duct in place with duct tape. Secure insulation vapor barrier jacket in place with steel or nylon draw band. Closure system to be in compliance with UL 181B and shall be marked "181 B-C".
- C. Flexible duct used to compensate for misalignment of main duct or branch duct will not be accepted.
- D. Individual sections of flexible ductwork shall be of one piece construction. Splicing of short sections will not be accepted.
- E. Flexible ductwork used as transfer duct shall be sized for a maximum velocity of 300 fpm.
- F. Penetration of any partition, wall, or floor with flexible duct (except transfer type) will not be accepted.

3.04 LOW PRESSURE DUCT (Maximum 2" Pressure Class)

- A. Seal all duct, with the exception of transfer ducts, in accordance with SMACNA seal Class "A"; all seams, joints, and penetrations shall be sealed.
- B. Install a manual balancing damper in each branch duct and for each diffuser or grille. The use of splitter dampers, extractors, or grille face dampers will not be accepted for balancing dampers.
- C. Hangers must be wrapped around bottom edge of duct and securely fastened to duct with sheetmetal screws or pop rivets. Trapeze hangers may be used at Contractor's option.

3.05 HIGH PRESSURE DUCT (Pressure Class 3" and Over)

- A. Seal all duct in accordance with SMACNA seal Class "A"; all seams, joints, and penetrations shall be sealed.

3.06 CLEANING

- A. Remove all dirt and foreign matter from the entire duct system and clean diffusers, registers, grilles and the inside of air-handling units before operating fans.
- B. Prior to installation, hand wipe the interior surfaces of the ductwork to remove all dust and debris which may have accumulated during storage. After installation, ductwork shall be protected with temporary closure to prevent contamination. Ductwork not wiped clean or protected shall be cleaned at this Contractor's expense.

3.07 SEALING EXISTING DUCTWORK

- A. All existing ductwork exposed by the remodeling and removal of ceilings which is not externally insulated shall have the transverse joint solvent cleaned and taped prior to new ceilings being installed.

SECTION 23 33 00

AIR DUCT ACCESSORIES

PART 1 GENERAL

1.01 SCOPE

- A. This section includes accessories used in the installation of duct systems. Included are the following topics:

- PART 1 - GENERAL

- Scope

- Related Work

- Reference

- Quality Assurance

- Shop Drawings

- PART 2 - PRODUCTS

- Manual Volume Dampers

- Turning Vanes

- Access Doors

- PART 3 - EXECUTION

- Manual Volume Dampers

- Turning Vanes

- Fire Dampers

- Smoke Dampers and Combination Fire/Smoke Dampers

- Access Doors

1.02 RELATED WORK

- A. Section 23 05 29 - Hanger and Supports for HVAC Piping and Equipment
- B. Section 13 48 00 - Vibration Control for HVAC Piping and Equipment
- C. Section 23 31 00 - HVAC Ducts and Casing

1.03 REFERENCE

- A. Applicable provisions of Division 01 govern work under this Section.

1.04 QUALITY ASSURANCE

- A. Refer to Division 01, General Conditions, Equals and Substitutions.

1.05 SHOP DRAWINGS

- A. Refer to Division 01, General Conditions, Submittals.
- B. Submit for all accessories and include dimensions, capacities, ratings, installation instructions, and appropriate identification.

PART 2 PRODUCTS

2.01 MANUAL VOLUME DAMPERS

- A. Manufacturers: Ruskin, Vent Products, Air Balance, Greenheck or approved equal.
- B. Dampers must be constructed in accordance with SMACNA Fig. 2-12, Fig. 2-13, and notes relating to these figures, except as modified below.
- C. Reinforce all blades to prevent vibration, flutter, or other noise. Construct dampers in multiple sections with mullions where width is over 48". Use rivets or tack welds to secure individual components; sheet metal screws will not be accepted. Provide operators with locking devices and damper position indicators for each damper; use an elevated platform on insulated ducts. Provide end bearings or bushings for all volume damper rods penetrating ductwork constructed to a 3" w.c. pressure class or above.

2.02 TURNING VANES

- A. Manufacturers: Aero Dyne, Anemostat, Barber-Colman, Hart & Cooley, or approved equal.
- B. Construct turning vanes and runners for square elbows in accordance with SMACNA Fig. 2-3 and Fig. 2-4 except use only airfoil type vanes. Construct turning vanes for short radius elbows and elbows where one-dimension changes in the turn in accordance with SMACNA Fig. 2-5 and Fig. 2-6.

2.03 ACCESS DOORS

- A. Construction to be suitable for the pressure class of the duct in which the door is to be installed. Materials of construction to be identical to adjacent ductwork. Doors in exposed areas shall be hinged type with sash lock. Doors in concealed spaces shall be secured in place with cam latches. Gasket all access doors. Use insulated doors when installed in insulated ductwork. Access doors constructed with sheet metal screw fasteners will not be accepted.

PART 3 EXECUTION

3.01 MANUAL VOLUME DAMPERS

- A. Install manual volume dampers in each branch duct and for each grille, register, or diffuser as far away from the outlet as possible while still maintaining accessibility to the damper. Install so there is no flutter or vibration of the damper blade(s).

3.02 TURNING VANES

- A. Install supply air duct system turning vanes in all rectangular, mitered elbows in accordance with SMACNA standards and/or manufacturer's recommendations. Exhaust and return air duct systems shall have radius elbows per Section 23 31 00; Ductwork: no square elbows with turning vanes.
- B. Install double wall, airfoil, 2" radius vanes in ducts with vane runner length 18" or greater and air velocity less than 2000 fpm. Install double wall, airfoil, 4-1/2" radius vanes in ducts with vane runner length 18" or greater and air velocity 2000 fpm or greater.
- C. If duct size changes in a mitered elbow, use single wall type vanes with a trailing edge extension. If duct size changes in a radius elbow or if short radius elbows must be used, install sheetmetal turning vanes in accordance with SMACNA Figure 2-5 and Figure 2-6.

3.03 ACCESS DOORS

- A. Install access doors where specified, indicated on the drawings and in locations where maintenance, service, cleaning, or inspection is required. Examples include, but are not limited to, motorized dampers, control dampers, fire and smoke dampers, smoke detectors, fan bearings, heating and cooling coils, filters, valves, and control devices needing periodic maintenance.
- B. Size and numbers of duct access doors to be sufficient to perform the intended service. Access door size shall be 1/2 of face duct dimension (e.g. 24" duct, 12" x 12" A.D.), with a minimum size of 8" x 8", up to 18" x 18" door size, larger sizes as indicated. Install access doors on both inlet and outlet sides of reheat coils as well as other duct mounted coils. Locate door on bottom (preferred) or sides of duct as required for access.

SECTION 23 37 13

DIFFUSERS, REGISTERS AND GRILLES

PART 1 GENERAL

1.01 SCOPE

- A. This section includes specifications for air terminal equipment. Included are the following topics:

- PART 1 - GENERAL

- Scope

- Related Work

- Reference

- Quality Assurance

- Submittals

- Design Criteria

- PART 2 - PRODUCTS

- Manufacturers

- Square Ceiling Diffusers - Plaque

- Ceiling Registers and Grilles

- Eggcrate Grilles

- Side-wall Return/Exhaust Grilles

- PART 3 - EXECUTION

- Installation

1.02 RELATED WORK

- A. Section 23 31 00 - HVAC Ducts and Casings
- B. Section 23 33 00 - Air Duct Accessories
- C. Section 23 05 93 - Testing, Adjusting, and Balancing for HVAC

1.03 REFERENCE

- A. Applicable provisions of Division 01 govern work under this section.

1.04 QUALITY ASSURANCE

- A. Refer to Division 01, General Conditions, Equals and Substitutions.

1.05 SUBMITTALS

- A. Refer to Division 01, General Conditions, Submittals.
- B. Furnish submittal information including, but not limited to, the following:
 - Manufacturer's name and model number
 - Identification as referenced in the documents
 - Capacities/ratings
 - Materials of construction
 - Sound ratings
 - Dimensions
 - Finish
 - Color selection charts where applicable
 - Manufacturer's installation instructions
 - All other appropriate data

1.06 DESIGN CRITERIA

- A. All performance data shall be based on tests conducted in accordance with Air Diffusion Council (ADC) Test Code 1062 GRD 84.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Carnes, Krueger, Titus, MetalAire, E.H. Price, or United Sheet Metal.
- B. Acceptable manufacturers for specific products are listed under each item. Grilles and diffusers shall be furnished by one manufacturer, unless approved by the Architect/Engineer.

2.02 SQUARE CEILING DIFFUSERS - Plaque

- A. Titus Model OMNI-AA, Carnes Series SFPA/SHPA, Price Model SPD, MetalAire Series 5750, and Krueger Series PLQ/5PLQ.
- B. Aluminum unless otherwise indicated, louvered face furnished with frame type appropriate to installation.
- C. Directional blow pattern as shown on the drawings and/or as scheduled.
- D. One-piece removable square face plaque with one-piece backpan.
- E. Finish as selected by Architect.

2.03 CEILING REGISTERS AND GRILLES

- A. Manufacturers: Titus Series 350 (return/exhaust), Carnes Model R Series, E.H. Price Model 630, MetalAire Series 4000, or Krueger Series S580. Filtered grilles to be same series but shall house 1", 20% efficient filter. One (1) filter furnished with each grille by this contractor.
- B. Aluminum, unless otherwise indicated, with frame type appropriate to installation.
- C. For 10" x 10" and larger, provide 24" x 24" lay-in panel. Grille and panel to be one-piece design.
- D. For 8" x 8" and smaller, provide light gauge angle to support grille across tile.
- E. Fixed blade (35 degree) core return and exhaust registers and grilles.
- F. Register and grille sizes as shown on drawings and/or as scheduled. Unless noted otherwise, off-white baked enamel finish.
- G. Screw holes on surface counter sunk to accept recessed type screws.

2.04 EGGCRATE GRILLES

- A. Manufacturers: Titus Model 50, Carnes Model RAE or RAT, E.H. Price Model C80, MetalAire Model CC, or Krueger Model EGC. Filter grilles to be same series but shall house 1", 20% efficient filter. One (1) filter furnished with each grille by this contractor.
- B. Aluminum construction with frame type appropriate to installation.
- C. Grille face 1/2" x 1/2" or 1" x 1" grid pattern 1" deep with a minimum of 85% free area.
- D. Grille sizes and finishes as shown on drawings and/or as scheduled. Unless noted otherwise, off-white baked enamel finish.
- E. Screw holes on surface counter sunk to accept recessed type screws on sidewall installations.

2.05 SIDE-WALL RETURN/EXHAUST GRILLES

- A. Manufacturers: Titus Series 350, Carnes Model R Series, E.H. Price Model 630, MetalAire Series 4002R, or Krueger Series S580. Filtered grilles to be same series but shall house 1", 20% efficient filter. One (1) filter furnished with each grille by this contractor. All return grilles to be filtered type.
- B. Aluminum construction, unless otherwise indicated, with frame type appropriate to installation.
- C. Fixed blade 3/4" spacing, 35 degree deflection core return and exhaust registers and grilles. Blade to be parallel to floor.
- D. Grille sizes as shown on drawings and/or as scheduled. Unless noted otherwise, off-white baked enamel finish.
- E. Screw holes on surface countersunk to accept recessed type screws.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install grilles, registers, and diffusers as shown on drawings and according to manufacturer's instructions.
- B. Furnish diffusers with equalizing grids where it is not possible to maintain minimum 2 duct diameter straight duct into diffuser. Equalizing grids shall consist of individually adjustable vanes designed for equalizing airflow into diffuser neck and providing directional control of airflow.
- C. Unless otherwise indicated, size ductwork drops to diffusers or grilles to match unit collar size.
- D. Seal connections between ductwork drops and diffusers/grilles airtight.
- E. All exposed screws shall be same finish as grille or diffuser. Use stainless screws in wet areas.

SECTION 23 82 00

CONVECTION HEATING AND COOLING UNITS

PART 1 GENERAL

1.01 SCOPE

- A. This section includes specification for heating and cooling terminal equipment using water and/or steam as the source. Included are the following topics:

- PART 1 - GENERAL

- Scope

- Related Work

- Reference

- Quality Assurance

- Shop Drawings

- Design Criteria

- PART 2 - PRODUCTS

- Reheat Coils

- PART 3 - EXECUTION

- Installation

- Reheat Coils

1.02 RELATED WORK

- A. Section 23 05 23 - General Duty Valves for HVAC Piping
- B. Section 23 05 13 - Common Motor Requirements for HVAC Equipment

1.03 REFERENCE

- A. Applicable provisions of Division 01 govern work under this Section.

1.04 QUALITY ASSURANCE

- A. Refer to Division 01, General Conditions, Equals and Substitutions.

1.05 SHOP DRAWINGS

- A. Refer to Division 01, General Conditions, Submittals.
- B. Include dimensions, capacities, materials of construction, ratings, weights, wiring diagrams, and appropriate identification for all equipment in this section. Include color selection chart where applicable.

1.06 DESIGN CRITERIA

- A. Forced Circulation Coils: Ratings certified in accordance with ARI 410.
- B. Electrical components and work must be in accordance with National Electrical Code.
- C. Electrical Equipment and heaters shall be UL listed for the service specified.

PART 2 PRODUCTS

2.01 REHEAT COILS

- A. Manufacturers: Aerofin, Daikin, Greenheck, Heatcraft, Trane, York, or equal.
- B. Construct coils of 5/8" copper tubes, 0.025" thick and 0.006" aluminum fins in a serpentine arrangement with piping connections on the same end. Provide galvanized steel casing, end supports, top and bottom channels to allow for expansion of finned tube section. Factory test coils at 200 psig.
- C. Headers may be cast iron with tubes expanded into the header, steel pipe with tubes brazed to the header, or seamless copper with tubes brazed to the header.
- D. Frames to be minimum 16 gauge galvanized steel flanged for a gasketed connection to adjacent ductwork or constructed for slip and drive connection to the ductwork.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install units in accordance with manufacturer's installation instructions.
- B. Install branch water or steam/condensate piping to each unit with a minimum of three elbows to allow for expansion and contraction of the piping system.
- C. Coordinate location of units with other trades to assure correct recess size for recessed units.
- D. After installation, provide protective covers to prevent accumulation of dirt on units during balance of construction.

3.02 REHEAT COILS

- A. Comb bent or crushed fins and clean dust and debris from each coil before enclosing coils in ductwork. Pitch coil casings in accordance with manufacturer's instructions. Install a drain valve on the coil side of the shutoff valves for each reheat coil.
- B. Pipe coils with multiple rows for counter flow arrangement.
- C. All coils shall have the ability to heat 55°F air to 72°F with 120°F water. Submit compliance to this requirement.

SECTION 26 05 00

BASIC ELECTRICAL REQUIREMENTS

PART 1 GENERAL

1.01 WORK INCLUDED

- A. The electrical work included in all other Divisions is the responsibility of the contractor performing the Division 26 work unless noted otherwise.
- B. Basic electrical requirements which are applicable to all Division 26 sections. This section includes information common to two or more technical specification sections or items that are of a general nature, not conveniently fitting into other technical sections.

1.02 RELATED WORK

- A. Applicable provisions of Division 01 shall govern all work under this section, including Section 01 62 10 - Owner Preferred Materials.

1.03 REFERENCE STANDARDS

- A. Abbreviations of standard organizations referenced in this and other sections are as follows:
 - 1. ANSI American National Standards Institute
 - 2. ASTM American Society for Testing and Materials
 - 3. EPA Environmental Protection Agency
 - 4. ETL Electrical Testing Laboratories, Inc.
 - 5. IEEE Institute of Electrical and Electronics Engineers
 - 6. IES Illuminating Engineering Society
 - 7. ISA Instrument Society of America
 - 8. NBS National Bureau of Standards
 - 9. NEC National Electric Code
 - 10. NEMA National Electrical Manufacturers Association
 - 11. NESC National Electrical Safety Code
 - 12. NFPA National Fire Protection Association
 - 13. UL Underwriters Laboratories Inc.

1.04 REGULATORY REQUIREMENTS

- A. All work and materials are to conform in every detail to applicable rules and requirements of the Wisconsin State Electrical Code Volumes 1 and 2, the National Electrical Code (ANSI/NFPA 70 and 70E) 2017 Edition, other applicable National Fire Protection Association codes, the National Electrical Safety Code, and present manufacturing standards (including NEMA).
- B. All Division 26 work shall be done under the direction of a currently certified State of Wisconsin Certified Master Electrician.

1.05 QUALITY ASSURANCE

- A. Substitution of Materials: Refer to Instructions to Bidders and Division 01.
- B. Where equipment or accessories are used which differ in arrangement, configuration, dimensions, ratings, or engineering parameters from those indicated on the contract documents, the contractor is responsible for all costs involved in integrating the equipment or accessories into the system and the assigned space and for obtaining the performance from the system into which these items are placed.
- C. All materials shall be listed by and shall bear the label of an approved electrical testing laboratory. If none of the approved electrical testing laboratories has published standards for a particular item, then other national independent testing standards, subject to approval of the Engineer, shall apply and such items shall bear those labels. Where one of the approved electrical testing laboratories has an applicable system listing and label, the entire system shall be so labeled.

1.06 PROTECTION OF FINISHED SURFACES

- A. See Division 01, GENERAL REQUIREMENTS for additional requirements.

1.07 APPROVED ELECTRICAL TESTING LABORATORIES

- A. The following laboratories are approved for providing electrical product safety testing and listing services as required in these specifications:
 - 1. Underwriters Laboratories, Inc.
 - 2. Electrical Testing Laboratories, Inc.

1.08 SEALING AND FIRESTOPPING

- A. References
 - 1. ASTM E814: "Standard Method of Fire Tests of Through-Penetration Fire Stops"
 - 2. ASTM E119: "Standard Method of Fire Tests of Building Construction and Materials"
 - 3. Underwriters Laboratories: Fire Resistance Directory, latest edition

B. System Description

1. This section describes the requirements for furnishing and installing firestopping for fire rated construction. These include:
 - a. All openings in fire rated floors and wall assemblies, both blank (empty) and those accommodating penetrating items such as cables, conduits, pipes, ducts, etc.
 - b. Construction joints, including those between top of fire rated walls and underside of floors above and those between exterior curtain walls and the outer perimeter edge of floor assemblies.
 - c. Openings at each floor level in shafts or stairwells.

C. Quality Assurance

1. Firestopping materials shall conform to Flame (F) and Temperature (T) ratings as required by local building code and as tested by nationally accepted test agencies per ASTM E814, UL 1479, or UL 2079. The F rating must be a minimum of one (1) hour but not less than the fire resistance rating of the assembly being penetrated. T rating, when required by code authority, shall be based on the measurement of the temperature rise on the penetrating item(s). The fire test pressure differential of a minimum 0.01" of water column is required.
2. Firestopping products shall be asbestos-free, free of any PCB's, and free of any lead.
3. Do not use any products containing solvents or that require hazardous waste disposal.
4. Firestopping Contractor Qualifications: Firestop application shall be performed by a single firestopping contractor who specializes in the installation of firestop systems, whose personnel to be utilized have received specific training and certification or approval from the proposed respective firestop manufacturer, and firestop applicator shall have a minimum of 3 years experience (under present company name) installing firestop systems of the type herein specified.

D. Sequencing

1. Schedule installation of firestop products after completion of penetrating item installation but prior to covering or concealing of openings.
2. Coordinate this work as required with work of other trades.

1.09 SLEEVES

- A. Sleeves for insulated penetrations of fire and/or smoke-rated wall and slab construction shall include rated system equivalent to rated construction. Firestopping the penetrating item is the responsibility of [the Firestopping Trade] shall coordinate and be held equally responsible for achieving installations consistent with the required firestopping.
- B. UL-listed fire rated sleeve assemblies shall be used as penetrants to all fire rated assemblies.
- C. Sleeves for existing raceways where new wall or slab construction creates a penetration shall include splitting a standard wall sleeve and installing same as specified above.
- D. Sleeves for existing wall or slab construction where new raceway creates a penetration shall be cored and sealed same as specified above. Do not pierce beams or columns without permission of the Architect/Engineer.

1.10 INTENT

- A. The Contractor shall furnish and install all the necessary materials, apparatus, and devices to complete the electrical equipment and systems installation herein specified, except such parts as are specifically exempted herein.
- B. If an item is either called for in the specifications or shown on the plans, it shall be considered sufficient for the inclusion of said item in this contract. If a conflict exists within the specifications or exists within the drawings, the Contractor shall furnish the item, system, or workmanship which is the highest quality, largest, or most closely fits the Engineer's intent (as determined by the Architect/Engineer Project Manager). Refer to Division 01 for further clarification.
- C. It must be understood that the details and drawings are diagrammatic. The Contractor shall verify all dimensions at the site and be responsible for their accuracy.
- D. All sizes as given are minimum except as noted.
- E. Materials and labor shall be new (unless noted or stated otherwise), first class, and workmanlike, and shall be subject at all times to the Architect/Engineer's inspections, tests and approval from the commencement until the acceptance of the completed work.
- F. Whenever a particular manufacturer's product is named, it is the Contractor's responsibility to provide that product/manufacture.

1.12 DATA AND DRAWINGS

- A. See Instructions to Bidders regarding examination of site and special site conditions.
- B. The information given herein and on the drawings is as exact as can be secured. Its accuracy is not guaranteed. Examination of site will be required to verify all existing conduits, measurements, distances, levels, elevations, and existing installation conditions before starting the work.
- C. The location of conduit or equipment which is governed by architectural features shall be established by reference to dimensions on architectural-structural drawings. Consult complete drawings and details for dimensions of all partitions, their construction, and location.
- D. The Architect reserves the right to change the location of any outlet (Power or Tele/Data) 5 feet in any direction without these changes being made subject of an extra charge, provided such changes are made before the rough-in.
- E. Deviations in the routing of feeders/risers, from that drawn, to conform to the building as constructed or to fit the work of other trades shall be made without extra cost.

1.13 OMISSIONS

- A. No later than ten (10) days before bid opening, the Contractor shall call the attention of the Architect/Engineer to any materials or apparatus the Contractor believes to be inadequate and to any necessary items of work omitted.

1.14 SUBMITTALS

- A. Refer to Division 01, General Conditions, Submittals.
- B. Within 30 days after Notice to Proceed, the successful bidder shall furnish submittals to the Architect/Engineer in accordance with provisions of Division 01. See the list below and individual technical sections for items requiring submittals:

Lighting fixtures	
Wiring devices	Occupancy sensors
Medium voltage cable & terminations	PVC conduit and fittings
Fire alarm equipment	Security equipment
Sleeves and Openings	Sealing and Firestopping

- C. Submit for all equipment and systems as indicated above and in the respective specification sections, marking each submittal with that specification section number. Mark general catalog sheets and drawings to indicate specific items being submitted and proper identification of equipment by name and/or number, as indicated in the contract documents. Failure to do this may result in the submittal(s) being returned to the Contractor for correction and resubmission. Failing to follow these instructions does not relieve the Contractor from the requirement of meeting the project schedule.

- D. On request from the Architect/Engineer, the successful bidder shall furnish additional drawings, illustrations, catalog data, performance characteristics, etc.
- E. Submittals shall be grouped to include complete submittals of related systems, products, and accessories in a single submittal. Mark dimensions and values in units to match those specified. Include wiring diagrams of electrically powered equipment.
- F. The above submittals must be approved before fabrication is authorized.

1.15 WORK SEQUENCE AND SCHEDULING

- A. Install work in phases to accommodate Owner's occupancy requirements. During the construction period, coordinate electrical schedule and operations with Architect/Engineer's Construction Representatives.
- B. See Division 01 for additional requirements.

1.16 PROJECT/SITE CONDITIONS

- A. Install Work in locations shown on Drawings, unless prevented by project conditions.
- B. Prepare drawings showed proposed rearrangement of Work to meet project conditions, including changes to Work specified in other Sections. Obtain permission from Architect/Engineer before proceeding.
- C. Tools, materials and equipment shall be confined to areas designated by Owner.

1.17 WORK BY OTHER TRADES

- A. Every attempt has been made to indicate in this trade's specifications and drawings all work required of this Contractor. However, there may be additional specific paragraphs in other trade specifications and addenda, and additional notes on drawings for other trades which pertain to this Trade's work. Thus, those additional requirements are hereby made a part of these specifications and drawings.
- B. Electrical details on drawings for equipment to be provided by others are based on preliminary design data only. This Contractor shall lay out the electrical work and shall be responsible for its correctness to match equipment actually provided by others.
- C. Each Trade shall be responsible for coordinating with all other Trades and the ductwork fabrication shop drawings prior to commencement of work.

1.18 SALVAGE MATERIALS

- A. No materials removed from this project shall be reused except as specifically noted. All materials removed shall become the property of and shall be disposed of by the Contractor, except as specifically noted.

1.19 CERTIFICATES AND INSPECTIONS

- A. Obtain and pay for all required State and Local installation inspections, permits, and certificates. Include copies of the certificates in the Operating and Maintenance Instructions.

1.20 OPERATING AND MAINTENANCE MANUAL

- A. All operations and maintenance data shall comply with the submission and content requirements specified under GENERAL REQUIREMENTS.
- B. Assemble material in three-ring or post binders, using an index at the front of each volume and tabs for each system or type of equipment. Provide electronic and paper copies as indicated in Division 01. In addition to the general content specified under GENERAL REQUIREMENTS, include the following information:
 - 1. Copies of all approved submittals.
 - 2. Manufacturer's wiring diagrams for electrically powered equipment.
 - 3. Records of tests performed to certify compliance with system requirements.
 - 4. Certificates of inspection by regulatory agencies.
 - 5. Parts lists for manufactured equipment.
 - 6. Preventive maintenance recommendations.
 - 7. Warranties.
 - 8. Additional information as indicated in the technical specification sections.

1.21 RECORD DRAWINGS

- A. The Contractor shall maintain at least one copy each of the specifications and drawings on the jobsite at all times.
- B. The Contractor shall record changes and deviations from contract daily. Dimensions and elevations on the record drawings shall locate all buried or concealed piping, conduit, or similar items.
- C. The daily record of changes shall be the responsibility of the Contractor's field superintendent. No arbitrary mark-ups will be permitted.
- D. At the completion of the project, the Contractor shall submit the mark-up record drawings to the Architect/Engineer.

1.22 ELECTRONIC FILE REQUEST

- A. See Section 01 00 00 GENERAL REQUIREMENTS for instructions and processing fees for electronic file requests.

PART 2 PRODUCTS

2.01 IDENTIFICATION

- A. See Electrical Section 26 05 53 - Identification for Electrical System.

2.02 ACCESS PANELS AND DOORS

- A. Lay-in Ceilings: Removable lay-in ceiling tiles in 2 x 2 foot or 2 x 4 foot configuration provided by General Trade are sufficient; no additional access provisions are required unless specifically indicated.
- B. Plaster Walls and Ceilings: 16 gauge frame with not less than a 20 gauge hinged door panel, prime coated steel for general applications, stainless steel for use in toilets, showers, and similar wet areas, concealed hinges, screwdriver operated cam latch for general applications, key lock for use in public areas, UL listed for use in fire rated partitions if required by the application. Use the largest size access opening possible, consistent with the space and the equipment needing service; use 24" x 24" unless space limitations require a smaller panel. Panels installed by the General Trade.
- C. Where remodeling in existing building creates inaccessibility of existing valves, equipment and/or control, This Contractor shall provide access panels as specified above.

2.03 SEALING AND FIRESTOPPING

- A. Acceptable Manufacturers:
 - 1. Rector Seal Corporation, Houston, Texas
 - 2. Nelson Firestop Products, Tulsa, Oklahoma
 - 3. Hilti Corporation, Tulsa, Oklahoma
 - 4. Specified Technologies, Inc., Somerville, New Jersey
 - 5. 3M Fire Protection Products, St. Paul, Minnesota
 - 6. Specifications based on products of Rector Seal Corporation.
- B. Through-Penetration Firestopping of Fire Rated Construction
 - 1. Systems of devices listed in the UL Fire Resistance Directory under categories XHCR and XHEZ may be used, providing that they conform to the construction type, penetrant type, annular space requirements and fire rating involved in each separate instance, and that the system be symmetrical for wall applications. Systems or devices must be asbestos-free.
 - 2. System shall withstand the passage of cold smoke either as an inherent property of the system or by the use of a separate product included as part of the UL system or device and designed to perform this function.
 - 3. All firestopping products must be from a single manufacturer. All trades shall use products from the same manufacturer.

C. Accessories

1. Fill, void or cavity materials shall be as classified under category XHHW in the UL Fire Resistance Directory.
2. Forming materials shall be as classified under category XHKU in the UL Fire Resistance Directory.

PART 3 EXECUTION

3.01 EXCAVATION AND BACKFILL

- A. Perform all excavation and backfill work to accomplish indicated electrical systems installation in accordance with Division 31.

3.02 CONCRETE WORK

- A. All cast-in-place concrete will be performed by the Division 03 Contractor unless noted otherwise elsewhere. Provide all layout drawings, anchor bolts, metal shapes, and/or templates required to be cast into concrete or used to form concrete for the support of electrical equipment.

3.03 CUTTING AND PATCHING

- A. Refer to Division 01, General Requirements, Cutting and Patching.

3.04 BUILDING ACCESS

- A. Arrange for the necessary openings in the building to allow for admittance of all apparatus. When the building access was not previously arranged and must be provided by this Contractor, restore any opening to its original condition after the apparatus has been brought into the building.

3.05 EQUIPMENT ACCESS

- A. Install all piping, conduit, ductwork, and accessories to permit access to equipment for maintenance. Coordinate the exact location of wall and ceiling access panels and doors with the other trades, making sure that access is available for all equipment and specialties. Access panels installed by the General Trade.

3.06 COORDINATION

- A. The Contractor shall cooperate with other trades and Architect/Engineer's personnel in locating work in a proper manner. Should it be necessary to raise or lower or move longitudinally any part of the electrical work to better fit the general installation, such work shall be done at no extra cost to the Owner, provided such decision is reached prior to actual installation. The Contractor shall check location of electrical outlets with respect to other installations before installing.

- B. The Contractor shall verify that all devices are compatible for the surfaces on which they will be used. This includes, but is not limited to, light fixtures, panelboards, devices, etc. and recessed or semi-recessed heating units installed in/on architectural surfaces.
- C. Prior to ordering material/equipment, review equipment shop drawings and installation instructions, including equipment furnished by other trades. Coordinate all electrical requirements and provide material/equipment (conduit, wiring, breakers, etc.) to provide a complete, compliant, and operational system. When the required material/equipment differs from that detailed in the construction documents, the Contractor shall notify the A/E immediately. Material/equipment that is incorrect and is ordered or installed by the Contractor shall be returned/removed at no cost to the Owner.
- D. Coordinate all work with other contractors prior to installation. Any installed work that is not coordinated and that interferes with other contractor's work shall be removed or relocated at the installing contractor's expense.

3.07 SLEEVES

- A. Pipe sleeves for conduits 6" in diameter and smaller, in new poured concrete construction, shall be Schedule 40 steel pipe, plastic removable sleeve or sheet metal sleeve, all cast in place.
- B. In wet area floor penetrations, top of sleeve to be 2" above the adjacent floor. In existing wet area floor penetrations, core drill sleeve openings large enough to insert Schedule 40 sleeve and grout the area around the sleeve. If the pipe penetrating the sleeve is supported by a pipe clamp resting on the sleeve, weld a collar or struts to the sleeve that will transfer weight to the existing floor structure. Wet areas for this paragraph are rooms or spaces containing air handling unit coils, converters, pumps, chillers, boilers, and similar waterside equipment.
- C. Pipe penetrations in existing concrete floors that are not in wet areas may omit the use of Schedule 40 sleeve and use the cored drilled opening as the sleeve.

3.08 SEALING AND FIRESTOPPING

- A. Examine areas and conditions under which work is to be performed and identify conditions detrimental to proper or timely completion.
 - 1. Verify barrier penetrations are properly sized and in suitable condition for application of materials.
 - 2. Do not proceed until unsatisfactory conditions have been corrected.
- B. Preparation
 - 1. Clean surfaces to be in contact with penetration seal materials of dirt, grease, oil, loose materials, rust, or other substances that may affect proper fitting, adhesion, or the required fire resistance.

C. Installation

1. Install penetration seal materials in accordance with printed instructions of the UL Fire Resistance Directory and in accordance with manufacturer's instruction.
2. Seal holes or voids made by penetrations to ensure an effective smoke barrier.
3. Where floor openings without penetrating items are more than 4" in width and subject to traffic or loading, install firestopping materials capable of supporting same loading as floor.
4. Protect materials from damage on surfaces subject to traffic.
5. Where large openings are created in walls or floors to permit installation of pipes, ducts, cable tray, busduct or other items, close unused portions of opening with firestopping material tested for the application. See UL Fire Resistance Directory.
6. Install smoke stopping as specified for firestopping.

D. Field Quality Control

1. Examine penetration sealed areas to ensure proper installation before concealing or enclosing areas.
2. Keep areas of work accessible until inspection by applicable code authorities.
3. Perform under this section patching and repairing of firestopping caused by cutting or penetration by other trades.

E. Adjusting and Cleaning

1. Clean up spills of liquid components.
2. Neatly cut and trim materials as required.
3. Remove equipment, materials and debris, leaving area in undamaged, clean condition.

3.09 HOUSEKEEPING AND CLEAN-UP

- A. The Contractor shall clean up and remove from the premises, on a daily basis, all debris and rubbish resulting from its work and shall repair all damage to new and existing equipment resulting from its work. When job is complete, this Contractor shall remove all tools, excess material and equipment, etc., from the site.

3.10 TRAINING OF OWNER'S PERSONNEL

- A. Instruct Owner's personnel in the proper operation and maintenance of systems and equipment provided as part of this project. Include not less than 4 hours of instruction, using the Operating and Maintenance manuals during this instruction. Demonstrate startup and shutdown procedures for all equipment. All training to be during normal working hours.

SECTION 26 05 02

ELECTRICAL DEMOLITION FOR REMODELING

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Demolition, removal, abandonment, and revision to electrical systems to accommodate the project.

1.02 RELATED WORK

- A. Applicable provisions of Division 01 shall govern all work under this Section.

PART 2 PRODUCTS

2.01 MATERIALS AND EQUIPMENT

- A. Materials and equipment for patching and extending work as specified in the individual Sections.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify field measurements and circuiting arrangements are as shown on Drawings.
- B. Verify that abandoned wiring and equipment serve only abandoned facilities.
- C. Verify whether or not PCB ballasts exist in light fixtures which will be disposed of. If PCB light fixture ballasts exist, then follow requirements in **PCB BALLAST HANDLING AND DISPOSAL** below.
- D. Beginning of demolition means installer accepts existing conditions.
- E. Demolition drawings are based on casual field observation and/or existing record documents. Report discrepancies to Owner and Architect/Engineer before disturbing existing installation.
- F. See also requirements for Interim Life Safety Measures per Sections 01 35 13 and 01 50 00.

3.02 PREPARATION

- A. Disconnect electrical systems in walls, floors, and ceiling scheduled for removal.
- B. Coordinate utility service outages with the Owner and Architect/Engineer.
- C. Provide temporary wiring and connections to maintain existing systems in service during construction. When work must be performed on energized equipment or circuits, use personnel experienced in such operations. In particular, all security and life safety systems must be maintained in operation at all times as required by the Owner. This includes security and safety lighting, fire alarms and smoke/heat detectors, and public address systems
- D. Existing Fire Alarm System: Maintain existing system in service until new system is accepted. Disable system only to make switchovers and connections. Notify Owner and Architect/Engineer [and local fire service] at least [24] hours before partially or completely disabling system. Minimize outage duration. Make temporary connections to maintain service in areas adjacent to work area.
- E. Existing Communication/Data System: Maintain existing system in service [until [new system is complete and ready for service. Disable system only to make switchovers and connections. Notify Owner and Architect/Engineer [and Telephone Utility Company] at least [24] hours before partially or completely disabling system. Minimize outage duration.

3.03 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

- A. Demolish and extend existing electrical work to meet all requirements of these specifications.
- B. If certain raceways and boxes are abandoned but not scheduled for removal, those items must be shown on the "As-Built Drawings".
- C. Remove, relocate, and extend existing installations to accommodate new construction.
- D. Remove abandoned wiring to source of supply.
- E. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.
- F. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide blank cover for abandoned outlets which are not removed.
- G. Disconnect and remove abandoned panelboards and distribution equipment.
- H. Disconnect and remove electrical devices and equipment serving utilization equipment that has been removed.

- I. Disconnect and remove abandoned luminaires. Remove brackets, stems, hangers, and other accessories.
- J. Repair adjacent construction and finishes damaged during demolition and extension work.
- K. Maintain access to existing electrical installations which remain active. Modify installation or provide access panel as appropriate.
- L. Extend existing installations using materials and methods compatible with existing electrical installations, or as specified. This includes the extension of the circuit from the last active device to the next device in the system to be activated.

3.04 PCB BALLAST HANDLING AND DISPOSAL

- A. Generally, all high power factor fluorescent light ballasts manufactured before 1978 and some HID ballasts contain PCB compounds in their capacitors. The Contractor shall inspect all ballasts in all light fixtures (which will become the property of the Contractor and will be removed from the project site as part of this project) and take the actions described below.
 - 1. All ballasts labeled as "NON-PCBs" or "NO PCBs" shall become the property of the Contractor. If the PCB content is not stated on the ballast label, the ballast shall be handled as a PCB ballast.
 - 2. All PCB ballasts shall be removed from the light fixtures and shall have the wires clipped off. However, before removal, all PCB ballasts shall be carefully inspected for leaks. If a ballast appears to be leaking (evidenced by potting compound leaking out or by an oily film on the ballast surface), the ballast must be handled per EPA and DNR PCB regulations. Basically, this means the ballast is to be carefully removed from the fixture and placed in an approved drum. See paragraph below for the drum specifications. The person removing the ballast from the fixture shall wear protective gloves, eye protection, and protective clothing as necessary.
 - 3. If the fixture has also been contaminated, it must be cleaned to less than 10 micrograms/100 square centimeters contamination before disposal. This cleaning must be done by an approved PCB contractor and is not considered a part of this contract. Contact Architect/Engineer for contractor approval before commencing with the cleanup.
 - 4. The ballasts shall then be placed in US DOT approved Type 17C or Type 17H drums (barrels) furnished by the Contractor. 55 gallon and 30 gallon drums are available from most drum suppliers. The quantity and size of the drums will be determined by the Contractor at the time of construction.
 - 5. These barrels shall be placed in storage with the cover that came with the barrels, in a location within a building, as designated by the Owner or Architect/Engineer project representative. The barrels are not to be placed outside where they are exposed to weather.

6. THESE BALLASTS ARE NOT TO BE REMOVED FROM THE WORK SITE BY THE CONTRACTOR. To do so would be a violation of DNR and DOT hazardous waste regulations and may result in a fine to the Contractor.
 7. The Contractor shall label and mark the PCB storage drums with EPA approved PCB labels and the storage area with signs, marks and lines to meet the regulations of Wisconsin Code NR 157.
 8. The Contractor shall also provide approved PCB absorbent materials to be stored immediately adjacent to the drum storage area. Do not place loose absorbent material in the drums.
 9. The Contractor shall provide to the Architect/Engineer project representative, in written form, a total count of these ballasts (or their total weight by barrel) and where they are stored.
- B. When the ballast demolition is completed and all PCB ballasts are placed in drums ready to be picked up for disposal, the Contractor project representative will advise the Architect/Engineer that the ballasts are ready for disposal together with the ballast quantity (or drum weight). The Architect/Engineer will then make arrangements for pickup and disposal of the PCB ballasts.

3.05 LAMP HANDLING AND DISPOSAL

- A. All lamps (fluorescent, incandescent, and HID) contain mercury and/or lead (in the base) as well as other heavy metals and compounds which are regulated by the EPA and DNR during the disposal process. As a result, regulations have been issued covering the handling and disposal of all lamps. Therefore, lamps which have been removed from service for disposal shall be handled as follows by the Contractor.
1. The Contractor shall very carefully remove all lamps (fluorescent, incandescent, and HID) from light fixtures before removal of the fixture from its mounted position. This is to reduce the likelihood that the lamp(s) will be broken.
 2. Removed lamps shall be placed in containers provided by the Contractor and placed in storage in a location on the Owner's property (this may be in another building) arranged by the Architect/Engineer field representative. The Contractor shall label the area as "Hazardous Material Storage - Mercury".
 3. The Contractor shall make arrangements for the lamps to be picked up.

3.06 CLEANING AND REPAIR

- A. Clean and repair existing materials and equipment which remain or are to be reused.
- B. Panelboards: Clean exposed surfaces and check tightness of electrical connections. Replace damaged circuit breakers and provide closure plates for vacant positions. Provide typed circuit directory showing revised circuiting arrangement.
- C. Luminaires: Remove existing luminaires for cleaning. Use mild detergent to clean all exterior and interior surfaces; rinse with clean water and wipe dry. Replace lamps.

3.07 INSTALLATION

- A. Install relocated materials and equipment under the provisions of other Sections.

SECTION 26 05 19

ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Furnishing and installing required wiring and cable systems including pulling, terminating and splicing.

1.02 RELATED WORK

- A. Applicable provisions of Division 01 shall govern all work under this Section, including Section 01 62 10 - Owner Preferred Suppliers.
- B. Section 26 05 33 - Raceway and Boxes for Electrical Systems
- C. Section 26 05 53 - Identification for Electrical Systems

1.03 REFERENCES

- A. NFPA 70 - National Electric Code

1.04 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum 3 years documented experience.

1.05 PROJECT CONDITIONS

- A. Verify that field measurements are as shown on Drawings.
- B. Conductor sizes are based on copper.
- C. Wire and cable routing shown on drawings is approximate unless dimensioned. Route wire and cable as required to meet project conditions.
- D. Where wire and cable routing is not shown, and destination only is indicated, determine exact routing and lengths required.

PART 2 PRODUCTS

2.01 GENERAL

- A. All wire shall be new, delivered to the site in unbroken cartons and shall be less than 1 year old out of manufacturer's stock.
- B. All conductors shall be copper. Aluminum conductors are not permitted.
- C. Insulation shall have a 600 volt rating.
- D. In mechanical rooms, light fixtures, and other high temperature applications, the insulation shall be rated 90°C. Other areas shall use insulation rated 75°C unless stated otherwise in other parts of these specifications and drawings.
- E. All conductors must be suitable for the application intended. Conductor #10 and larger must be stranded. Conductors #12 must be solid [stranded] with the following requirements or exceptions:
 - 1. Stranded conductors may only be terminated with UL or ETL Listed type terminations or methods: e.g. Stranded conductors may not be wrapped around a terminal screw but must be terminated with crimp type device or must be terminated in an approved back wire method.

2.02 BUILDING WIRE

- A. Description: Single conductor insulated wire.
- B. Insulation: Type THHN/THWN insulation for feeders and branch circuits.

2.03 WIRING CONNECTORS

- A. Split Bolt Connectors: Not acceptable.
- B. Solderless Pressure Connectors: High copper alloy terminal. May be used only for cable termination to equipment pads or terminals. Not approved for splicing.
- C. Twist Type Wire Connectors: Solderless twist type spring connector (wire nut) with insulating cover for copper wire splices and taps. Use for conductor sizes 10 AWG and smaller. The manufacturer's wire fill capacity must be followed.
- D. All wire connectors used in underground or exterior pull boxes shall be gel filled twist connectors or a connector designed for damp and wet locations. Gel filled twist type connectors can be used for conductor Sizes 6 AWG and smaller for site lighting applications. The manufacturer's wire fill capacity must be followed.
- E. Mechanical Connectors: Bolted type tin-plated; high conductivity copper alloy; spacer between conductors; beveled cable entrances.

- F. Compression (crimp) Connectors: Long barrel; seamless, tin-plated electrolytic copper tubing; internally beveled barrel ends. Connector shall be clearly marked with the wire size and type and proper number and location of crimps. Connector must be installed with a crimper tool listed for use with the manufacturer and type of compression connector.
- G. Insulation Piercing Connectors: Molded insulated body, copper teeth, wrench tightened, UL 486B Listed. May be used only for connection of a tap conductor in run and tap type applications when main conductor is 8 AWG and larger.

PART 3 EXECUTION

3.01 GENERAL WIRING METHODS

- A. All wire and cable shall be installed in conduit.
- B. Do not use wire smaller than 12 AWG for power and lighting circuits.
- C. All conductors shall be sized to prevent excessive voltage drop at rated circuit ampacity. As a minimum, use 10 AWG conductors for 20 ampere, 120 volt branch circuit home runs larger than 100 feet (30 m), and for 20 ampere, 277 volt branch circuit home runs longer than 200 feet (61 m).
- D. Make conductor lengths for parallel conductors equal.
- E. Splice only in junction or outlet boxes.
- F. No conductor less than 12 AWG shall be installed in exterior underground conduit.
- G. Identify ALL low voltage, 600v and lower, wire per Section 26 05 53.
- H. Neatly train and lace wiring inside boxes, equipment, and panelboards.

3.02 WIRING INSTALLATION IN RACEWAYS

- A. Pull all conductors into a raceway at the same time. Use Listed water or silicone based wire pulling lubricant for pulling 4 AWG and larger wires and for other conditions when necessary. Wax based lubricants are not allowed. Pulling lubricant is not required for low friction type products where the cable manufacturer recommends that cables be pulled without lube.
- B. Install wire in raceway after interior of building has been physically protected from the weather and all mechanical work likely to injure conductors has been completed.
- C. Completely and thoroughly swab raceway system before installing conductors.
- D. Place all conductors of a given circuit (this includes phase wires, neutral (if any), and ground conductor) in the same raceway. If parallel phase and/or neutral wires are used, then place an equal number of phase and neutral conductors in same raceway or cable.

3.03 WIRING CONNECTIONS AND TERMINATIONS

- A. Splice only in accessible junction boxes.
- B. Wire splices and taps shall be made firm and adequate to carry the full current rating of the respective wire without soldering and without perceptible temperature rise.
- C. All splices shall be so made that they have an electrical resistance not in excess of two feet (600 mm) of the conductor.
- D. Use solderless twist type spring connectors (wire nuts) with insulating covers for wire splices and taps, 10 AWG and smaller.
- E. Use mechanical or compression connectors for wire splices and taps, 8 AWG and larger. Tape uninsulated conductors and connectors with electrical tape to 150 percent of the insulation value of conductor.
- F. Thoroughly clean wires before installing lugs and connectors.
- G. At all splices and terminations, leave tails long enough to cut splice out and completely re-splice.

3.04 FIELD QUALITY CONTROL

- A. Field inspection and testing shall be performed under provisions of Section 26 05 04 and per NFPA 99:
 - 1. Conductors shall be closely checked for loose or poor connections and for signs of overheating or corrosion.
 - 2. Test procedures shall meet NETA guidelines.
 - 3. Contractor shall correct all deficiencies.

3.05 WIRE COLOR

A. General:

1. For wire sizes 10 AWG and smaller, wire shall be colored as indicated below.
2. For wire sizes 8 AWG and larger, identify wire with colored tape at all terminals, splices and boxes. Colors to be as indicated below.
3. In new facilities, use black and red for single phase circuits at 120/240 volts, use Phase A black, Phase B red and Phase C blue for circuits at 120/208 volts single or three phase and use Phase A brown, Phase B orange and Phase C yellow for circuits at 277/480 volts single or three phase. Note: This includes fixture whips except for Listed whips mounted by the fixture manufacturer on the fixture and Listed as a System.
4. All switch legs shall be the same color as their associated circuit. Traveler conductors run between 3-way and 4-way switches shall be colored PINK or PURPLE.

B. Neutral Conductors: White. Where there are two or more neutrals in one conduit, each shall be individually identified with a different stripe.

C. Branch Circuit Conductors: Three or four wire home runs shall have each phase uniquely color coded.

D. Feeder Circuit Conductors: Each phase shall be uniquely color coded.

E. Ground Conductors: Green for 6 AWG and smaller. For 4 AWG and larger, identify with green tape at both ends and at all access points, such as panelboards, motor starters, disconnects and junction boxes. When isolated grounds are required, Contractor shall provide green with yellow tracer.

3.06 BRANCH CIRCUITS

A. The use of single-phase, multi-wire branch circuits with a common neutral is not permitted. All single-phase branch circuits shall be furnished and installed with an individual accompanying neutral, sized the same as the phase conductor.

3.07 EMERGENCY CIRCUITS

A. All emergency system wiring shall be installed in separate raceways after their associated transfer switches. The wiring shall be separate from each other and from all normal system wiring.

SECTION 26 05 23

CONTROL-VOLTAGE WIRING

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Furnishing and installing required remote control and signal cabling.

1.02 RELATED WORK

- A. Applicable provisions of Division 01 shall govern all work under this Section
- B. Section 26 05 33 - Raceway and Boxes for Electrical Systems
- C. Section 26 05 53 - Identification for Electrical Systems
- D. Section 27 00 00 - Communications Cable and Equipment
- E. Section 28 31 00 - Fire Alarm System

1.03 REFERENCES

- A. NFPA 70 - National Electric Code

1.04 PROJECT CONDITIONS

- A. Verify that field measurements are as shown on Drawings.
- B. Conductor sizes are based on copper.
- C. Wire and cable routing shown on Drawings is approximate unless dimensioned.
Route wire and cable as required to meet Project Conditions.
- D. Where wire and cable routing is not shown, and destination only is indicated, determine exact routing and lengths required.

PART 2 - PRODUCTS

2.01 GENERAL

- A. All wire shall be new, delivered to the site in unbroken cartons and shall be less than one year old out of manufacturer's stock.
- B. All conductors shall be copper.
- C. Insulation shall have a 600 volt rating.

- D. All conductors must be suitable for the application intended. Conductors #12 and smaller may be solid or stranded with the following requirements or exceptions:
 - 1. All conductors terminated with crimp type devices must be stranded.
 - 2. Stranded conductors may only be terminated with UL OR ETL Listed type terminations or methods: e.g., stranded conductors may not be wrapped around a terminal screw but must be terminated with a crimp type device or must be terminated in an approved back wired method.

2.02 REMOTE CONTROL AND SIGNAL CABLE

- A. Refer to Section 28 31 00 for requirements for cable to be used on fire alarm system.
- B. Refer to Section 27 00 00 for requirements for cable to be used on communication systems.
- C. All other systems cabling shall meet the requirements of NEC Article 725 and the following:
 - 1. Control Cable for Class 1 Remote Control and Signal Circuits: 600 volt insulation, individual conductors twisted together, [shielded], and covered with an overall PVC jacket. Cable shall be Listed, temperature rated, and plenum or non-plenum rated for the application as required in the National Electrical Code.
 - 2. Control Cable for Class 2 or Class 3 Remote Control and Signal Circuits shall be constructed, Listed, temperature rated, and plenum or non-plenum rated for the application as required in the NEC Article 725.

2.03 WIRING CONNECTORS

- A. Split Bolt Connectors: Not acceptable.
- B. Twist Type Wire Connectors: Solderless twist type spring connector (wire nut) with insulating cover for copper wire splices and taps. Use for conductor sizes 10 AWG and smaller. The manufacturer's wire fill capacity must be followed.
- C. All wire connectors used in underground or exterior pull boxes shall be gel filled twist connectors or a connector designed for damp and wet locations. The manufacturer's wire fill capacity must be followed.

PART 3 - EXECUTION

3.01 GENERAL WIRING METHODS

- A. Low voltage control and signal cables shall be installed in conduit. However, they may be installed without conduit above accessible ceilings if the cable meets NEC requirements for the application, unless specified to be in conduit in other sections of the specifications. See requirements for free-air cabling installation below.
- B. Control cables for controlling HVAC and lighting equipment connected to emergency power shall be routed in raceway.
- C. Do not use wire smaller than 14 AWG for control wiring greater than 60 volts, or #18 AWG for voltages less than 60 volts, all sizes subject to NEC 725 requirements.
- D. Splice only in junction boxes.
- E. Identify wire per Section 26 05 53.
- F. Neatly train and lace wiring inside boxes, and equipment.

3.02 WIRING INSTALLATION IN RACEWAYS

- A. Pull all conductors into a raceway at the same time. Use Listed wire pulling lubricant for pulling conditions when necessary.
- B. Install wire in raceway after interior of building has been physically protected from the weather and all mechanical work likely to injure conductors has been completed.
- C. Completely and thoroughly swab raceway system before installing conductors.

3.03 FREE-AIR CABLE INSTALLATION

- A. When permitted in exposed ceiling areas, "Free-Air" wiring runs shall avoid areas of high traffic (i.e., aisle way), shall be run as close as possible to outlining walls and shall be a minimum of ten (10) feet above finished floor.
- B. Cabling shall be neatly run at right angles and be kept clear of other trades work.
- C. Cabling shall be supported at a maximum of 4-foot intervals utilizing "bridal-type" mounting rings or J-hooks anchored to ceiling concrete, piping supports or structural steel beams. If cable sag at mid-span exceeds 12", another support shall be provided. Mounting rings shall be designed to maintain cables bend to larger than the minimum bend radius (typically 4 x cable diameter).
- D. Cabling shall not be attached to or supported by existing cabling, plumbing or steam piping, ductwork, suspended ceiling supports or electrical conduit. Additionally, cabling shall not be laid directly on the ceiling grid.

- E. To reduce or eliminate Electro-Magnetic Interference (EMI), the following minimum separation distances for "Free-Air" cabling installations shall be adhered to:
1. Twelve inches (12") from power lines of less than 5kV.
 2. Thirty-nine inches (39") from power lines of 5kV or greater.
 3. Eighteen inches (18") from lighting fixtures.
 4. Thirty-nine inches (39") from transformers and motors.
- F. A coil of 2 feet in each cable shall be placed in the ceiling at each "free-air" wired device. These coils shall be secured (wire tied) at the last cable support before the cable reaches the device and shall be coiled from 100% to 200% of the cable recommended minimum bend radius.
- G. All cable shall be free of tension at both ends. Nylon strain relief connectors shall be provided at each device and junction box where cables enter. In cases where the cable must bear some stress, Kellum type grips may be used to spread the strain over a longer length of cable.
- H. Cable manufacturer's minimum bend radius shall be observed in all instances. Care should be taken in the use of cable ties to secure and anchor the station cabling. Ties should not be over tightened as to compress the cable jacket. No sharp burrs should remain where excess length of the cable tie has been cut.
- I. All exposed vertical cable extensions to devices located below the finished ceiling shall be in conduit.
- J. Provide protection for exposed cables where subject to damage.
- K. Use suitable cable fittings and connectors.

3.04 WIRING CONNECTIONS AND TERMINATIONS

- A. Splice only in accessible junction boxes.
- B. All splices shall be so made that they have an electrical resistance not in excess of two feet (600 mm) of the conductor.
- C. Use solderless twist type spring connectors with insulating covers for wire splices and taps, 10 AWG and smaller.
- D. Thoroughly clean wires before installing lugs and connectors.
- E. At all splices and terminations, leave tails long enough to cut splice out and completely re-splice.

GROUNDING AND BONDING

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Grounding electrodes and conductors, equipment grounding conductors and bonding.

1.02 RELATED WORK

- A. Applicable provisions of Division 01 shall govern all work under this Section

1.03 REFERENCES

- A. Provide all materials and equipment under this contract in accordance with the following applicable Technical Society, Organization or Body.

- 1. ANSI/NFPA 70 - National Electrical Code.

1.04 REGULATORY REQUIREMENTS

- A. Conform to requirements of NFPA 70.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. or testing firm acceptable to Authority Having Jurisdiction (AHJ) as suitable for the purpose specified and shown.

1.05 GROUNDING ELECTRODE SYSTEM

- A. Metal frame of the building.
- B. Rod electrode.

1.06 PERFORMANCE REQUIREMENTS

- A. Grounding System Resistance: 2 ohms maximum at building service entrance.

1.07 PROJECT RECORD DOCUMENTS

- A. Accurately record actual locations of grounding electrodes.

PART 2 PRODUCTS

2.01 ROD ELECTRODE

- A. Material: Copper-clad steel.
- B. Diameter: 3/4 " ([19]) mm) minimum.
- C. Length: [10feet ([3m]) minimum. Rod shall be driven at least 9'-6" deep.
- D. Provide the number of rods required to obtain proper ground resistance. This applies to manholes, padmount switches, transformers, service entrances, etc.

2.02 MECHANICAL CONNECTORS

- A. The mechanical connector bodies shall be manufactured from high strength, high conductivity cast copper alloy material. Bolts, nuts, washers, and lockwashers shall be made of silicon bronze and supplied as a part of the connector body and shall be of the two-bolt type.
- B. Split bolt connector types are NOT allowed.
- C. The connectors shall meet or exceed UL 467 and be clearly marked with the catalog number, conductor size, and manufacturer.

2.03 COMPRESSION CONNECTORS

- A. The compression connectors shall be manufactured from pure wrought copper. The conductivity of this material shall be no less than 99% by IACS standards.
- B. Each connector shall be factory filled with an oxide-inhibiting compound.
- C. The connectors shall meet or exceed the performance requirements of IEEE 837, latest revision.
- D. The connectors shall be clearly marked with the manufacturer, catalog number, conductor size, and the required compression tool settings.
- E. The installation of the connectors shall be made with a compression, tool and die system, as recommended by the manufacturer of the connectors.
- F. Pre-crimping of the ground rod is required for all irreversible compression connections to a ground rod.

2.04 EXOTHERMIC CONNECTIONS

- A. Determine weld type and configuration. Provide proper mold.
- B. Description: Molecular weld.
- C. Catalyst: Powdered copper oxide.
- D. Procedure: Follow manufacturer's recommendations.

2.05 WIRE

- A. Material: Stranded copper (aluminum not permitted).
- B. Grounding Electrode Conductor: Size as shown on drawings, specifications or as required by NFPA 70, whichever is larger.
- C. Feeder and Branch Circuit Equipment Ground: Size as shown on drawings, specifications, or as required by NFPA 70, whichever is larger. Differentiate between the normal ground and the isolated ground when both are used on the same facility.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that final backfill and compaction has been completed before driving rod electrodes.

3.02 GENERAL

- A. Install products in accordance with manufacturer's instructions.
- B. Mechanical connections shall be accessible for inspection and checking. No insulation shall be installed over mechanical ground connections.
- C. Ground connection surfaces shall be cleaned and all connections shall be made so that it is impossible to move them.
- D. Attach grounds permanently before permanent building service is energized.
- E. Install rod electrodes at locations indicated or as required by Code, whichever requires the most rods. [Install additional rod electrodes as required to achieve specified resistance to ground.]

3.03 LESS THAN 600-VOLT SYSTEM GROUNDING

- A. Supplementary Grounding Electrode: [Use driven ground rod [on exterior of building.]
- B. Receptacle Grounding: All receptacles installed shall have a separate grounding contact.
- C. Bond together system neutrals, service equipment enclosures, exposed non-current carrying metal parts of electrical equipment, metal raceway systems, grounding conductor in raceways and cables, receptacle ground connectors, and plumbing systems.
- D. Equipment Grounding Conductor: Provide separate, insulated green conductor within each raceway and cable tray, sized per NEC or as indicated in the contract documents, whichever is larger. Terminate each end on suitable lug, bus, enclosure or bushing, per NEC. Provide a ground wire from each device to the respective enclosure.
- E. Provide communications system grounding conductor at point of service entrance and connect to building common grounding electrode system.
- F. Telecommunications systems shall be installed with an isolated grounding system which has only one ground point. That ground point is to be the common grounding electrode system at the electrical service entrance for the building. The Contractor is to provide an isolated grounding conductor from the electrical service entrance of the building to each Telecommunications Grounding Bus Bar (TGB) in each Telecommunication Room. Use a minimum #2/0 AWG copper conductor, or as indicated on the plans, for the telecommunications service grounding conductor. Leave 10 feet slack grounding conductor at each Telecommunications Room. The grounding conductor must not be attached to the building steel (except as allowed at the main electrical service entrance). The TGB shall be provided as follows:
 - 1. Materials: 20" x 4" x 1/4" solid copper bar
 - 2. Drilled with 17/64" (7 mm) holes
- G. Telecommunications Equipment Rack Grounding: Use a #6 or larger AWG copper conductor from all telecommunications cabinets and racks to the TGB in their respective Telecommunication Room.

3.05 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.] [Measure ground resistance from system neutral connection at service entrance to convenient ground reference point using suitable ground testing equipment. Resistance shall not exceed 2 ohms.]

SECTION 26 05 29

HANGERS AND SUPPORTS FOR ELECTRICAL PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Conduit and equipment supports, straps, clamps, steel channel, etc. and fastening hardware for supporting electrical work.

1.02 RELATED WORK

- A. Applicable provisions of Division 01 shall govern all work under this Section, including Section 01 62 10 - Owner Preferred Suppliers.
- B. Section 05 05 20 - Fasteners and Metal Fastenings
- C. Section 26 05 33 - Raceway and Boxes for Electrical Systems

1.03 QUALITY ASSURANCE

- A. Support systems shall be adequate for weight of equipment and conduit, including wiring, which they carry.

PART 2 PRODUCTS

2.01 MATERIAL

- A. Support Channel: Steel, galvanized, enameled or other corrosion-resistant; sized to support the load.
- B. Hardware: Corrosion resistant.
- C. Minimum sized threaded rod for supports shall be 3/8" for trapezes and single conduits 1-1/4" and larger, and 1/4" for single conduits 1" and smaller.
- D. Conduit clamps, straps, supports, etc. shall be steel or malleable iron. One-hole straps shall be heavy duty type. All straps shall have steel or malleable iron backing plates where rigid steel conduit is installed on the interior or exterior surface of any exterior building wall.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Fasten hanger rods, conduit clamps, outlet, junction and pull boxes to building structure using pre-cast insert system, preset inserts, beam clamps, expansion anchors, or spring steel clips (interior metal stud walls only).
- B. Use toggle bolts or hollow wall fasteners in hollow masonry, plaster, or gypsum board partitions and walls; expansion anchors or preset inserts in solid masonry walls; self-drilling anchors or expansion anchor on concrete surfaces; sheet metal screws in sheet metal studs; and wood screws in wood construction. If nail-in anchors are used, they must be removable type anchors.
- C. Do not use powder-actuated or plastic anchors.
- D. File and de-bur cut ends of support channel and spray paint with cold galvanized paint to prevent rusting.
- E. Do not fasten supports to piping, ductwork, mechanical equipment, cable tray or conduit. Do not fasten to suspended ceiling grid system.
- F. Do not drill structural steel members unless approved by Architect/Engineer.
- G. Fabricate supports from galvanized structural steel or steel channel, rigidly welded or bolted to present a neat appearance. Use hexagon head bolts with spring lock washers under all nuts.
- H. In wet locations, mechanical rooms and electrical rooms install free-standing electrical equipment on 4" concrete pads.
- I. Install surface-mounted cabinets and panelboards with minimum of four anchors. Provide steel channel supports to stand cabinet 1" (25 mm) off wall (7/8" Uni-Strut or 3/4" painted, fire-retardant plywood is acceptable).
- J. Bridge studs top and bottom with channels to support flush-mounted cabinets and panelboards in stud walls.
- K. Furnish and install all supports as required to fasten all electrical components required for the project, including free standing supports required for those items remotely mounted from the building structure, catwalks, walkways etc.

RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Conduits, surface raceways, multi-outlet assemblies, auxiliary gutters, wall duct, and boxes for electrical systems including wall and ceiling outlet boxes, floor boxes, and junction boxes.

1.02 RELATED WORK

- A. Applicable provisions of Division 01 shall govern all work under this Section.
- B. Section 26 05 29 - Hangers and Supports for Electrical Piping and Equipment
- C. Section 26 27 02 - Equipment Wiring Systems
- D. Section 26 27 26 - Wiring Devices
- E. Section 27 00 00 - Communications Cable and Equipment
- F. Section 28 31 00 - Fire Detection and Alarm

PART 2 - PRODUCTS

2.01 RIGID METAL CONDUIT AND FITTINGS

- A. Conduit: Heavy wall, galvanized steel, Schedule 40, threaded.
- B. Fittings and Conduit Bodies: Use all steel threaded fittings and conduit bodies.

2.02 INTERMEDIATE METAL CONDUIT (IMC) AND FITTINGS

- A. Conduit: Galvanized steel, threaded.
- B. Fittings and Conduit Bodies: Use all steel threaded fittings and conduit bodies.

2.03 ELECTRICAL METALLIC TUBING (EMT) AND FITTINGS

- A. Conduit: Steel, galvanized tubing.
- B. Fittings: All steel, compression, watertight, concrete-tight. No push-on or indenter types permitted.
- C. Conduit Bodies: All steel threaded conduit bodies.

2.04 FLEXIBLE METAL CONDUIT AND FITTINGS

- A. Conduit: Steel, galvanized, spiral strip.
- B. Fittings and Conduit Bodies: All steel, galvanized, or malleable iron (except as allowed in Specification Section 26 51 13).

2.05 LIQUIDTIGHT FLEXIBLE METAL CONDUIT AND FITTINGS

- A. Conduit: Flexible, steel, galvanized, spiral strip with an outer Liquid-tight, non-metallic, sunlight-resistant jacket.
- B. Fittings and Conduit Bodies: ANSI/NEMA FB 1, compression type. There shall be a metallic cover/insert on the end of the conduit inside the connector housing to seal the cut conduit end.

2.06 MC CABLE AND CONNECTORS

- A. Southwire (only) Type MC ^{AP} cable (for non-Healthcare).
- B. Utilize U.L. approved MCI-A fittings only.
- C. Utilize in applications as approved by the NEC.

2.07 RIGID NON-METALLIC CONDUIT AND FITTINGS

- A. Conduit: Schedule 40 PVC minimum, Listed, sunlight resistant, rated for 90°C conductors.
- B. Fittings and Conduit Bodies: NEMA TC 2, Listed.

2.08 CONDUIT SUPPORTS

- A. See Section 26 05 29.

2.09 OUTLET BOXES

- A. Sheet Metal Outlet Boxes: Galvanized steel, with stamped knockouts.
- B. Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported; include 3/8" male fixture studs where required.
- C. Concrete Ceiling Boxes: Concrete type.

Cast Boxes: Cast ferroalloy or aluminum type deep type, gasketed cover, threaded hubs.

2.10 PULL AND JUNCTION BOXES

- A. Pull boxes and junction boxes shall be minimum 4" square (100 mm) by 2-1/8" (54 mm) deep for use with 1" (25 mm) conduit and smaller. On conduit systems using 1-1/4" (31.75 mm) conduit or larger, pull and junction boxes shall be sized per NEC but not less than 4-11/16" square (117 mm).
- B. For telecommunication, fiber optic, security, and other low voltage cable installations, the NEC box size requirements shall apply. All boxes, used on telecommunication, security, other low voltage and fiber optic systems with conduits of 1-1/4" and larger, shall be sized per the NEC conduit requirements. For determining box size, the conduit is the determining factor not the wire size.
- C. Sheet Metal Boxes: Code gauge galvanized steel, screw covers, flanged and spot welded joints and corners.
- D. Sheet metal boxes larger than 12" (300 mm) in any dimension shall have a hinged cover or a chain installed between box and cover.
- E. Cast Metal Boxes for Outdoor and Wet Location Installations: Type 4 and Type 6, flat-flanged, surface-mounted junction box, UL listed as raintight. Galvanized cast iron or aluminum box and cover with ground flange, neoprene gasket, and stainless steel cover screws.
- F. Box extensions and adjacent boxes within 48" of each other are not allowed for the purpose of creating more wire capacity.
- G. Junction boxes 6" x 6" or larger size shall be without stamped knock-outs.
- H. Wireways shall not be used in lieu of junction boxes.

2.11 GENERAL

- A. All steel fittings and conduit bodies shall be galvanized.
- B. No cast metal, split or gland type fittings permitted.
- C. Condulets larger than 2" (50 mm) not permitted except as approved or detailed.
- D. All conduit covers must be fastened to the conduit body with screws and be of the same manufacture.
- E. Wireways and gutters shall not be used in lieu of pull boxes and condulets.
- F. All boxes shall be of sufficient size to provide free space for all conductors enclosed in the box and shall comply with NEC requirements.

PART 3 - EXECUTION

3.01 CONDUIT SIZING, ARRANGEMENT, AND SUPPORT

- A. EMT is permitted to be used in sizes 4" (50 mm) and smaller for power and telecommunication systems. See CONDUIT INSTALLATION SCHEDULE below for other limitations for EMT and other types of conduit.
- B. Size power conductor raceways for conductor type installed. Conduit size shall be 3/4" minimum except as specified elsewhere. **Caution: Per the NEC, the allowable conductor ampacity is reduced when more than three current-carrying conductors are installed in a raceway. Contractor must take the NEC ampacity adjustment factors into account when sizing the raceway and wiring system.**
- C. Size conduit for all other wiring, including but not limited to data, control, security, fire alarm, telecommunications, signal, video, etc. Conduit size shall be 1" minimum except where specified elsewhere. Conduit shall be sized per number of conductors pulled and their cross-section. 40% fill shall be maximum for all new conduit fills.
- D. Arrange conduit to maintain headroom and present a neat appearance.
- E. Route exposed conduit and conduit above accessible ceilings parallel and perpendicular to walls and adjacent piping.
- F. Maintain minimum 6" (150 mm) clearance between conduit and piping. Maintain 12" (300 mm) clearance between conduit and heat sources such as flues, steam pipes, and heating appliances.
- G. Arrange conduit supports to prevent distortion of alignment by wire pulling operations. Fasten conduit using galvanized pipe straps, conduit racks (lay-in adjustable hangers), clevis hangers, or bolted split stamped galvanized hangers.
- H. Group conduit in parallel runs where practical and use conduit rack (lay-in adjustable hangers) constructed of steel channel with conduit straps or clamps. Provide space for 25 percent additional conduit.
- I. Do not fasten conduit with wire or perforated pipe straps. Before conductors are pulled, remove all wire used for temporary conduit support during construction.
- J. Support and fasten metal conduit at a maximum of 8 feet (2.4 m) on center.
- K. Supports shall be independent of the installations of other trades, e.g. ceiling support wires, HVAC pipes, etc., unless so approved or detailed.
- L. In general, all conduit shall be concealed except where noted on the drawings or approved by the Architect/Engineer. Contractor shall verify with Architect/Engineer all surface conduit installations except in mechanical rooms.

- M. Changes in direction shall be made with symmetrical bends, cast steel boxes, stamped metal boxes or cast steel conduit bodies.
- N. No continuous conduit run shall exceed 100 feet (30 meters) without a junction box.
- O. All conduits installed in exposed areas shall be installed with a box offset before entering the box.

3.02 CONDUIT INSTALLATION

- A. Cut conduit square using a saw or pipecutter; de-burr cut ends.
- B. Conduit shall not be fastened to the corrugated metal roof deck.
- C. Bring conduit to the shoulder of fittings and couplings and fasten securely.
- D. Use conduit hubs for fastening conduit to cast boxes. Use sealing locknuts or conduit hubs for fastening conduit to sheet metal boxes in damp or wet locations.
- E. All conduit terminations (except for terminations into conduit bodies) shall use connectors or conduit hubs with one locknut or shall use double locknuts (one each side of box wall) and insulating bushing. Provide bushings for the ends of all conduit not terminated in box walls. Refer to Section 26 05 26 - Grounding and Bonding for Electrical Systems for grounding bushing requirements.
- F. Install no more than the equivalent of three 90 degree bends between boxes.
- G. Use hydraulic one-shot conduit bender or factory elbows for bends in conduit larger than 2" (50 mm) size unless sweep elbows are required.
- H. Conduit shall be bent according to manufacturer's recommendations. Torches or open flame shall not be used to aid in bend of PVC conduit.
- I. Use suitable conduit caps or other approved seals to protect installed conduit against entrance of dirt and moisture.
- J. Provide 1/8" (3 mm) nylon pull string in empty conduit, except sleeves and nipples.
- K. Install expansion-deflection joints where conduit crosses building expansion joints.
Note: Expansion-deflection joints are not required where conduit crosses building control joints if the control joint does not act as an expansion joint. Install expansion fitting in PVC conduit runs as recommended by the manufacturer.
- L. Avoid moisture traps where possible. Where moisture traps are unavoidable, provide junction boxes with drain fittings at conduit low points.
- M. Where conduit passes between areas of differing temperatures such as into or out of cool rooms, freezers, unheated and heated spaces, buildings, etc., provide Listed conduit seals to prevent the passage of moisture and water vapor through the conduit.

- N. Route conduit through roof openings for piping and ductwork where possible.
- O. Conduit is not permitted in any slab topping of two inches (50mm) or less.
- P. Ground and bond conduit under provisions of Section 26 05 26.
- Q. Maximum Size Conduit in Slabs Above Grade: 3/4" (19mm). Do not route conduits to cross each other in slabs above grade.
- R. Identify conduit under provisions of Section 26 05 53.
- S. PVC conduit shall be cleaned with solvent, and dried before application of glue. The temperature rating of glue/cement shall match weather condition. Apply full even coat of cement/glue to entire area that will be inserted into fitting. The entire installation shall meet manufacturer's recommendations.

3.03 CONDUIT INSTALLATION SCHEDULE

- A. Conduit other than that specified below for specific applications shall not be used.
- B. Underground Installations Within Five Feet (1.5 m) of Foundation Wall: Rigid steel conduit.
- C. Under Slab on Grade Installations: Schedule 40 PVC conduit.
- D. Exposed Outdoor Locations: Rigid steel conduit.
- E. Concealed in Concrete and Block Walls: Rigid steel conduit. Schedule 40 PVC conduit, electrical metallic tubing.
- F. Within Concrete Slabs: Rigid steel conduit. Schedule 40 PVC conduit.
- G. Wet Interior Locations: Rigid steel conduit. [Schedule 40 PVC conduit][PVC coated rigid steel conduit].
- H. Concealed Dry Interior Locations: Electrical metallic tubing.
- I. Exposed Dry Interior Locations: Electrical metallic tubing.
- J. Motor and Equipment Connections: Flexible PVC coated metal conduit (all locations). Minimum length shall be one foot (300 mm), maximum length shall be three feet (900 mm). Conduit must be installed perpendicular to direction of equipment vibration to allow conduit to freely flex.
- K. Light Fixtures: Direct box or conduit connection for surface mounted and recessed fixtures. Flexible metal conduit from a J-box for recessed lay-in light fixtures. Conduit size shall be 3/8" (10 mm) minimum diameter and six foot (1.8 M) maximum length. Conduit length shall allow movement of fixture for maintenance purposes. [Note: MC cable approved for undercabinet light fixture installations only.]

3.04 SURFACE METAL RACEWAY AND MULTI-OUTLET ASSEMBLY INSTALLATION

- A. Use flat-head screws to fasten channel to surfaces every 24". Mount plumb and level.
- B. Use suitable insulating bushings and inserts at connections to outlets and corner fittings.
- C. Maintain grounding continuity between raceway components to provide a continuous grounding path under provisions of Section 26 05 26.
- D. Fastener Option: Use clips and straps suitable for the purpose.

3.05 COORDINATION OF BOX LOCATIONS

- A. Provide electrical boxes as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections, and code compliance.
- B. Electrical box locations shown on Contract Drawings are approximate unless dimensioned. Verify location of floor boxes and outlets in offices and work areas prior to rough-in.
- C. No outlet, junction or pull boxes shall be located where it will be obstructed by other equipment, piping, lockers, benches, counters, etc.
- D. Boxes shall not be fastened to the metal roof deck.
- E. It shall be the Contractor's responsibility to study drawings pertaining to other trades, to discuss location of outlets with workmen installing other piping and equipment and to fit all electrical outlets to job conditions.
- F. In case of any question or argument over the location of an outlet, the Contractor shall refer the matter to the Architect/Engineer and install outlet as instructed by the Architect/Engineer.
- G. The proper location of each outlet is considered a part of this contract and no additional compensation will be paid to the Contractor for moving outlets which were improperly located.
- H. Locate and install boxes to allow access to them. Where installation is inaccessible, coordinate locations and provide 18" (450 mm) by 24" (600 mm) access doors.
- I. Locate and install to maintain headroom and to present a neat appearance.
- J. Install boxes to preserve fire resistance rating of partitions and other elements, using approved materials and methods.

3.06 OUTLET BOX INSTALLATION

- A. Do not install boxes back-to-back in walls. Provide minimum 6" (150 mm) separation, except provide minimum 24" (600 mm) separation in acoustic-rated walls.
- B. Power: Recessed (1/4" maximum) outlet boxes in masonry, concrete or tile construction shall be masonry type, minimum 4" square with device rings. Device covers shall be square-cut except rounded corner plaster rings are allowed in drywall applications. Angle cut plaster rings are not permitted. Coordinate masonry cutting to achieve neat openings for boxes.
- C. Low Voltage: Recessed (1/4" maximum) outlet boxes in masonry, concrete or tile construction shall be minimum 4-11/16" square, 2-1/8" deep. Device covers shall be square-cut except rounded corner plaster rings are allowed in drywall applications. Angle cut plaster rings are not permitted. Coordinate masonry cutting to achieve neat openings for boxes.
- D. Provide knockout closures for unused openings.
- E. Support boxes independently of conduit except for cast boxes that are connected to two rigid metal conduits, both supported within 12" (300 mm) of box.
- F. Use multiple-gang boxes where more than one device are mounted together; do not use sectional boxes. Provide non-metallic barriers to separate wiring of different voltage systems.
- G. Install boxes in walls without damaging wall insulation.
- H. Coordinate mounting heights and locations of outlets mounted above counters, benches, and backsplashes.
- I. Ceiling outlets shall be 4" (100 mm) octagon or 4" square, minimum 2-1/8" (54 mm) deep except that concrete boxes and plates will be approved where applicable. Position outlets to locate luminaires as shown on reflected ceiling plans.
- J. In inaccessible ceiling areas, position outlets and junction boxes within 6" (150 mm) of recessed luminaire, to be accessible through luminaire ceiling opening.
- K. Provide recessed outlet boxes in finished areas; secure boxes to interior wall and partition studs, accurately positioning to allow for surface finish thickness. Use stamped steel stud bridges for flush outlets in hollow stud wall, and adjustable steel channel fasteners for flush ceiling outlet boxes.
- L. Align wall-mounted outlet boxes for switches, thermostats, and similar devices.
- M. Provide cast ferroalloy or aluminum outlet boxes in exterior and wet locations.
- N. Surface wall outlets shall be 4" (100 mm) square with raised covers for one and two gang requirements. For three gang or larger requirements, use gang boxes with non-overlapping covers.

3.07 PULL AND JUNCTION BOX INSTALLATION

- A. Locate pull boxes and junction boxes above accessible ceilings, in unfinished areas or furnish and install access panels in non-accessible ceilings where boxes are installed. All boxes to be readily accessible.
- B. Support pull and junction boxes independent of conduit.

IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 WORK INCLUDED

- A. This section describes the products and execution requirements relating to labeling of [power], [lighting], [general wiring], [fire alarm], and [telecommunications] wire and cabling. Further, this section includes labeling of all terminations and related sub-systems, including, but not limited to, nameplates, stenciling, [wire and cable marker]cables, terminating equipment.

1.02 RELATED WORK

- A. Applicable provisions of Division 01 shall govern all work under this Section
- B. Section 26 05 19 - Electrical Power Conductors and Cables
- C. Section 26 05 23 - Control-Voltage Wiring
- D. Section 27 00 00 - Communications Cable and Equipment

PART 2 PRODUCTS

2.01 MATERIAL

- A. Labels: All labels shall be permanent, and be machine generated. NO HANDWRITTEN OR NON-PERMANENT LABELS SHALL BE ALLOWED. Exception: Back side of device plates and junction boxes may use handwritten, legible labeling on box covers, unless specifically prohibited by other specification sections.
- B. Cable label size shall be appropriate for the conductor or cable size(s), outlet faceplate layout [and patch panel design]. All labels to be used shall be self-laminating, white/transparent vinyl and be wrapped around the cable. Flag type labels are not allowed. The labels shall be of adequate size to accommodate the circumference of the cable being labeled and properly self-laminate over the full extent of the printed area of the label.
- C. Nameplates: Engraved three-layer laminated plastic, black letters on a white background.
- D. Stenciling: Black paint.
- E. Tape (phase identification only): Scotch #35 tape in appropriate colors for system voltage and phase.

- F. Adhesive type labels not permitted except for phase and wire identification. Machine generated adhesive labels shall be permitted for device plates, fire alarm, and control devices.
- G. Schedules: Typewritten, paper or cardboard stock. Sized / cut to fit in schedule holder furnished with equipment.

PART 3 EXECUTION

3.01 GENERAL

- A. Where mixed voltages are used in one building (e.g., 4160 volt, 480 volt, 208 volt) each switch, switchboard, junction box, equipment, etc., on each system must be labeled for voltage addition to other requirements listed herein.
- B. All branch circuit and power panels must be identified with the same symbol used in circuit directory in main distribution center.
- C. Clean all surfaces before attaching labels with the label manufacturer's recommended cleaning agent.
- D. Install all labels firmly as recommended by the label manufacturer.
- E. Labels shall be installed plumb and neatly on all equipment.
- F. Insert schedules in provided schedule holders. Size schedule as required.
- G. Install nameplates parallel to equipment lines.
- H. Secure nameplates to equipment fronts using screws, rivets, or manufacturer approved adhesive or cement. Secure nameplate to inside of recessed panelboards in finished locations.
- I. Embossed tape will not be permitted for any application.

3.02 JUNCTION AND PULLBOX IDENTIFICATION

- A. The following junction and pullboxes shall be identified utilizing spray-painted covers:

<u>System</u>	<u>Color</u>
Secondary Power – 480Y/277V	Brown
Secondary Power – 208Y/120V	White
Emergency Power – 480Y/277V	Brown/Red
Emergency Power – 208Y/120V	White/Red
Fire Alarm	Red
Door control and Door Monitoring System	Orange
Sound and Intercom Systems	Blue
Video Surveillance System /MATV	Yellow
Temperature Control	Green

- B. Provide circuit numbers and source panel designation for power wiring. Other systems shall be identified as shown on details or approved shop drawings. Temperature Control shall identify the source.

3.03 POWER AND CONTROL WIRE IDENTIFICATION

- A. Provide wire markers on each conductor in panelboard gutters, pull boxes, outlet and junction boxes and at load connection. Identify with branch circuit or feeder number for power and lighting circuits, and with control wire number as indicated on equipment manufacturer's shop drawings for control wiring.
- B. All wiring shall be labeled within 2" - 4" of terminations. Each end of a wire or cable shall be labeled as soon as it is terminated, including wiring used for temporary purposes.

3.04 WIRING DEVICE IDENTIFICATION

- A. Wall switches, receptacles, occupancy sensors, wall dimmers, device plates and box covers, poke-through fitting, floor boxes, photo cells, and time clocks shall be identified with circuit numbers and source. In exposed areas, identification should be made inside of the device covers, unless directed otherwise. Use machine-generated labels or neatly handwritten permanent marker.

3.05 NAMEPLATE ENGRAVING

- A. Provide nameplates as follows:
 - 1. Panelboards, Switchboards and Motor Control Centers: 1" (25 mm); identify equipment designation. 1/2" (13 mm); identify voltage rating, source, and source location.
 - 2. Equipment Enclosures: 1" (25 mm); identify equipment designation.
 - 3. Circuit Breakers, Switches, and Motor Starters in Panelboards, Switchboards, or Motor Control Centers: 1/2" (13 mm); identify circuit and load served, including location.
 - 4. Individual Circuit Breakers, Enclosed Switches, and Motor Starters: 1/2" (13 mm); identify source and load served.
 - 5. Transformers: 1" (25 mm); identify equipment designation. 1/2" (13 mm); identify primary and secondary voltages, primary source, and secondary load and location.
 - 6. Junction Boxes: 1" (25 mm); identify system source(s) and load(s) served. Junction boxes may be neatly identified using permanent marker.

3.06 PANELBOARD DIRECTORIES

- A. Typed directories for panels must be covered with clear plastic and have a metal frame. Room number on directories shall be Owner's numbers, not Plan numbers unless Owner so specifies.
- B. Update panel directories on all new and existing panelboards and equipment affected by this project. All schedules must be complete, updated and approved prior to closeout of project. Failure to update all schedules may delay final payments.

SECTION 26 27 26

WIRING DEVICES

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Wall switches, receptacles, motion sensors, wall dimmers, ELCU's, device plates and box covers, poke-through service fittings,.

1.02 RELATED WORK

- A. Applicable provisions of Division 01 shall govern all work under this Section.

1.03 SUBMITTALS

- A. Provide product data showing model numbers, configurations, finishes, dimensions, and manufacturer's instructions.
- B. Manufacturer's Instructions:
 - 1. Indicate application conditions and limitations of use stipulated by product testing agency specified under regulatory requirements.
 - 2. Include instructions for storage, handling, protection, examination, preparation, operation, and installation of product.

1.04 OPERATION AND MAINTENANCE DATA

- A. All operation and maintenance data shall comply with the submission and content requirements specified under Section GENERAL REQUIREMENTS.

PART 2 PRODUCTS

2.01 WALL SWITCHES

- A. Wall Switches for Lighting Circuits: Heavy duty use toggle switch, rated 20 amperes and 120/277 volts AC. Switches shall be UL20 Listed and meet Federal Specification WS-896. All switches shall be [heavy-duty specification grade] with separate green ground screw.
- B. All switches shall be back and side wired, screw clamp type, suitable for solid or stranded wire up to 10 AWG.
- C. Handle: Nylon or high impact resistant material.
 - 1. Normal Circuit: [Light Almond]

D. Acceptable Manufacturers:

1.	Pass & Seymour	Model CSB20 AC1
2.	Hubbell	Model CS1221
3.	Leviton	Model CSB1-20
4.	Cooper	Model CSB120

2.02 RECEPTACLES

A. Convenience and Straight-Blade Receptacles: NEMA Type 5- 20R, tamper-proof type, nylon or high impact resistant face. Receptacles shall be UL 498 Listed and meet Federal Specification WC-596. All receptacles shall be back and side wired, screw clamp type, suitable for solid or stranded wire up to 10 AWG, with a separate green ground screw.

B. Generally, all receptacles shall be duplex convenience type unless otherwise noted.

C. Face Color:

1. Normal Circuit: [Light Almond

D. All receptacles installed in outdoor locations, commercial kitchens, in garages, within 6 feet of the outside edge of sinks, and in other damp or wet locations shall be GFCI type.

E. Specific-use Receptacle Configuration: NEMA type as indicated on drawings.

F. Duplex, Tamper Resistant Convenience Receptacle Acceptable Manufacturers:

1.	Pass & Seymour	Model TR5362
2.	Hubbell	Model 5352TR
3.	Leviton	Model T5362
4.	Eaton	Model TR5362

2.03 MOTION SENSORS (OCCUPANCY and VACANCY)

A. All sensors shall be hardwired type; battery type shall not be permitted.

B. See Automatic Lighting Control Schedule on Drawings.

C. Wall Mounted (Wall Switch Type)

1. The sensor shall use either passive infrared or, if dual technology, passive infrared and passive acoustic sensing or passive infrared and ultrasonic (Dual Technology), for detecting room occupancy. The unit shall fit in/on a standard single gang switch box and require only two wires and a grounded box for operation.
2. Rated Capacity: 800 watts minimum at 120 volts, 60 Hz or 1200 watts minimum at 277 volts, 60 Hz.

3. Sensitivity shall be user adjustable or self-adjusting type.
4. The delay timer shall be adjusted within a range of 0.5 to 20 minutes by the Contractor in the field. The sensor shall have a test mode for performance testing. Set all units for 20-minute delay off unless otherwise directed.
5. Unit shall be provided with a manual switch on the front assembly. Switch shall manually control the operation regardless of sensing. All devices shall be programmed for vacancy mode unless otherwise directed. (Manual on, Automatic off)
6. The test LED shall indicate motion.
7. The area of coverage shall be approximately 180 degrees by 30 feet.
8. The unit shall have a five-year warranty.
9. Sensor shall be Light Almond.
10. Mount device in vertical orientation.
11. Dimming (Option). Where required per schedules, provide integral 0-10V DC dimming control output. Unit shall provide up / down pushbutton switching on the front cover, in addition to the manual controls.

D. Ceiling Mounted

1. The sensor shall use either passive infrared, ultrasonic; or if dual technology, passive infrared and passive acoustic sensing, or passive infrared and ultrasonic, for detecting room occupancy. The unit shall fit in/on a standard octagon box. All ceiling mounted sensors shall be installed to a box with ring and box support.
2. Rated capacity shall be 20 amps at 120 or 277 volts, for LED lamps. Provide power pack as required for low voltage sensors.
3. The sensitivity shall be user adjustable or self-adjusting type.
4. The delay timer shall be adjusted within a range of 0.5 to 20 minutes by the Contractor in the field. The sensor shall have a test mode for performance testing.
5. The coverage area shall be 360 degrees by approximately 15 feet radius when mounted at 9 foot height. The sensor shall have provisions, such as masking, to block out problem areas.
6. Test LED to indicate motion.

7. Line voltage sensors are acceptable, especially in exposed ceiling areas where all wiring shall be installed in conduit, including low voltage cabling if power packs are used. Provide power pack as required for low voltage sensors. Rated capacity shall be 20 amps at 120 or 277 volts for fluorescent lamps. The unit shall fit on a standard octagon box. All power packs shall be installed onto a supported box. Low voltage cabling shall be plenum rated or installed in conduit in plenum-rated areas.
8. The unit shall have a five year warranty.
9. Sensor shall be White.

2.04 LED WALL BOX DIMMER SWITCH

A. General:

1. Compatible With the Voltage of the Circuit Being Controlled: 120V or 277V.
2. Compatible with the load being dimmed.
3. Linear full-range slide control.
4. Separate ON/OFF Switch: Single-pole, 3-way, or multiple-location operation as indicated on the drawings.
5. No derating required in multi-gang applications.
6. Polycarbonate construction.
7. Color to match receptacles and/or standard toggle switches.

B. Line-Voltage LED Dimmer: Forward or reverse phase dimming control as required for the application.

C. 0-10V Dimmers:

1. Ratings: 30 mA sink current.
2. Adjustable dial allows users to trim the low-end dimming range.

D. Description: 0 - 10V dimmer switch listed by fixture manufacturer as compatible with fixture to provide dimming to minimum 10% before shutoff without flickering.

E. Body and Handle: Plastic with linear slide

F. Color:

1. Normal Circuit: Light Almond

G. Voltage: 120 volts

2.05 DEVICE PLATES AND BOX COVERS

- A. Decorative Cover Plate: [Light Almond smooth thermoplastic nylon.]
- B. Surface Cover Plate: Raised galvanized steel.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install wall switches OFF position down.
- B. Install wall dimmers as instructed by manufacturer; do not use common neutral. De-rate ganged devices.
- C. Install convenience receptacles grounding pole on bottom or as to match existing receptacles as applicable.
- D. Install wiring devices at heights shown on contract drawings.
- E. Drill opening for poke-through fitting installation in accordance with manufacturer's instructions.
- F. Install decorative plates on switch, receptacle, and blank outlets in finished areas, using jumbo size plates for outlets installed in masonry walls.
- G. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface-mounted outlets.
- H. Install devices and wall plates flush and level.
- I. Wiring devices shall have a bonding conductor from grounding terminal to both the equipment grounding conductor and the metal conduit system. Self-grounding receptacles using mounting screws as bonding means are not approved.

3.02 FIELD QUALITY CONTROL

- A. Inspect each wiring device for defects.
- B. Operate each wall switch and sensor 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.

3.03 GROUND FAULT CIRCUIT INTERRUPTING RECEPTACLES

- A. Receptacles shown on plans with "GF" designation shall be a ground fault circuit interrupting type device. Daisy chain and series type installations are not acceptable.
- B. Ground fault circuit interrupting receptacles shall be wired to terminals labeled "line side" such that no single "GF" device will affect or open the circuit to another "GF" device or equipment on a common circuit. Do not connect to terminals labeled "load side".
 - 1. "Line Side" terminals of "GF" device must be labeled as approved for more than one conductor termination, if not so labeled, then conductors will require to be spliced in device box.

3.04 OCCUPANCY SENSORS

- A. Power packs used in return air plenum ceiling areas shall be installed in an approved enclosure or UL Listed for return air plenums.
- B. Sensitivity Test: After the sensor has been energized for at least 15 minutes, walk to the middle of the room (if conference room) or sit at the normal desk position (if an office). Make no motion for 20 seconds. Move one arm up and down slowly. The test LED should blink.
- C. Time Delay Test: Set the time delay for 10 minutes. Walk into the room to activate the sensor, then leave room. Sensor must turn lights off at approximately 10 minutes. Walk into the room again to reactivate the lights. Lights should activate within 1 second.

3.05 ADJUSTING

- A. Adjust devices and wall plates to be flush and level.
- B. Mark all conductors with the panel and circuit number serving the device with a machine generated label, at the device and on the back of the device cover. Reference Specification Section 26 05 53.

INTERIOR LIGHTING FIXTURES, LED'S AND DRIVERS

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Luminaires and accessories
- B. LEDs
- C. Drivers

1.02 RELATED WORK

- A. Applicable provisions of Division 01 shall govern all work under this Section.

1.03 SUBMITTALS

- A. Include outline drawings, lamp and ballast data, support points, weights, accessory information and performance data for each luminaire type.
- B. For each luminaire type, submit catalog cuts with highlighted catalog numbers and required accessories.

1.04 OPERATION AND MAINTENANCE DATA

- A. All operation and maintenance data shall comply with the submission and content requirements specified under Section GENERAL REQUIREMENTS and Section 26 05 00.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Deliver products to site and store and protect products under provisions of Section 26 05 00 and Division 01.

PART 2 PRODUCTS

2.01 LUMINAIRES AND ACCESSORIES

- A. As scheduled on drawings.

2.02 LED LUMINAIRES

- A. The manufacturer offering this item shall have been in business for a minimum of 5 years and shall have successfully produced at least 1000 (one thousand) identical or similar models to that being tendered.
- B. Luminaire shall be certified by a Nationally Recognized Testing Laboratory (UL, ETL, or IEC).
- C. Luminaire shall be mercury-free, lead-free, and RoHS compliant.
- D. Luminaire shall comply with FCC 47 CFR Part 15 non-consumer FRI/EMI standards.
- E. Luminaire shall maintain 70% lumen output (L70) for a minimum of 50,000 hours.
- F. Light output of the LED system shall be measured using the absolute photometry method following IES LM-79 and IES LM-80 requirements and guidelines.
- G. Electrical components of the LED lighting fixture (LED light engine/board array and driver(s)) shall be of modular construction so that each component is individually replaceable in the field for maintenance and repair purposes. Wiring connecting these components shall utilize polarized quick-disconnects.
- H. Fuse Protections: All luminaires shall have built-in fuse protection. All power supply outputs shall be either fuse protected or be Polymeric Positive Temperature Coefficient (PTC)-protected as per Class 2 UL listing. All luminaires shall be provided with knockouts for conduit connections.
- I. The LED lighting fixture shall carry a limited 5-year warranty minimum for LED light engine(s)/board array and driver(s).

2.03 LED DRIVERS

- A. General:
 - 1. Provide driver type (non-dimmed, step-dimmed, continuous-dimming, etc.) as indicated on the luminaire schedule on the drawings.
 - 2. Minimum warranty of 5 years (not pro-rated) to include LED driver and all LED components.
 - 3. Driver shall have a rated life of 50,000 hours, minimum.
 - 4. Driver and LEDs shall be furnished from a single manufacturer to ensure compatibility.
 - 5. Driver shall have a minimum power factor (pf) of 0.9 and a maximum crest factor (cf) of 1.5 at full input power and across specified voltage range.
 - 6. Driver shall operate normally for input voltage fluctuations of plus or minus 10 percent.

7. Driver shall have a maximum Total Harmonic Distortion (THD) of $\leq 20\%$ at full input power and across specified voltage range.
8. Wiring connections to LED drivers shall utilize polarized quick-disconnects for field maintenance.
9. Fuse Protections: All luminaires shall have built-in fuse protection. All power supply outputs shall be either fuse protected or be Polymeric Positive Temperature Coefficient (PTC)-protected as per Class 2 UL listing.
10. Provide all of the following data on submittals:
 - a. Input watts
 - b. Power Factor (pf)
 - c. Crest Factor (cf) at full input power
 - d. Total Harmonic Distortion (THD)

B. Dimming Drivers:

1. LED driver shall be compatible with dimming controls where dimming is indicated on the plans. Dimmable drivers shall use Dimming Constant Current (DCC), Constant Voltage, or Pulse Width Modulation (PWM) operation.
2. Step-Dimming Drivers: Easily switch from 0% to 50% to 100% output power. Both switch-leg inputs shall control 50% of the luminaire's light output equally.
3. Continuous Dimming Drivers: LED luminaires shall dim to 10% or 1% as specified in the Luminaire Schedule on the plans without visible flicker or "popcorn effect". "Popcorn effect" is defined as the luminaire being on a pre-set dimmed level (less than 100%) and going to 100% prior to returning to the pre-set level when power is returned to the luminaire. Continuous Dimming Drivers shall use 0-10V control.

PART 3 EXECUTION

3.01 INSTALLATION - GENERAL

- A. Install in accordance with manufacturer's instructions.
- B. Install suspended luminaires and suspended exit signs using pendants supported from swivel hangers. Heavy duty jack chain supports may be used where indicated on the fixture schedule. Provide pendant or chain length required to suspend luminaire at indicated height.
- C. Support luminaires larger than 2 x 4 foot (600 x 1 200 mm) size independent of ceiling framing.
- D. Locate ceiling luminaires as indicated on reflected ceiling plan.
- E. Install surface mounted luminaires and exit signs plumb and adjust to align with building lines and with each other. Secure to prohibit movement.

- F. The Contractor shall install fixture supports as required. Fixture installations with fixtures supported only by insecure boxes will be rejected. It shall be the Contractor's responsibility to support all lighting fixtures adequately, providing extra steel work for the support of fixtures if required. Any components necessary for mounting fixtures shall be provided by the Contractor. No plastic, composition, or wood type anchors shall be used.
- G. Exposed Grid Ceilings: Support surface mounted luminaires on grid ceiling directly from building structure. Provide independent support for all fixtures over 50 lbs.
- H. Install recessed luminaires to permit removal from below.
- I. Install recessed luminaires using accessories and firestopping materials to meet regulatory requirements for fire rating.
- J. Install code required hardware to secure recessed grid-supported luminaires in place.
- K. Install wall mounted luminaires, emergency lighting units, and exit signs at height as indicated on drawings.
- L. Install accessories furnished with each luminaire.
- M. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within luminaire.
- N. Bond fixtures and metal accessories to branch circuit equipment grounding conductor.
- O. All new fixtures/drivers shall be operational at the Substantial Completion of the project. Replace drivers which have failed at completion of work.

3.02 INSTALLATION - ZERO-TO-10V DIMMING CONTROL WIRING

- A. Zero-to-10V dimming control conductors are classified by the NEC as Class 2 conductors and shall be kept separate from line-voltage conductors per NEC 725.136(A). Matching the insulating rating of Conductors of Different Systems does not apply to Class 2 conductors per NEC 300.3(C)(1), Informational Note No. 1.
- B. Wall box dimmers will typically have two conduits: One conduit for line-voltage power, and one conduit or conduit stub for the 0-10V control wiring.
- C. At each luminaire, separate openings (either manufactured knock-outs or punched openings) shall be used for the line-voltage power and the 0-10V wiring. The Electrical Contractor shall use a cable connector at the opening for the 0-10V wiring. Zero-to-10V conductors entering and within a luminaire enclosure shall maintain a minimum separation of 6 mm (0.25") per NEC 725.136(D).

D. The 0-10V cables may be routed in free air where concealed above accessible ceilings. Cables routed in free air shall observe the following installation requirements:

1. The 0-10V cables may be tie-wrapped to the outside of the luminaire power raceway where allowed by NEC 300.11(B)(2). Tie-wraps shall be UL listed for UV resistance. Care should be taken in the use of cable ties to secure and anchor the cabling. Ties shall not be over tightened as to compress the cable jacket. No sharp burrs shall remain where excess length of the cable tie has been cut.
2. Cabling shall be neatly run at right angles and be kept clear of other trades' work.
3. Cabling shall be secured within 12" of direction change or termination.
4. Cabling shall be supported at a maximum of 5-foot intervals utilizing "J-Hook" or "Bridle Ring" supports anchored to ceiling concrete, piping supports, or structural steel beams. If cable sag at mid-span exceeds 12", another support shall be provided. Cable supports shall be installed to maintain cable bend to larger than the minimum bend radius.
5. Cabling shall not be attached to or supported by existing cabling, plumbing or steam piping, ductwork, suspended ceiling supports, or electrical or communications conduit. Do not place cable directly on the ceiling grid or attach cable in any manner to the ceiling grid wires.
6. All cables shall be free of tension at both ends. Nylon strain relief connectors shall be provided at each device and junction box where cables enter. In cases where the cable must bear some stress, Kellum type grips may be used to spread the strain over a longer length of cable.
7. Cable manufacturer's minimum bend radius shall be observed in all instances.
8. Use suitable cable fittings and connectors.

3.03 ADJUSTING AND CLEANING

- A. Align luminaires and clean lenses and diffusers at completion of work. Clean paint splatters, dirt, and debris from installed luminaires.
- B. Aim and adjust luminaires as indicated on the drawings or as directed by the Architect/Engineer.
- C. Touch up luminaire finish at completion of work.

3.04 LUMINAIRE GROUNDING

- A. See Section 26 05 26 - GROUNDING AND BONDING.

3.05 FIELD QUALITY CONTROL

- A. Operate each luminaire after installation and connection. Inspect for proper connection and operation.

3.06 ALL FIXTURE CONNECTIONS [INCLUDING MASTER-SLAVE]

- A. Direct box or conduit connections for surface and recessed fixtures. Flexible metal conduit from a J-box for recessed lay-in light fixtures. Flexible metal conduit shall be minimum 3/8" (10 mm) minimum diameter and six foot (1.8 M) maximum length. Conduit length shall allow movement of the fixture for maintenance purposes. Minimum wire size shall be #18 AWG for single fixture.
- B. The flexible connectors shall be all steel, galvanized, clamp type with locknut or snap-in connector.

SECTION 27 00 00

COMMUNICATIONS CABLE AND EQUIPMENT

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Applicable provisions of Division 01 shall govern all work under this Section.
- B. Unless noted otherwise, "Contractor" shall refer to the Telecommunications Contractor.
- C. This section describes the products and execution requirements relating to furnishing and installation of Telecommunications Cabling and Termination Components and related sub-systems as part of a Structured Cabling System at the remodeled building. Horizontal (Station) cabling comprised of Copper Cabling is covered under this document.
- D. The Horizontal (Station) Cabling System is based on the installation of 4-Pair Unshielded Twisted Pair (UTP) DATA (Category 6) Copper Cables. The cables shall be installed from the Standard Information Outlet (SIO) in the work area to the Telecommunications Closet (TC) or Equipment Room (ER) serving that area and terminated as specified in this document.
- E. Station cables shall be installed in conduit, cable tray and J-hooks as applicable. Outlets shall be mounted flush on a wall-mounted box. Information Outlet locations are identified on Project Drawings.
- F. All cables and related termination, support and grounding hardware shall be furnished, installed, wired, tested, labeled, and documented by the Contractor, as detailed in the following sections.
- G. The Contractor shall provide all labor and materials necessary to construct the system as described herein. This includes, but is not limited to, furnishing and installing cable, cable supports, termination components, termination, testing, labeling and documentation.
- H. Equipment, materials, and accessories for electrical systems as shown and noted on the drawings including, but not limited to, the following:
 - 1. Provide a complete telecommunications cable distribution system including all materials and installation for the entire extension of the inside building (ISP) cable plant.
 - 2. The cabling and termination from the Floor Distribution Rack, station wiring and the termination of the station jacks.
 - 3. Station mounts, terminating connectors, distribution rings, jacks, and other hardware as required.

1.02 REGULATORY REFERENCES

- A. All work and materials shall conform in every detail to the rules and requirements of the National Fire Protection Association, the Wisconsin Electrical Code and present manufacturing standards.
- B. All materials shall be listed by UL and shall bear the UL label. If UL has no published standards for a particular item, then other national independent testing standards shall apply and such items shall bear those labels. Where UL has an applicable system listing and label, the entire system shall be so labeled.
- C. Other applicable standards are as follows:

ANSI/IEEE C2 - National Electrical Safety Code

DILHR Chapter 16 - Wisconsin Electrical Code

NCA/BICSI-568 – Standard for Installing Commercial Building Telecommunications Cabling

TIA/EIA Standards:

- 1) TIA/EIA-568-B.1 – Commercial Building Telecommunications Cabling Standard, Part 1: General Requirements
- 2) TIA-568-B.2 – Commercial Building Telecommunications Cabling Standard, Part 2: Balanced Twisted Pair Cabling Components
- 3) TIA-568-B.3 – Optical Fiber Cabling Components Standard
- 4) TIA/EIA-569-A – Commercial Building Standard for Telecommunications Pathways and Spaces
- 5) TIA/EIA-606(A) – The Administration Standard for the Telecommunications Infrastructure of Commercial Buildings
- 6) TIA/EIA-607(A) – Commercial Building Grounding and Bonding Requirements for Telecommunications

- D. Install cabling in accordance with the most recent edition of BICSI® publications:

- 1) BICSI – Telecommunications Distribution Methods Manual
- 2) BICSI – Cabling Installation Manual
- 3) BICSI – LAN Design Manual
- 4) BICSI – Customer-Owned Outside Plant Design Manual

1.03 WORK SEQUENCE

- A. During the construction period, coordinate telecommunications schedule and operations with the Architect/Engineer Construction Representative and Owner.

1.04 SUBMITTALS

- A. Under the provisions of Section 26 05 00 and Division 01, prior to the start of work the Contractor shall submit:
 - 1. Six (6) sets of Manufacturers' Data covering all products proposed indicating construction, materials, ratings and all other parameters identified in Part 2 (Products) below.
 - 2. Manufacturers' installation instructions.
- B. Submittals should be grouped to include complete documentation of related systems, products and accessories in a single submittal. Where applicable, dimensions should be marked in units to match those specified.
- C. Submittals shall be original catalog sheets or photocopies thereof. Facsimile (fax) sheets shall not be accepted.
- D. Perform no portion of the work requiring submittal and review of shop drawings, product data has approved the respective submittal. Such work shall be in accordance with approved submittals.

1.05 PROJECT RECORD DOCUMENTS

- A. Submit and record documents under provisions of Section 26 05 00.
- B. Accurately record exact sizes, locations, and quantities of cables.

1.06 QUALITY ASSURANCE

- A. The following manufacturer's cabling systems are approved for the work of this section:
 - 1. Belden**
- B. The Contractor shall be a Certified Belden cabling system installer with Belden Certification Badge.
- C. The Contractor shall have worked satisfactorily for a minimum of five (5) years on systems of this type and size.
- D. Equipment and materials of the type for which there are independent standard testing requirements, listings, and labels shall be listed and labeled by the independent testing laboratory.
- E. Where equipment and materials have industry certification, labels, or standards (i.e., NEMA - National Electrical Manufacturers Association), this equipment shall be labeled as certified or complying with standards.

- F. Material and equipment shall be new and conform to grade, quality, and standards specified. Equipment and materials of the same type shall be a product of the same manufacturer throughout.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to and receive products at the site under provisions of Division 01.
- B. Cable shall be stored according to manufacturer's recommendations as minimum. In addition, cable must be stored in a location protected from vandalism and weather. If cable is stored outside, it must be covered with opaque plastic or canvas with provision for ventilation to prevent condensation and for protection from weather. If air temperature at cable storage location will be below 40°F, the cable shall be moved to a heated (50°F minimum) location.
- C. If the Contractor wishes to have a trailer on site for storage of materials, arrangements shall be made with the Owner. If necessary, cable shall be stored off site at the Contractor's expense.

1.08 DRAWINGS

- A. It shall be understood that the electrical and telecommunication details and drawings provided with the specification package are diagrammatic. They are included to show the intent of the specifications and to aid the Contractor in bidding the job. The Contractor shall make allowance in the bid proposal to cover whatever work is required to comply with the intent of the plans and specifications.
- B. The Contractor shall verify all dimensions at the site and be responsible for their accuracy.
- C. Prior to submitting the bid, the Contractor shall call the attention of the Engineer to any materials or apparatus the Contractor believes to be inadequate and to any necessary items of work omitted, within ten (10) days prior to the Bid Due Date.

PART 2 PRODUCTS

2.01 RACEWAYS - DATA, VOICE, SECURITY, TV

- A. Electrical metallic tubing (EMT), 1" size (3/4" for TV), unless otherwise noted. Bushed conduit above accessible ceiling.

2.02 BOXES

- A. 4" square with raised single gang cover flush-mounted in walls, unless otherwise noted.

2.03 MANUFACTURERS

- A. Provide products of manufacturers as named in individual articles.

2.04 FABRICATION

- A. Fabricate custom-made equipment with careful consideration given to aesthetic, technical, and functional aspects of equipment and its installation.

2.05 SUITABILITY

- A. Provide products that are suitable for intended use including, but not limited to, environmental, regulatory, and electrical.

2.06 VOICE TELECOMMUNICATIONS STATION CABLE

- A. Solid copper, 24 AWG, 100 Ω balanced twisted-pair (UTP) Category 6 cables with four individually twisted-pairs, which meet or exceed the mechanical and transmission performance specifications in TIA-568-B.2.

- 1. Belden 2413 Blue PVC 4 Par

2.07 DATA TELECOMMUNICATIONS STATION CABLE (Copper)

- A. Solid copper, 24 AWG, 100 Ω balanced twisted-pair (UTP) Category 6 cables with four individually twisted-pairs, which meet or exceed the mechanical and transmission performance specifications in TIA-568-B.2.

- 1. Belden 2413 Blue PVC 4 Par

2.08 DATA WORK AREA OUTLETS (Copper Only)

- A. Single-gang mounting plate with four (4) openings, Light Almond. Color of shall be light Almond.
- B. Data Outlets - 8-pin modular, Category 6, unkeyed, Blue, pinned to T568B standards. Quantity as specified on drawing.

- 1. Belden DC6MJKSME-S1

2.09 WALL VOICE OUTLETS

- A. Single-gang mounting plate with one (1) opening, Light Almond. Color of plate shall be Light Almond.

- 1. Belden AX102248

- B. ONE Data Outlet - 8-pin modular, Category 6, unkeyed, Blue, pinned to T568B standards.

- 1. Belden DC6MJKSME-S1

2.10 TERMINATION BLOCKS

- A. Wiring blocks are to be in following configurations.
 - 1. List dimensional configurations.
 - 2. ER – List pairs connectorized for PBX portion of ER and pairs field terminated for backbone and CO portion of ER.
- B. Provide wiring troughs between ER frame sections.

2.11 MODULAR PATCH CORDS

Customer to determine quantity and length of patch cords.

- A. Belden Modular Patch Cords

2.12 PATCH PANELS

- A. 19" rack mountable, 24/48-port 8-pin modular to insulation displacement connector (IDC) meeting Category 6 performance standards, and pinned to T568B standards. A typical example of IDC connections is the 110 style.
 - 1. Belden Patch Panel

PART 3 EXECUTION

3.01 PRE-INSTALLATION SITE SURVEY

- A. Prior to start of systems installation, meet at the project site with Owner representative and representatives of trades performing related work to coordinate efforts. Review areas of potential interference and resolve conflicts before proceeding with the work. Facilitation with the General Contractor will be necessary to plan the crucial scheduled completions of the equipment room and telecommunications closets.
- B. Examine areas and conditions under which the system is to be installed. Do not proceed with the work until satisfactory conditions have been achieved.
- C. Copper Pair counts of the cables to be supplied are detailed on the Project Drawings. Contractor shall furnish and install all cables, connectors and equipment as shown on drawings and as specified above. It shall be noted that all cables shall be installed in continuous lengths from endpoint to endpoint. No splices shall be allowed unless noted otherwise.
- D. It is the Contractor's responsibility to survey the site and include all necessary costs to perform the installation as specified. This includes any modifications required to route and conceal horizontal distribution wiring.
- E. Beginning installation means Contractor accepts existing conditions.
- F. Contractor shall furnish all required installation tools to facilitate cable pulling without damage to the cable jacket. Such equipment is to include, but not limited to,

sheaves, winches, cable reels, cable reel jacks, duct entrance tunnels, pulling tension gauge and similar devices. All equipment shall be of substantial construction to allow steady progress once pulling has begun. Makeshift devices which may move or wear in a manner to pose a hazard to the cable shall not be used.

- G. All cable shall be pulled by hand unless installation conditions require mechanical assistance. Where mechanical assistance is used, care shall be taken to ensure that the maximum tensile load for the cable as defined by the manufacturer is not exceeded. This may be in the form of continuous monitoring of pulling tension, use of a "break-away" or other approved method.
- H. The Contractor will be responsible for identifying and reporting to the Architect/Engineer any existing damage to walls, flooring, tiles and furnishings in the work area prior to start of work. All damage to interior spaces caused by the installation of cable, raceway or other hardware must be repaired by the Contractor. Repairs must match preexisting color and finish of walls, floors and ceilings. Any contractor-damaged ceiling tiles are to be replaced to match color, size, style and texture.
- I. Where unacceptable conditions are found, the Contractor shall bring this to the attention of the Architect/Engineer construction supervisor immediately. A written resolution will follow to determine the appropriate action to be taken.
- J. Qualified personnel utilizing state-of-the-art equipment and techniques shall complete all installation work. During pulling operation, an adequate number of workers shall be present to allow cable observation at all points of duct entry and exit as well as the feed cable and operate pulling machinery.
- K. Cable pulling shall be done in accordance with cable manufacturer's recommendations and ANSI/IEEE C2 Standards. Manufacturer's recommendations shall be a part of the cable submittal. Recommended pulling tensions and pulling bending radius shall not be exceeded. Any cable bent or kinked to radius less than recommended dimension shall not be installed. If any installed cable is kinked to a radius less than recommended dimension, it shall be replaced by the Contractor with no additional cost to the project.
- L. All cable shall be free of tension at both ends.
- M. Avoid abrasion and other damage to cables during installation.
- N. Pulling lubricant may be used to ease pulling tensions. Lubricant shall be of a type that is non-injurious to the cable jacket and other materials used. Lubricant shall not harden or become adhesive with age.
- O. The Cable system will be tested and documented upon completion of the installation as defined in the section below.

3.02 STATION CABLING

- A. Information Outlets cables with copper media (Voice & Data UTP) shall be located as detailed on the Project Drawings.

- B. The Bidder, in determining materials quantities and routing, should utilize these documents.
- C. Station Cabling on each Floor shall be routed to the Telecommunications Closet (TC) on that floor.
- D. Station cables shall be run to the Information Outlet from the Telecommunications Closet serving each area in conduit routed to the new cable tray.
- E. The maximum station cable drop length for Data UTP shall not exceed 295-feet (90-meters) in order to meet data communications performance specifications. This length is measured from the termination panel in the wiring closet to the outlet and must include any slack required for the installation and termination. The Contractor is responsible for installing station cabling in a fashion as to avoid unnecessarily long runs. Any area that cannot be reached within the above constraints should be identified and reported to the Engineer prior to installation. Changes to the plan shall be approved by the Engineer.
- F. All cables shall be installed splice-free unless otherwise specified.
- G. During pulling operation, an adequate number of workers shall be present to allow cable observation at all points of duct entry and exit as well as the feed cable and operate pulling machinery.
- H. Avoid abrasion and other damage to cables during installation.
- I. All cable shall be free of tension at both ends. In cases where the cable must bear some stress, Kellom grips may be used to spread the strain over a longer length of cable.
- J. Where installed free-air, installation shall consider the following:
 - 1. Cable shall run at right angles and be kept clear of other trades work.
 - 2. Cables shall be supported according to code utilizing "J-hooks" or "Bridal-type" mounting rings anchored to ceiling concrete, piping supports or structural steel beams. Rings shall be designed to maintain cables bend to larger than the minimum bend radius (typically 4 x cable diameter).
 - 3. Supports shall be spaced at a maximum 4-foot interval unless limited by building construction. If cable "sag" at mid-span exceeds 6", another support shall be used.
 - 4. Cable shall never be laid directly on the ceiling grid or attached in any manner to the ceiling grid wires.
 - 5. Cables shall not be attached to existing cabling, plumbing or steam piping, ductwork, ceiling supports or electrical or communications conduit.
- K. Manufacturer's minimum bend radius specifications shall be observed in all instances.

- L. Care should be taken in the use of cable ties to secure and anchor the station cabling. Ties should not be over tightened as to compress the cable jacket. No sharp burrs should remain where excess length of the cable tie has been cut.
- M. Cable sheaths shall be protected from damage from sharp edges. Where a cable passes over a sharp edge, a bushing or grommet shall be used to protect the cable.
- N. A coil of 4 feet in each cable shall be placed in the ceiling at the last support before the cables enter a fishable wall, conduit, surface raceway or box. These "service loops" shall be secured at the last cable support before the cable leaves the ceiling and shall be coiled from 100% to 200% of the cable recommended minimum bend radius.
- O. To reduce or eliminate EMI, the following minimum separation distances from $\leq 480V$ Power lines shall be adhered to:
 - 1. 12" from power lines of $<5-kVa$.
 - 2. 18" from high voltage lighting (including fluorescent).
 - 3. 39" from power lines of 5-kVa or greater.
 - 4. 39" from transformers and motors.
- P. All openings shall be sleeved and firestopped per prevailing code requirements upon completion of cable installation.
 - 1. IMPORTANT: Within the room in which Data Cabling is to be terminated, Hook and Loop (e.g., "Velcro") ties only shall be used from room entry to the point of termination. This is to facilitate the addition of future cables.

3.03 GROUNDING

- A. Refer to Section 26 05 26 and the project drawings for grounding details.

3.04 IDENTIFICATION AND LABELING

- A. Refer to Section 26 05 53 "Communication System Identification and Labeling" for Identification and Labeling guidelines for this project.
- B. All Copper Backbone and Station Cables, Outlet Faceplates and Termination components (e.g., Voice Field & Data Patch Panel) shall be clearly labeled.

C. Labeling shall conform to TIA/EIA-606(A) standards. In addition, provide the following:

1. Label each outlet with Beldon label designed for faceplate.
2. Label each cable with permanent self-adhesive label with minimum 1/8" high characters in the following locations:
 - a. Inside receptacle box at the work area
 - b. Behind the communication closet patch panel or punch block
3. Use labels designed for Belden Patch Panels. Provide facility assignment records in a protective cover at each telecommunications closet location that is specific to the facilities terminated therein. Patch panels should be numbered sequentially in each room.
4. Labels shall be machine-printed. Hand-lettered labels shall not be acceptable.
5. Label cables, outlets, patch panels, and punch blocks with Telecom room name or Server Room name (T or S) designation and port number on patch panel. All patch panel ports on each rack should be wired sequentially.

3.05 TESTING AND ACCEPTANCE

A. General

1. The Contractor is responsible to perform acceptance tests as indicated below.
2. The Contractor is responsible for supplying all equipment and personnel necessary to conduct the acceptance tests. Prior to testing, the Contractor shall provide a summary of the proposed test plan for each cable type including equipment to use used, set-up, test frequencies or wavelengths, results format, etc. The method of testing shall be approved by the Architect/Engineer.
3. The Contractor shall visually inspect all cabling and termination points to ensure that they are complete and conform to the wiring pattern defined herein. The Contractor shall provide the Architect/Engineer with a written certification that this inspection has been made.
4. The Contractor shall conduct acceptance testing according to a schedule coordinated with the Architect/Engineer. Representatives of the Owner may be in attendance to witness the test procedures. The Contractor shall provide a minimum of one (1) week advance notice to the Architect/Engineer as to allow for such participation. The notification shall include a written description of the proposed conduct of the tests including copies of blank test result sheets to be used.

IMPORTANT: Failure to provide the above information shall be grounds for the Owner/Engineer to reject any and all Documentation of Results on related testing and to require a repeat of the affected test.

5. Tests related to connected equipment of others shall only be done with the permission and presence of Contractor involved. The Contractor shall ascertain that testing only as required to prove the wiring connections are correct.
6. The Contractor shall provide test results and describe the conduct of the tests including the date of the tests, the equipment used and the procedures followed. At the request of the Engineer, the Contractor shall provide copies of the original test results.
7. All cabling shall be 100% fault-free unless noted otherwise. If any cable is found to be outside the specification defined herein, that cable and the associated termination(s) shall be replaced at the expense of the Contractor. The applicable tests shall then be repeated.
8. Should it be found by the Architect/Engineer that the materials or any portion thereof furnished and installed under this contract fail to comply with the specifications and drawings, with the respect or regard to the quality, amount of value of materials, appliances or labor used in the work, it shall be rejected and replaced by the Contractor and all work distributed by changes necessitated in consequence of said defects or imperfections shall be made good at the Contractor's expense.
9. Testing shall conform to TIA/EIA-568-B.1 standard as it applies to Category 6. Testing shall be accomplished using Level III or higher field testers.
10. Test each pair and shield of each cable for opens, shorts, grounds, and pair reversal. Correct grounded and reversed pairs. Examine open and shorted pairs to determine if problem is caused by improper termination. If termination is proper, tag bad pairs at both ends and note on termination sheets.
 - a. Perform testing of copper cables with tester meeting TIA/EIA-568-B.1 requirements.
 - b. If horizontal cable contains bad conductors, remove and replace cable.

B. Voice Cabling (Copper UTP)

1. Station Cabling
 - a. Testing shall be from the Jack at the SIO voice outlet in the Work Area to the Termination Block on which the cables are terminated at the TC or ER.
 - b. All horizontal "Station" cables shall be free of shorts within the pairs, and be verified for continuity, pair validity and polarity, Wire Map (Conductor Position on the Modular Jack). Any defective, split or mis-positioned pairs must be identified and corrected.

2. Data Station Cabling (Copper UTP)

- a. Testing shall be from the Jack at the SIO to the Data Patch Panel on which the cables are terminated at the wiring hub.
- b. Horizontal "Station" cables shall be free of shorts within the pairs, and be verified for continuity, pair validity and polarity, and Wire Map (Conductor Position on the Modular Jack). Any defective, split or mis-positioned pairs must be identified and corrected.
- c. Testing of the Cabling Systems rated at TIA Category 6 and above shall be performed to confirm proper functioning and performance.
- d. In addition to the above, Performance Testing shall be performed on all cables. Testing of the Transmission Performance of station cables (Category 6 and above) shall include the following:
 - Length
 - Attenuation
 - Pair to Pair NEXT Loss (new limits)
 - PSNEXT Loss
 - Return Loss
 - Pair to Pair ELFEXT Loss (Equal Level Far End Cross-talk)
 - PSEFEXT Loss
 - Propagation Delay
 - Delay Skew
 - Return Loss
- e. Cables shall be tested to the maximum frequency defined by the standards covering that performance category. Transmission Performance Testing shall be performed using a test instrument designed for testing to the specified frequencies. Test records shall verify "PASS" on each cable and display the specified parameters - comparing test values with standards based "templates" integral to the unit.
- f. Testing shall be per ANSI/TIA/EIA TSB67 Basic Link test configurations and ANSI/TIA/EIA 568-A-5 (SP 4195-A); Category 6.

C. Propagation Delay

1. The maximum propagation delay determined in accordance with the TIA/EIA 568-A-1 for a Basic Link configuration shall be less than 518-ns measured at 10MHz. (Note: In determining the channel and basic link propagation delay, the propagation delay contribution of connecting hardware is assumed to not exceed 2.5 ns from 1 MHz to 100MHz.

D. Delay Skew

1. The difference in propagation delay between the fastest and slowest pair in a cable shall not exceed the parameters below and the skew between all pair combinations shall not vary more than 610 ns when measured in accordance with TIA/EIA-568-A-1 and ASTM D 4566.

Category 6 45ns between 1 MHz and 100MHz

E. Return Loss (Basic Link) Worst Pair

Frequency	dB
1-20 MHz	17
20-100MHz	$17 - 7\log(f/20)$

1. In order to establish testing baselines, cable samples of known length and of the cable type and lot installed shall be tested. The cable may be terminated with an 8-position Category 6 Modular plug (8-pin) to facilitate testing. Net Propagation Velocity (NPV) and nominal attenuation values shall be calculated based on this test and be utilized during the testing of the installed cable plant. This requirement can be waived if NPV data is available from the cable manufacturer for the exact cable type under test.
2. In the event results of the tests are not satisfactory, the Contractor shall make adjustments, replacement and changes as are necessary, and shall then repeat the test or tests which disclosed faulty or defective material, equipment or installation method, and shall make additional tests as the Engineer deems necessary at no additional expense to the project or user agency.

F. Documentation (General)

1. Upon completion of the installation, the Contractor shall provide two (2) full Documentation Sets to the Engineer for approval. Documentation shall include the items detailed in the sub-sections below.
2. Documentation of Test Results shall be submitted in hard copy or in electronic form (preferred). Electronic documents may be submitted on CD-ROM (preferred) or 3-1/2" diskettes for review and distribution. Where documentation provided in electronic form requires unique software (other than an MS-Word™ compatible Word Processor or MS-Excel™ spreadsheet) for viewing test results, the Contractor shall provide, along with the above documentation, one (1) licensed copy of such software. The software shall run on a DOS or MICROSOFT Windows-based personal computer supplied by the Owner.
3. Documentation shall be submitted within ten (10) working days of the completion of each testing phase (e.g., subsystem, cable type, area, floor, etc.). This is inclusive of all test result and *draft* as-built drawings. Draft drawings may include annotations done by hand. Machine generated (final) copies of all drawings shall be submitted within 30 working days of the completion of each testing phase.

G. Test Data - Copper Media

1. Test results shall include a record of test frequencies, cable type, conductor pair and cable (or Outlet) I.D., measurement direction, test equipment type, model and serial number, date, reference setup, and crew member name(s).
2. Printouts generated for each cable by the wire (or fiber) test instrument (e.g., PentaScanner or Optical Power Meter) shall be submitted as part of the documentation package. Alternately, the Contractor may furnish this information in electronic form (3.5" diskette).

H. As-Built Construction Drawings

1. Drawings included with the specifications set shall be modified by the Contractor to denote as-built information.
2. The drawings are to include cable routes and outlet locations. Outlet locations shall be identified by their sequential number as defined elsewhere in this document. Numbering, icons and drawing conventions used shall be consistent throughout all documentation provided.
3. The Architect/Engineer will provide floor plans in paper and electronic formats on which as-built construction information can be added. These documents will be modified accordingly by the Contractor to denote as-built information as defined above and returned to the Architect/Engineer for acceptance. This information shall be supplied to the Architect/Engineer no later than one (1) week prior to the scheduled occupancy of the affected floors.
4. The Contractors shall annotate the base drawings and return to the Architect/Engineer in hard copy (same plot size as originals) and electronic form.
5. Each drawing submitted by the Contractor as part of the Project Documentation shall be identified as an "as-built" drawing and include the Contractor name and/or logo and the date of the drawing.
6. All fonts, color, layer, Model Space/Paper Space conventions established in the base drawings shall be retained by the Contractor in preparation of the as-built drawings.

I. Warranty

1. **Belden Warranty:** Transfer manufacturer's warranties to Owner in addition to the General System Guarantee. Submit these warranties on each item in list form with shop drawings. Detail specific parts within equipment that are subject to separate conditional warranty. Warranty proprietary equipment and systems involved in this contract during the guarantee period. Final payment shall not relieve Contractor of these obligations.

SECTION 28 13 00

ACCESS CONTROL SYSTEM

PART 1 GENERAL

1.01 SUMMARY

- A. This specification section describes the products and execution requirements relating to the furnishing, installation, testing, and commissioning of a complete Access Control System and placing it into satisfactory operation.
- B. This system is an extension of the existing i Star Ultra
- C. In general, work consists of installation of new access control field devices and all associated cabling as part of this project.
- D. The Access Control System vendor shall be responsible to provide the following:
 - a. Cabling
 - b. Terminations
 - c. Credential Readers and/or Keypads
 - d. Request-to-Exit Devices (PIR)
 - e. Door Release Pushbuttons
 - f. Local Locking/Unlocking Switch
 - g. Door-Position Switches
- E. All raceways and pull boxes, conduit and cables supports, grounding hardware, and bonding as required for a full and functioning system shall be installed and documented by the Division 26 Contractor, as detailed in this and related section(s).

1.02 RELATED WORK

- A. Applicable provisions of Division 01 shall govern work under this Section.
- B. Section 26 05 26 - Grounding and Bonding for Electrical Systems
- C. Section 26 05 29 - Hangers and Supports for Electrical Systems
- D. Section 26 05 33 - Raceway and Boxes for Electrical Systems
- E. Section 26 05 53 - Identification for Electrical Systems

1.03 QUALITY ASSURANCE

- A. Bidder Qualifications: The intent of these quality assurance requirements is to ensure that the installing contractor has the capabilities to engineer, install, and commission the devices as specified under this section.
 - 1. Installing contractor must be a firm specializing and experienced in Access Control system installation for no less than 13 years.
 - 2. Installing contractor must be a branch office or an authorized representative of the manufacturer of the specified Access Control System as required to support the required warranty. Such authorization must have been in effect for a period of not less than three years at the time of Bidding and remain so throughout project.
 - 3. Installation of equipment and cabling shall be done by qualified staff in the direct employ or directly subcontracted and under the supervision of the manufacturer or Authorized Representative.

1.04 REFERENCES

- A. All work and materials are to conform to applicable rules and requirements of the Wisconsin State Electrical Code (SPS 316), the National Electrical Code (NFPA 70), other applicable National Fire Protection Association codes, the National Electrical Safety Code, Federal Communications Commission (FCC) rules, and present manufacturing standards (including NEMA).
- B. All materials shall be listed by UL and shall bear the UL label. If UL has no published standards for a particular item, then other national independent testing standards shall apply and such items shall bear those labels. Where UL has an applicable system listing and label, the entire system shall be so labeled.
- C. Other applicable standards are as follows:
 - 1. FCC Part 15 as applicable to the equipment type(s) included
 - 2. UL 294 Standard for Access Control System Units

PART 2 PRODUCTS

2.01 GENERAL

- A. All furnished items shall be compatible with the existing system as identified above. New system devices installed as part of this project will integrate into the existing system. No substitutions will be allowed unless otherwise noted.
- B. All furnished items shall be new and meet the requirements of the specifications.

2.02 CREDENTIAL READERS AND KEYPADS

A. Proximity Card Reader:

1. Frequency: [125 kHz] [and 13.56 MHz]
2. Output Format: [Wiegand] [and Open Supervised Device Protocol (OSDP)]
3. Read Range: Up to 8.0 inches (wall-mount); up to 6.0 inches (mullion-mount).
Dependent upon installation conditions and credential type.
4. Power: 5-16 VDC
5. Bluetooth enabled to support mobile devices.
6. Able to support Smart Card Operating System (SCOS) type cards.
7. Polycarbonate housing, IP55 rated for indoor and outdoor use, operating temperature of -22°F to 150°F.
8. Reader provides visual – typically a change in color of LED from red to green and an audible indication of acceptance or denial of credentials when card is presented to the reader.
 - a. Wall-mount: [HID MultiClass SE][HID ProxPro® II 5455][Other]
Mounts in 1-gang electrical box.
 - b. Mullion-mount: [HID MultiClass #####][HID MiniProx® 5365][Other]
 - c. Proximity card readers manufactured by others shall be considered equals provided they meet or exceed in performance and quality as specified.
9. Color: **Architect to select standard color option.** Confirm during shop drawing review.

2.03 MISCELLANEOUS FIELD DEVICES

A. Request-to-Exit (REX):

1. Refer to drawings and schedules for applicable REX type(s).
2. Integral to Door Hardware Type: By Division 08 Contractor.
3. Motion-Sensor Type:
 - Passive infrared (PIR) sensing with an adjustable 8 ft. x 10 ft. coverage area.
 - Designed for wall mounting above a door.
 - Listed as an access control device under the UL 294 Standard.
 - Configured with a minimum of two from “C” relay contacts with an adjustable latch time.

- Programmable for fail-safe or fail-secure modes. Configured with an activation LED.

B. Door Position Switches:

1. Magnetic-type contacts.
2. Switch contacts shall be of the reed switch type with plating eliminating cold welding, sticking, and resistance build-up.
3. All contacts shall be hermetically sealed for long term 10,000,000 contact cycles.
 - a. Surface-Mounted Contacts: Magnetic contacts with a maximum gap range of 38 mm for standard applications and 64 mm for wide-gap applications. Honeywell 950 or 7945 (wide-gap), SENTROL 1085T series, or approved equal.

C. Recessed Contacts for Steel Doors: GENERAL ELECTRIC 1078C series or approved equal.

2.04 CABLING

A. General:

1. All cables shall be suitable for installation in the environment defined.
2. Any cabling installed unenclosed shall meet a [CM] [CMP] [CMR] rating (or approved substitutes as defined by the referenced NEC).
3. Cables shall be Underwriters Laboratory (UL) listed and comply with Article 800 (Communications Circuits) of the National Electrical Code.

B. Field Device to Controller: Per manufacturer's recommendations.

C. Horizontal (Telecom Cabling): Refer to specification Section 27 10 00 – Structured Cabling for cable and termination requirements for horizontal links designated for Access Control System locations.

PART 3 EXECUTION

3.01 GENERAL

- A. The complete installation shall be done in a neat, workmanlike manner in accordance with Division 26 of these documents and manufacturer's recommendations.
- B. Review the project drawings to identify rough-in, cabling and device requirements of all controlled and monitored doors.

3.02 COORDINATION

- A. Coordinate with the Division 08 contractor regarding the door frames and hardware equipment which is associated with the Access Control System. Verify rough-in and

installation requirements for all door frame mounted and/or door mounted control and monitoring equipment.

- B. Prior to start of construction, confirm installation requirements with the Owner. The coordination shall include, but not be limited to, hardware, cabling and wiring requirements including types, sizes, color-coding schemes, labeling, wire way requirements, termination responsibilities, and cable identification requirements.
- C. Prior to the start of system installation, schedule and facilitate a pre-installation meeting with the pertinent hardware, lock, exit device, and door closer manufacturers' representatives and related trades to coordinate materials, techniques, and to sequence complex hardware items and system installation. Proper installation and adjustment of hardware is to be reviewed. Convene at least one week prior to commencement of access control installation. Provide written documentation of the meeting including date, attendee/participant list and minutes. Distribute to Architect/Engineer and Owner within seven days of the meeting date.
- D. Coordinate with Division 26 installer to confirm required cabling pathways, device rough-ins, and line-voltage power requirements.

3.03 CONTINUITY OF EXISTING SERVICES AND SYSTEMS

- A. No outages shall be permitted on existing systems except at the time and during the interval specified by Owner and site representatives. Obtain written approval for any outages.
- B. Schedule any outage when the interruption causes the least interference with normal site schedules and business routines. No extra costs will be paid to the Contractor for such outages which must occur outside of regular weekly working hours.
- C. Refer to [General Requirements] [Supplementary General Conditions].
- D. Restore any service interrupted as a result of this work to proper operation as soon as possible.

3.04 INSTALLATION

- A. General:
 - 1. Receive, store, and install Access Control System equipment and cabling as specified.
 - 2. Comply with the manufacturer's instructions and recommendations for installation of all products.
 - 3. Provide all system wiring between all components in accordance with manufacturer's guidelines. Each cable for each device shall be home run. No splices are allowed unless otherwise noted.

- a. Intermediate termination points within a wire run would be considered a splice. If intermediate termination points are allowed, with prior approval of the Owner and Engineer, provide pull boxes and terminal strips permanently labeled with the numbering scheme per Owner's requirements.
4. Mount all credential readers where shown on plans. Placement shall be in accordance with Americans With Disabilities Act (ADA) requirements.
5. Locate all request-to-exit motion detectors directly above the door frame, centered on the door opening (as applicable). Adjust sensitivity to permit operation on motion of persons within 2'-0" of door. Avoid false activation by persons passing where possible.
6. Provide wiring to request-to-exit devices located in electrified door hardware.
- B. Controller Installation – General:
 1. Install, wire, and power per manufacturer's recommendations.
- C. Cable Installation – General:
 1. Route cable for field devices in raceway unless otherwise noted.
 2. Route system cabling to equipment per the Access Control System installation diagrams. Provide all interconnecting cabling from the head-end, between controllers, and between peripheral devices.
 3. Route cabling/conduit on secure side of door.
 4. Where cables are to be installed unenclosed (without raceway), the cable shall meet NEC requirements for the application and installation environment. See Cable Installation – Unenclosed below.
 5. Route in conduit all exposed vertical extensions to devices located below the finished ceiling.
 6. Install and terminate cable as required at each door location.
 7. Observe cable manufacturer's minimum bend radius in all instances. Take care in the use of cable ties to secure and anchor the station cabling. Do not overtighten cable ties as to compress the cable jacket. No sharp burrs should remain where excess length of the cable tie has been cut.
 8. All cable shall be free of tension at both ends. Provide strain relief connectors at each device and junction box where cables enter.
 9. Use suitable cable fittings and connectors.
- D. Cable Installation – Unenclosed:
 1. Where unenclosed cable installation is permitted and as designated on the plan drawings, route cabling to avoid areas of high traffic (i.e., aisle way) and as close

as possible to outlining walls. Cable route shall be a minimum of ten (10) feet above finished floor. Provide protection for exposed cables where subject to damage.

2. Route cabling neatly at right angles and be kept clear of other trades' work.
3. Support cabling at a maximum of 4-foot intervals utilizing "J-Hook" or "Bridle Ring" supports anchored to structure. Cable sag at mid-span shall not exceed 6". Install supports to maintain cable bend to larger than the minimum bend radius.
4. Do not attach-to or support cabling from existing cabling, plumbing or steam piping, ductwork, suspended ceiling supports, or electrical or communications conduit. Do not place cable directly on the ceiling grid or attach cable in any manner to the ceiling grid wires.
5. Provide 4-foot slack in each cable in accessible ceiling at each device location. Secure cable slack-coiled from 100% to 200% of the cable recommended minimum bend radius – (wire tied) at the last cable support before the cable reaches the device.

E. Field Device Installation:

1. Field devices are shown on the drawing locations diagrammatically and shall not be used for dimensioning of final location. The exact location of door control devices shall be determined by the Division 28 contractor and verified with the General and Division 08 contractors.
2. Multiple devices (i.e. intercoms, card readers, etc.) at door locations shall be mounted adjacent to each other.
3. Mount credential readers at 42" AFF to center unless noted otherwise on drawings.
4. Card reader stations shall not be mounted back-to-back on a common wall. Maintain separation to eliminate one card reader reading through the wall to a card reader on the opposite side.
5. When mounting credential readers on a new surface-mounted box, match box dimensions to the dimensions of the credential reader. (Example: For mounting HID ProxPro II 5455 or reader of similar dimension, a Wiremold V5752 2-gang alarm device box, or equivalent, is appropriate.)
6. Coordinate with Division 26 all 120-volt connections to access control panels and at remote and local door power supply locations as indicated on the drawings.

F. Door Control Interface Wiring:

1. Obtain from the Division 08 contractor all necessary cut sheets, wiring diagrams, and manufacturer's installation instructions.
2. Install door control wiring at each door location according to manufacturer's wiring instructions and as provided by the hardware supplier, including standard locations

and all special function controls for interlocking doors and fire release door locations.

G. Emergency Door Release: There are two types of emergency door release events:

1. Condition 1 – Emergency Fire Alarm
 - a. Doors that receive their lock power from centralized power supplies adjacent to the access control panels: This door type, which when scheduled to be unlocked in a Condition 1 – Emergency Fire Alarm condition, shall unlock from a fire alarm interface control module at the centralized power supply. When activated, the fire alarm interface control module removes power to the power supply that feeds the locks.
 - b. Doors that are associated with crash bars and rim mounted electric locks: The electrical in-rush current of these devices makes it necessary to control these locks from a local power supply provided with the device. This door type, which when scheduled to be unlocked in a Condition 1 – Emergency Fire Alarm condition, shall unlock from a fire alarm interface control module located at the door's local power supply.
2. Condition 2 – Emergency Response
 - a. Doors that receive their lock power from centralized power supplies adjacent to the access control panels: This door type, which when scheduled to be unlocked in a Condition 2 – Emergency Response condition, shall unlock from the key switch control located per the drawings at the fire alarm control panel located in the lobby. When activated, the key switch removes power to the power supply that feeds the locks.
 - b. Doors that are associated with crash bars and rim mounted electric locks: The electrical in-rush current of these devices makes it necessary to control these locks from a local power supply provided with the device. This door type, which when scheduled to be unlocked in a Condition 2 – Emergency Response condition, shall unlock from the same key switch control as noted above. When activated, the key switch removes power to the power supply that feeds the locks.

H. Network:

1. Where identified in PART 1, provide network electronics as required for links between Control Panels and Central Equipment. Otherwise, confirm network requirements to the agency.

3.05 IDENTIFICATION AND LABELING

- A. Label all installed electronic access control cabling and equipment.
- B. Prior to installation, provide samples of all label types planned for the project. These samples shall include examples of the lettering to be used.

- C. Label cables with the architectural door number for the opening served, the room number the opening is located in, the type of door device they serve ("reader", "REX", "lock", etc.), a unique numerical identification number for the control panel it originates in, and the room number the control panel is located in, on both ends of the cable. Example: "DOOR 1234A / RM 1234 / READER / CP 1 / RM B123".
- D. All system wiring shall be color-coded as required by Owner. Maintain color coding and labeling throughout the system at all accessible locations to the cabling.

3.06 ACCEPTANCE TESTING

A. General:

- 10. Conduct acceptance testing according to a schedule coordinated with the Owner.
- 11. Prior to testing, provide a summary of the proposed test plan. Test plan shall include – at minimum – proposed schedule, list of tests to be performed, equipment to be used, set-up, expected results, and documentation format.
- 12. Testing shall not proceed without approval by the Engineer.
- 13. Schedule shall allow time for correction of defects and remedial work.
- 14. Representatives of the Owner may be in attendance to witness the test procedures. Provide a minimum of one (1) week advance notice to allow for such participation.
- 15. Supply all equipment and personnel necessary to conduct the acceptance tests.
- 16. Perform tests related to connected equipment of others only with the permission and presence of Contractor responsible for that equipment.
- 17. Assist the Owner in the final system checkout and commissioning of the Access Control System.
- 18. Document all tests. Refer to the Article "DOCUMENTATION" below which details requirements.

B. Cable Testing:

- 1. Visually inspect all cabling and termination points to ensure that they are complete and conform to the wiring pattern defined herein. Provide the Engineer with written certification that this inspection has been made.
- 2. Test all cables to verify continuity in both door-open and door-closed conditions.
- 3. Test all cables for open circuits, ground faults or line-to-line short circuits.

C. System Testing:

1. At minimum, verify the following are properly wired and labeled:
 - Field Devices [and Control Panels]
 - Associated equipment such as Power Supplies
2. Prior to the commencement of the Acceptance Tests, verify the installation and configuration of software related to the operation and control of the Access Control System.
3. Assist Owner in testing overall functionality of the Access Control System. The tests shall include verification of the following:
 - The functional operation of each controlled access door and circuit.
 - Demonstrate normal and abnormal modes of operation and required responses to each.

3.07 DOCUMENTATION

A. General:

1. Upon completion of the installation, provide project documentation to the Engineer for review.
2. Documentation shall include the items detailed in the sub-sections below. Provide approved test results and documentation in Operating and Maintenance Manuals.
3. At the request of any of the parties listed above, provide copies of the original test results.
4. Provide chart listing test results for each controlled door.
5. All documentation, including hard copy and electronic forms, shall become the property of the Owner.

B. Operation and Maintenance Manuals:

1. Submit quantities required by Division 01 and Section 26 05 00.
2. Provide documents in electronic format (Adobe Acrobat .pdf) and, when requested, hard copy.
3. At minimum, O&M Manuals shall include:
 - Drawings annotated to show as-installed field device locations, cable routes, and major equipment locations
 - Cabling schematics
 - Approved submittals
 - Test plan and test report sheets

3.08 WARRANTY

- A. This Contractor shall guarantee the following for a period of two (2) years from date of substantial completion of this work:
- All provided materials and equipment
 - Installation of all equipment, hardware, cabling, and related components
- B. Warranties shall include labor, materials and travel time.
- C. See Division 01, GENERAL CONDITIONS and GENERAL REQUIREMENTS – Guarantee Documents and the individual technical sections for further requirements.
- D. If, while fulfilling requirements of this warranty, the Contractor disturbs other work, the Contractor shall arrange for such disturbed work to be restored to its original condition by the responsible Contractor. This shall be at no cost to the Owner.

EXHIBIT B

DE PERE CITY HALL FIRST FLOOR REMODEL PLANS

DE PERE CITY HALL FIRST FLOOR REMODEL



GENERAL FINISH NOTES:

- SEE AR101 SHEET FOR CEILING MATERIAL, TYPE, AND HEIGHT.
- SINGLE OR FIRST FINISH TYPE IN NEW ROOM FINISH SCHEDULE COLUMN INDICATES FIELD FINISH IN ENTIRE ROOM. ADDITIONAL FINISH TYPE(S) IN NEW ROOM FINISH SCHEDULE COLUMN INDICATES ACCENT(S). SEE 100 SERIES SHEETS FOR ACCENT FLOOR AND WALL FINISH TYPE LOCATIONS.
- INSTALL ALL MANUFACTURED ITEMS, MATERIALS, AND EQUIPMENT IN STRICT ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDED SPECIFICATIONS.
- ALL REQUESTS FOR SUBSTITUTIONS FOR SPECIFIED ITEMS SHALL BE SUBMITTED IN WRITING; WITH ALTERNATIVE PRODUCT INFORMATION TO THE ARCHITECT AND WILL BE CONSIDERED ONLY IF DEEMED ACCEPTABLE WITH REGARD TO QUALITY, APPEARANCE AND FUNCTION. REFER TO SPECIFICATIONS FOR PROCEDURE.
- FOR ITEMS NOT SPECIFIED, ASSUME INTERIOR SELECTIONS WILL BE MADE FROM FULL RANGE OF MANUFACTURER'S STANDARDS INCLUDING PREMIUM COLORS.
- IF THERE IS A CONFLICT BETWEEN DRAWINGS AND THE SCHEDULE, CONTACT THE ARCHITECT FOR CLARIFICATION.
- WHERE EXISTING HOLLOW METAL FRAMES AND/OR DOORS ARE WITHIN WALLS SCHEDULED TO BE PAINTED, BOTH SIDES OF THE FRAMES AND DOORS ARE TO BE REPAINTED.

FLOORING:

- FLOAT FLOORS AS NECESSARY TO PROVIDE FLUSH TRANSITIONS BETWEEN FLOORING MATERIALS. SEE G001 SHEET FOR FLOOR TRANSITIONS.
- CENTER ALL FLOORING TRANSITIONS DIRECTLY UNDER THE CENTERLINE OF DOOR IN CLOSED POSITION.

BASE:

- BASE SHALL BE 4" ROLL GOODS, NOT SECTIONS OR PIECE GOODS.

WALLS:

- REFER TO THE PAINT SCHEDULE IN THE SPECIFICATIONS FOR THE SPECIFIC PAINT SYSTEM LOCATIONS.
- WHERE ACCENT PAINTS ARE INDICATED ON THE DRAWINGS, COLOR IS TO EXTEND TO THE LENGTH AND ENDS ON THE INSIDE CORNER WHERE INDICATED.
- ALL METAL GRILLES, PANELS OR PAINTABLE PROTRUSIONS SHALL BE PAINTED TO MATCH SURFACE ON WHICH THEY OCCUR, UNLESS OTHERWISE NOTED ON FINISH PLAN OR ELEVATIONS, NOT OUTLET COVERS AND PLATES.
- WHERE SOFFIT ACCENT PAINT IS IDENTIFIED, COLOR IS TO COVER FACE AND UNDERSIDE OF SOFFIT.

INTERIOR FINISH LEGEND

06 40 00 ARCHITECTURAL WOODWORK

PLAM1	FORMICA, 8826-58 NEUTRAL TWILL
PLAM2	FORMICA, 918-58 NEUTRAL WHITE
PLAM3	WILSONART, 5005-38 SIERRA CASCADE
PLAM4	WILSONART, 4943-38 CLASSIC LINEN

SOLID SURFACE:
SS1 HI MACS; 2006 STRATO CREME

DRAWER PULLS:
PULL1 DOUG MOCKETT; DP305A, BLADE DRAWER PULL, 17S SATIN NICKEL

GROMMETS: DOUG MOCKETT; COLOR: 95 WHITE

08 14 16 FLUSH WOOD DOORS

GRADE A, MATCH EXISTING SPECIES, STAIN TO MATCH EXISTING

09 51 13 ACOUSTICAL PANEL CEILINGS

ACT1 USG, RADAR 2210, 2' X 2' SQUARE EDGE, 15/16" GRID

09 65 13 RESILIENT BASE

RB1 4" COVED, TARKETT 29 MOON ROCK

09 65 19 RESILIENT TILE FLOORING

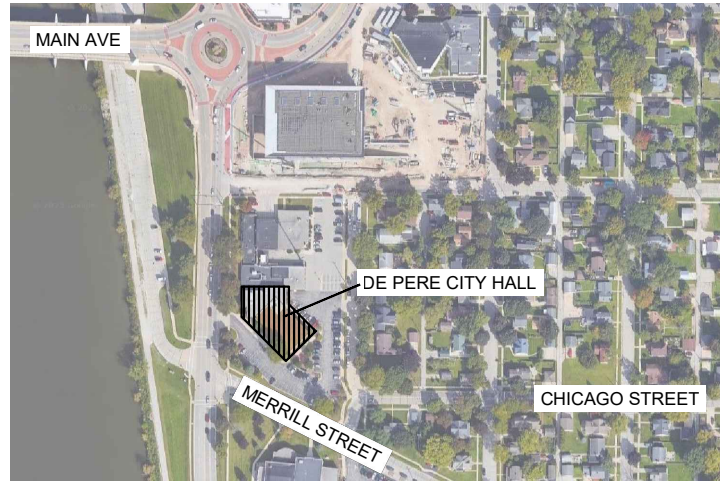
LVT1 LUXURY VINYL TILE, MILLIKEN, LOCAL MEASURE 2.5MM - COLOR TO MATCH OWNER STANDARD

09 68 13 TILE CARPETING

CPT1 MILLIKEN, NORDIC STORIES, TECTONIC T7C57-119 NORDIC NOIR

09 91 00 PAINTING

PT1 SHERWIN WILLIAMS; 7029 AGREEABLE GRAY - SEE OWNER FOR PAINT FORMULA
PT2 DE PERE CITYSHADE (PANTONE 418 C) SEE OWNER FOR PAINT FORMULA
PT3 DE PERE CLOUDWHITE (PANTONE 9101 C) SEE OWNER FOR PAINT FORMULA
PT4 DE PERE STONEGRAY (PANTONE 7335 C) SEE OWNER FOR PAINT FORMULA
PT5 HOLLOW METAL FRAMES - PAINT TO MATCH EXISTING



K7 SITE LOCATION MAP
NOT TO SCALE

GENERAL NOTES

- VERIFY ALL DIMENSIONS RELATING NEW CONSTRUCTION TO EXISTING CONSTRUCTION.
- UNLESS NOTED OTHERWISE, DIMENSIONS ON PLANS LOCATING INTERIOR PARTITIONS ARE TO FACE OF CONCRETE BLOCK, OR FACE OF OUTER LAYER OF GYPSUM BOARD.
- GENERAL TRADE SHALL PATCH HOLES IN SLABS, PARTITIONS, AND CEILINGS CAUSED BY ANY TRADE AS FOLLOWS:
 - AT REMOVED DUCTWORK, CONDUIT, AND PIPING
 - AT NEW DUCTWORK, CONDUIT AND PIPING IN EXISTING PARTITIONS
 - AT ADDED OR REMOVED PARTITION MOUNTED ITEMS
- WHERE EXPOSED TO VIEW, PATCHED SURFACES SHALL MATCH ADJACENT FINISHES. WORK SHALL MAINTAIN EXISTING SEPARATION RATINGS.
- GENERAL TRADE SHALL REMOVE ACOUSTICAL TILE AND GYPSUM BOARD WHERE REQUIRED FOR MECHANICAL OR ELECTRICAL TRADES. REINSTALL ACOUSTICAL TILE AND PATCH GYPSUM BOARD WHEN WORK ABOVE CEILING HAS BEEN COMPLETED.
- UNLESS DIMENSIONED OTHERWISE, LOCATE DOOR FRAMES 4" FROM PARTITION PERPENDICULAR TO HINGE PLATE ON DOOR FRAME.
- FOR FLOOR TRANSITION DETAILS, SEE (A12 G001)
- PROVIDE BLOCKING FOR ALL PARTITION MOUNTED ITEMS INCLUDING THOSE SHOWN ON THESE DRAWINGS TO BE PROVIDED UNDER SEPARATE CONTRACT, SEE (C15 G001)
- FOR MOUNTING HEIGHTS AND LOCATIONS OF DEVICES PROVIDED BY OTHER TRADES, SEE (A15 G001)
- UNLESS OTHERWISE NOTED, EXTEND ROOM FINISHES AT CASEWORK AS FOLLOWS:
 - EXTEND FLOOR FINISH UNDER CASEWORK (EXCEPT AT CARPET AND INTEGRAL BASES).
 - IT IS THE INTENT THAT ALL SURFACES CONCEALED BY CASEWORK BE FINISHED IN THE SAME MANNER AS THE ROOM. ONCE CASEWORK IS IN PLACE, INSTALL ADDITIONAL BASE MATERIAL TO BASE UNIT. MATERIAL SHALL MATCH ROOM BASE UNLESS NOTED OTHERWISE ON CASEWORK ELEVATIONS.
- PROVIDE SELF LEVELING UNDERLAYMENT WHERE RESILIENT FLOORING IS SCHEDULED. PREPARE EXISTING FLOORING AS REQUIRED FOR SELF LEVELER.
- WHERE MECHANICAL EQUIPMENT DOES NOT ALLOW STUDS TO EXTEND TO STRUCTURE, PROVIDE STRUCTURAL METAL STUD BOX HEADER BENEATH ALL EQUIPMENT. BOX HEADER SHALL BE CONSTRUCTED OF (2) STRUCTURAL STUDS LAID ON THEIR BACK SIDE UTILIZING THE SAME DIMENSION STUDS AS THE WALL. BE CONSTRUCTED (IE, 3 S8), OPENINGS BETWEEN 8'-0" AND 12'-0" SHALL UTILIZE .0451 THICKNESS STUDS. OPENINGS LESS THAN 8'-0" SHALL UTILIZE .0345 THICKNESS STUDS.
- UNLESS NOTED OTHERWISE, CASEWORK IS PLASTIC LAMINATE. FOR CASEWORK LEGEND SEE (A12 A501)
- DOOR ELEVATIONS SHOWN IN ROOM ELEVATIONS ARE SYMBOLIC REPRESENTATIONS ONLY AND DO NOT REFLECT SCHEDULED DOOR ELEVATIONS. SEE DOOR SCHEDULE FOR ACTUAL DOOR PANEL ELEVATION.

MATERIALS

ACOUSTICAL CEILING TILE	PARTICLE BOARD
BATT INSULATION / SOUND ATTENUATION	PLYWOOD
CARPET	PLASTER / MORTAR
CONCRETE	SOLID SURFACE
CONCRETE MASONRY UNIT (CMU)	CONTINUOUS WOOD BLOCKING
EXISTING CONSTRUCTION	WOOD TRIM
GYPSUM BOARD	WOOD SHIM
METAL STUD PARTITION SINGLE LAYER	

SHEET INDEX

GENERAL	GENERAL INFORMATION
G001	
ARCHITECTURAL	
AD101	FIRST FLOOR DEMOLITION PLAN
A101	FIRST FLOOR PLAN
A501	DETAILS AND SCHEDULES
PLUMBING	
P101	FLOOR PLANS
MECHANICAL	
M101	FIRST FLOOR PLAN
ELECTRICAL	
E101	FIRST FLOOR ELECTRICAL PLANS
E501	SCHEDULE AND DETAILS

SYMBOLS

NEW WORK PLAN

ROOM ROOM NAME
100 ROOM NUMBER
100 EXISTING CEILING HEIGHT

100 OPENING NUMBER
36 OPENING WIDTH IN INCHES

100 OPENING NUMBER
ELPT BORROWED LITE / PASS THRU

A1 ELEVATION NUMBER
A401 SHEET NUMBER

A1 DETAIL NUMBER
A101 SHEET NUMBER

A1 SECTION NUMBER
A401 SHEET NUMBER

A1 VIEW TITLE
2011A SCALE SHEET NUMBER

0 NEW COLUMN GRID

100 NEW DOORS (CONTAIN DOOR TAGS)

NEW ELEVATION

WALL CORNER GUARD (CG)

DEMOLITION PLAN

ROOM ROOM NAME
100 ROOM NUMBER
100 EXISTING CEILING HEIGHT

100 OPENING NUMBER
36 OPENING WIDTH IN INCHES

100 OPENING NUMBER
ELPT BORROWED LITE / PASS THRU

A1 ELEVATION NUMBER
A401 SHEET NUMBER

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A101 SHEET NUMBER

A1 SECTION NUMBER
A401 SHEET NUMBER

A1 VIEW TITLE
2011A SCALE SHEET NUMBER

0 NEW COLUMN GRID

100 NEW DOORS (CONTAIN DOOR TAGS)

NEW ELEVATION

WALL CORNER GUARD (CG)

KEYED NOTE

PARTITION TYPE

WINDOW TYPE

EXISTING CONSTRUCTION TO BE REMOVED (SHORT DASHES)

(A) A.D.A. ACCESSIBLE

EQUIPMENT IN SEPARATE CONTRACT

EXISTING COLUMNS

EXISTING ELEVATION

LOCATION OF CEILING MOUNTED EQUIPMENT SUPPORT ABOVE

EXISTING DOORS TO REMAIN (DO NOT CONTAIN DOOR TAGS)

EXISTING DOORS TO REMAIN (DO NOT CONTAIN DOOR TAGS)

EXISTING DOORS TO REMAIN (DO NOT CONTAIN DOOR TAGS)

EXISTING DOORS TO REMAIN (DO NOT CONTAIN DOOR TAGS)

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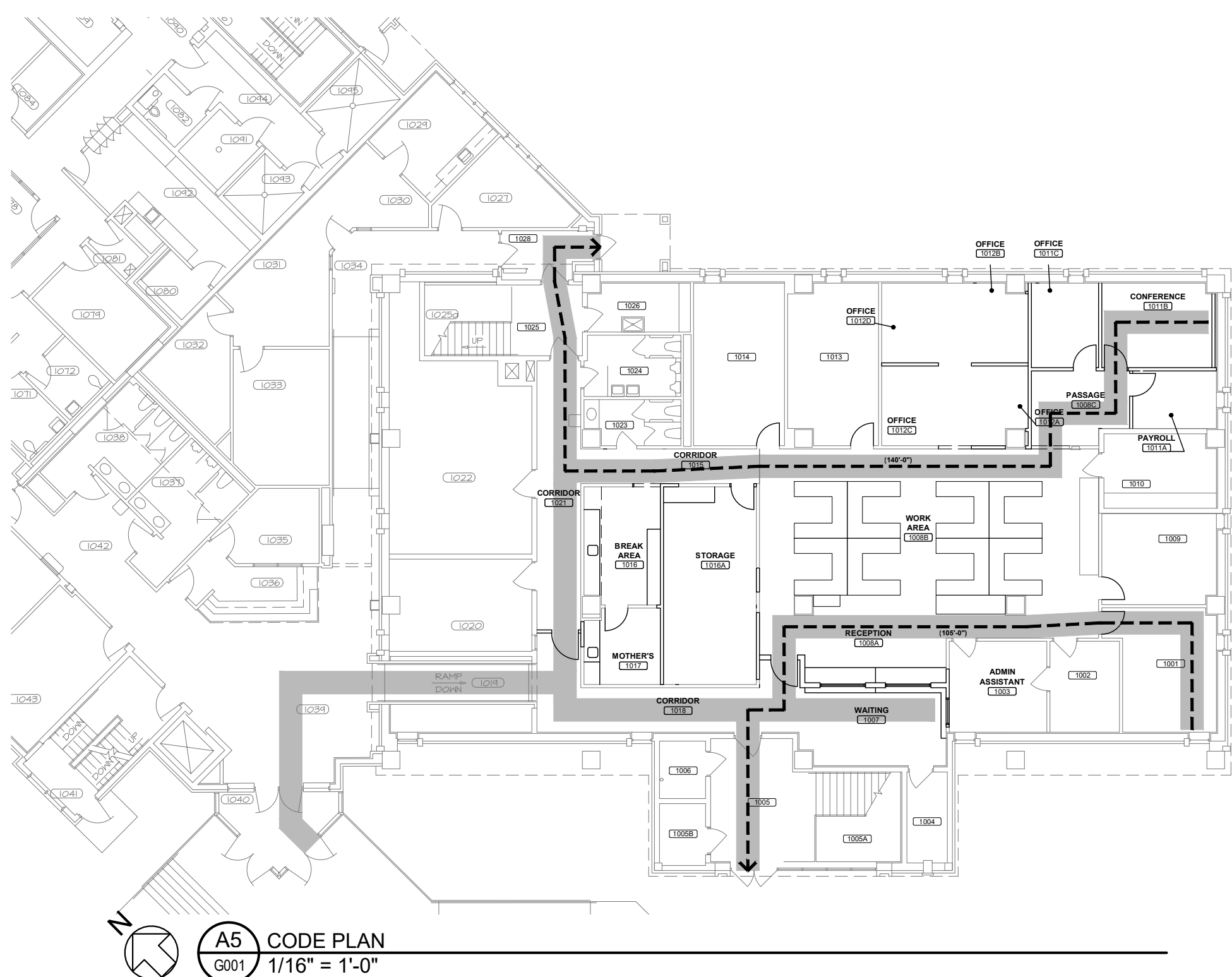
EXISTING DOORS TO REMAIN (DO NOT CONTAIN DOOR TAGS)

EXISTING DOORS TO REMAIN (DO NOT CONTAIN DOOR TAGS)

EXISTING DOORS TO REMAIN (DO NOT CONTAIN DOOR TAGS)

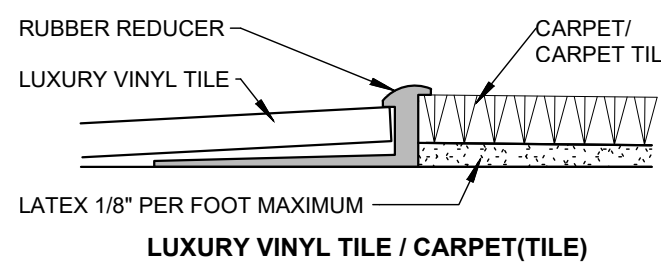
EXISTING DOORS TO REMAIN (DO NOT CONTAIN DOOR TAGS)

ROOM NUMBER	ROOM NAME	FLOOR MATERIAL	FLOOR TYPE	BASE MATERIAL	BASE TYPE	WALL MATERIAL	WALL FINISH	WALL FINISH TYPE	CEILING MATERIAL	CEILING TYPE	REMARKS	REVISION
1003	ADMIN ASSISTANT	EXISTING CARPET TILE	PATCH TO MATCH	4" RUBBER	PATCH TO MATCH	PATCH EXISTING/ GYPSUM BOARD AT NEW	PAINT AT NEW WALLS	PT1	ACOUSTICAL CEILING TILE	PATCH TO MATCH		
1007	WAITING	EXISTING CARPET TILE	PATCH TO MATCH	4" RUBBER	PATCH TO MATCH	PATCH EXISTING/ GYPSUM BOARD AT NEW	PAINT AT NEW WALLS	PT1	ACOUSTICAL CEILING TILE	PATCH TO MATCH		
1008A	RECEPTION	CARPET TILE	CPT1	4" RUBBER	RB1	PATCH EXISTING/ GYPSUM BOARD AT NEW	PAINT AT NEW WALLS	PT1	ACOUSTICAL CEILING TILE	ACT1		
1008B	WORK AREA	EXISTING CARPET TILE	PATCH TO MATCH	4" RUBBER	PATCH TO MATCH	PATCH EXISTING/ GYPSUM BOARD AT NEW	PAINT AT NEW WALLS	PT1	ACOUSTICAL CEILING TILE	PATCH TO MATCH		
1008C	PASSAGE	CARPET TILE	CPT1	4" RUBBER	RB1	PATCH EXISTING/ GYPSUM BOARD AT NEW	PAINT	PT1	ACOUSTICAL CEILING TILE	ACT1		
1011A	PAYROLL	CARPET TILE	CPT1	4" RUBBER	RB1	PATCH EXISTING/ GYPSUM BOARD AT NEW	PAINT	PT1	ACOUSTICAL CEILING TILE	ACT1		
1011B	CONFERENCE	CARPET TILE	CPT1	4" RUBBER	RB1	PATCH EXISTING/ GYPSUM BOARD AT NEW	PAINT	PT3, PT4	ACOUSTICAL CEILING TILE	ACT1	SEE SHEET A101 FOR ACCENT PAINT LOCATION	
1011C	OFFICE	CARPET TILE	CPT1	4" RUBBER	RB1	PATCH EXISTING/ GYPSUM BOARD AT NEW	PAINT	PT1	ACOUSTICAL CEILING TILE	ACT1		
1012A	OFFICE	CARPET TILE	CPT1	4" RUBBER	RB1	PATCH EXISTING/ GYPSUM BOARD AT NEW	PAINT	PT1	ACOUSTICAL CEILING TILE	ACT1		
1012B	OFFICE	CARPET TILE	CPT1	4" RUBBER	RB1	PATCH EXISTING/ GYPSUM BOARD AT NEW	PAINT	PT1	ACOUSTICAL CEILING TILE	ACT1		
1012C	OFFICE	CARPET TILE	CPT1	4" RUBBER	RB1	PATCH EXISTING/ GYPSUM BOARD AT NEW	PAINT	PT1	ACOUSTICAL CEILING TILE	ACT1		
1012D	OFFICE	CARPET TILE	CPT1	4" RUBBER	RB1	PATCH EXISTING/ GYPSUM BOARD AT NEW	PAINT	PT1	ACOUSTICAL CEILING TILE	ACT1		
1015	CORRIDOR	EXISTING CARPET TILE	PATCH TO MATCH	4" RUBBER	PATCH TO MATCH	PATCH EXISTING/ GYPSUM BOARD AT NEW	PAINT AT NEW WALLS	PT1	ACOUSTICAL CEILING TILE	PATCH TO MATCH		
1016	BREAK AREA	LUXURY VINYL TILE	LVT1	4" RUBBER	RB1	PATCH EXISTING/ GYPSUM BOARD AT NEW	PAINT	PT1, PT2	ACOUSTICAL CEILING TILE	ACT1	SEE SHEET A101 FOR ACCENT PAINT LOCATION	
1016A	STORAGE	LUXURY VINYL TILE	LVT1	4" RUBBER	RB1	PATCH EXISTING/ GYPSUM BOARD AT NEW	PAINT	PT1	ACOUSTICAL CEILING TILE	ACT1		
1017	MOTHERS	EXISTING CARPET TILE	PATCH TO MATCH	4" RUBBER	PATCH TO MATCH	PATCH EXISTING/ GYPSUM BOARD AT NEW	PAINT	PT1	ACOUSTICAL CEILING TILE	ACT1		
1018	CORRIDOR	EXISTING CARPET TILE	PATCH TO MATCH	4" RUBBER	PATCH TO MATCH	PATCH EXISTING/ GYPSUM BOARD AT NEW	PAINT AT NEW WALLS	PT1	ACOUSTICAL CEILING TILE	PATCH TO MATCH		
1021	CORRIDOR	EXISTING CARPET TILE	PATCH TO MATCH	4" RUBBER	PATCH TO MATCH	PATCH EXISTING/ GYPSUM BOARD AT NEW	PAINT AT NEW WALLS	PT1	ACOUSTICAL CEILING TILE	PATCH TO MATCH		



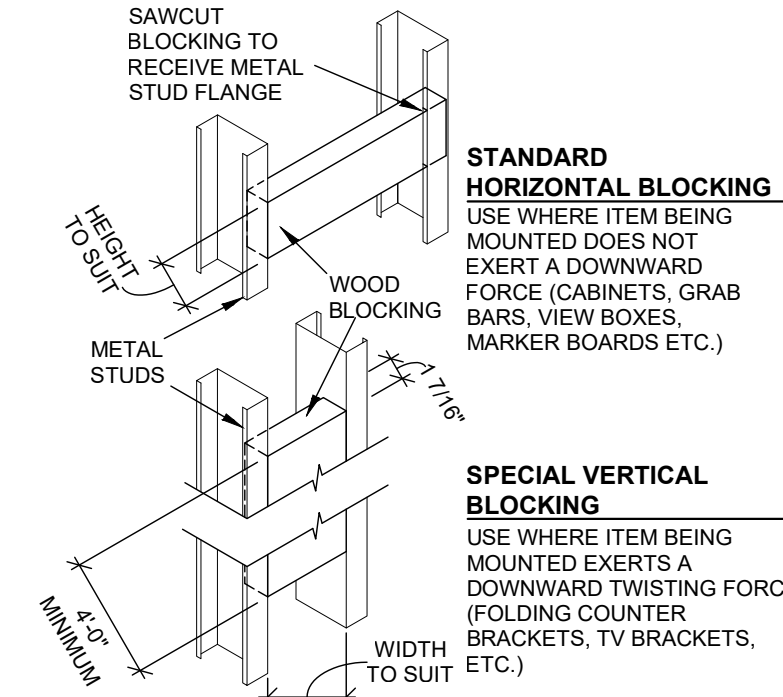
LEGEND
EXIT ACCESS CORRIDOR
LONGEST EGRESS DISTANCE

A5 CODE PLAN
G001 1/16" = 1'-0"

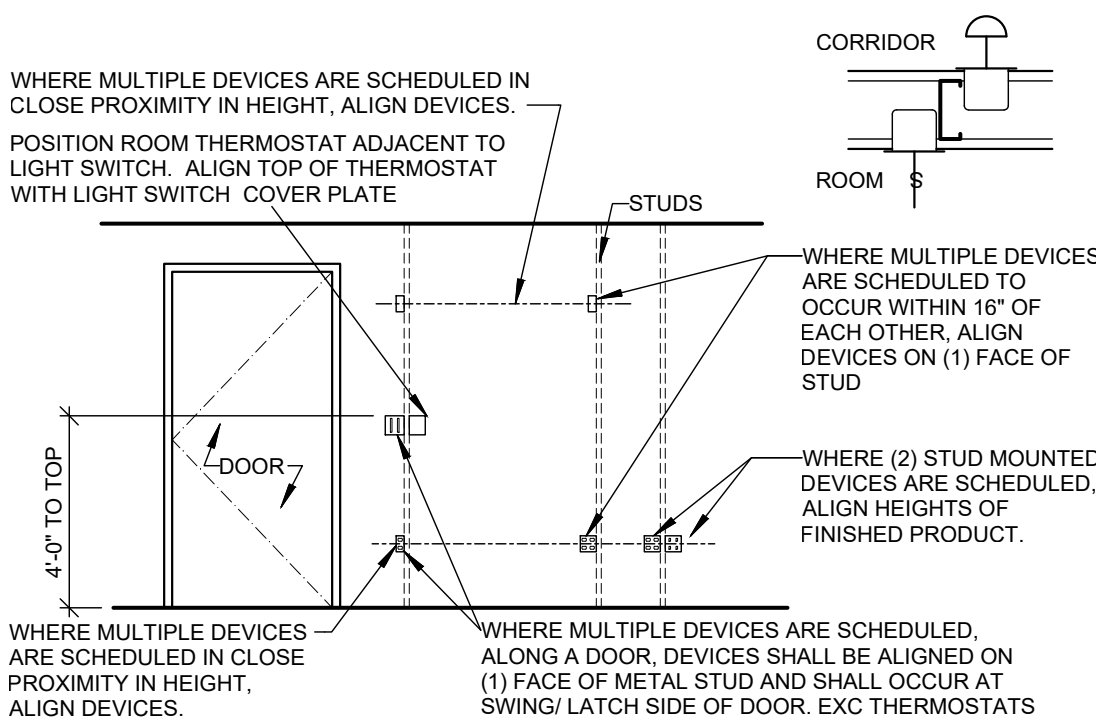


LUXURY VINYL TILE / CARPET(TILE)

A12 LVT TO CARPET
G001 1' = 1'-0"



C15 BLOCKING ISOMETRIC - WOOD
G001 1" = 1'-0"



A15 DEVICE MOUNTING SCHEDULE
G001 1/4" = 1'-0"

CITY HALL FIRST FLOOR REMODEL

Sheet Title:

GENERAL INFORMATION

Revisions:		
No.	Date:	Description:
01	04/25/25	OWNER REVIEW SET
02	07/02/25	BID DOCUMENT SET
BID DOCUMENT SET		
GRAPHIC SCALE		
UNLESS NOTED OTHERWISE		
PROJECT NUMBER		
25CDEP01.00		
DATE ISSUED		
2 JULY, 2025		
SHEET NUMBER		
G001		

EXISTING FINISH SCHEDULE											
ROOM NUMBER	ROOM NAME	FLOOR MATERIAL	BASE MATERIAL	WAINSCOT MATERIAL	WAINSCOT HEIGHT	WALL MATERIAL	WALL FINISH	CEILING MATERIAL	CEILING TYPE	REMARKS	REVISION
1003	SECRETARY	CARPET TILE	4" VINYL	-	-	GYPSUM BOARD	PAINT	ACOUSTICAL CEILING TILE	2X2 LAY-IN		
1007	WAITING	CARPET TILE	4" VINYL	-	-	GYPSUM BOARD	PAINT WALLCOVERING	ACOUSTICAL CEILING TILE	2X2 LAY-IN		
1008	WORK AREA	CARPET TILE	4" VINYL	-	-	GYPSUM BOARD	PAINT	ACOUSTICAL CEILING TILE	2X2 LAY-IN		
1011	FILES STORAGE	VINYL COMPOSITION TILE	4" VINYL	-	-	GYPSUM BOARD	PAINT WALLCOVERING	ACOUSTICAL CEILING TILE	2X2 LAY-IN		
1012	CITY ASSESSOR	CARPET TILE	4" VINYL	-	-	GYPSUM BOARD	PAINT	ACOUSTICAL CEILING TILE	2X2 LAY-IN		
1015	CORRIDOR	CARPET TILE	4" VINYL	-	-	GYPSUM BOARD	PAINT	ACOUSTICAL CEILING TILE	2X2 LAY-IN		
1015	CORRIDOR	CARPET TILE	4" VINYL	-	-	GYPSUM BOARD	PAINT	ACOUSTICAL CEILING TILE	2X2 LAY-IN		
1016	BREAK AREA	VINYL COMPOSITION TILE	4" VINYL	-	-	GYPSUM BOARD	PAINT	ACOUSTICAL CEILING TILE	2X2 LAY-IN		
1016A	COPY ROOM	CARPET TILE	4" VINYL	-	-	GYPSUM BOARD	PAINT	ACOUSTICAL CEILING TILE	2X2 LAY-IN		
1017	PAYROLL OFFICE	CARPET TILE	4" VINYL	-	-	GYPSUM BOARD	PAINT	ACOUSTICAL CEILING TILE	2X2 LAY-IN		
1017A	WATER OFFICE	CARPET TILE	4" VINYL	-	-	GYPSUM BOARD	PAINT	ACOUSTICAL CEILING TILE	2X2 LAY-IN		
1018	CORRIDOR	CARPET TILE	4" VINYL	-	-	GYPSUM BOARD	PAINT	ACOUSTICAL CEILING TILE	2X2 LAY-IN		

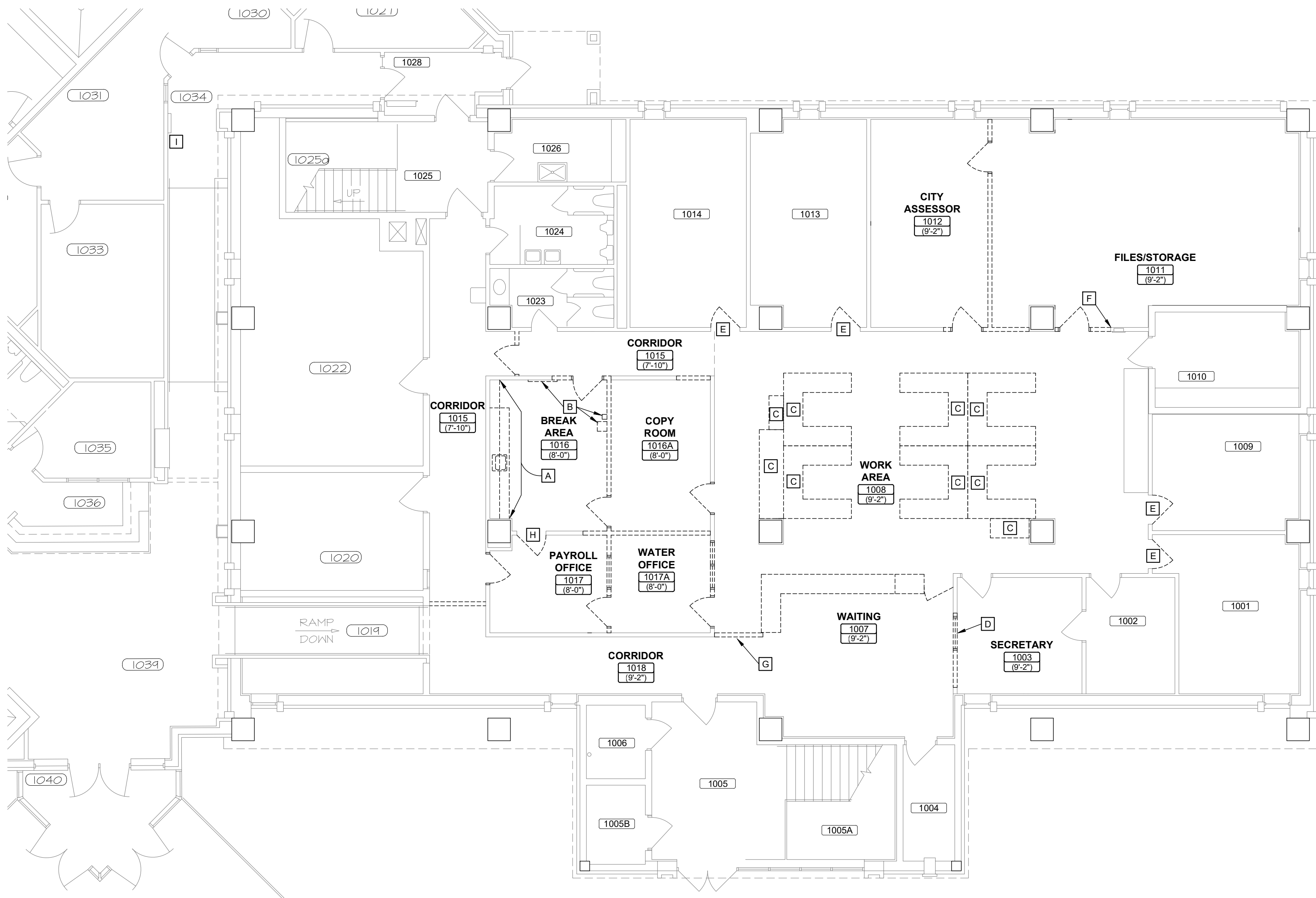
DEMOLITION NOTES

GENERAL DEMOLITION NOTES:

1. REMOVE ALL PARTITIONS, DOORS, FRAMES, PLUMBING FIXTURES, CASEWORK, ETC. TO BE REMOVED. REMOVE ALL MATERIALS DASHED ON THIS PLAN. COORDINATE WITH OWNER ITEMS TO BE SAVED.
2. REMOVE ALL SUSPENDED ACoustICAL TILE AND PLASTER CEILINGS FROM ROOMS WITH NEW CEILING SCHEDULED (SEE CEILING SCHEDULE FOR PLASTER AND PLASTER NEW CEILING). REMOVE CEILING GRID, HANGER WIRES, FURRING CHANNELS, AND ALL MATERIALS REQUIRED TO REMOVE EXISTING CEILING AND TO CONFIRM CLOSING OF ALL PARTITIONS TO REMAIN.
3. WHERE EXISTING CONSTRUCTION IS SCHEDULED TO REMAIN, REPAIR PATCH OPENINGS (I.E. AFTER REMOVAL OF ADJACENT PARTITION OR CASEWORK) TO MATCH EXISTING FINISHES. GUARDRAILS, WALL PROTECTION, ETC.) IN WALLS, CEILINGS, AND FLOORS WHERE THERE ARE OPENINGS TO BE REPAIRED. PROVIDE SMOOTH AND INVISIBLE TRANSITIONS. MAINTAIN EXISTING CODE AND FIRE RATING REQUIREMENTS.
4. WHERE EXISTING PARTITIONS ARE SHOWN TO REMAIN, THE EXISTING PARTITION SYSTEM SHALL BE MAINTAINED. EXISTING HEIGHT MAY NOT EXCEED TO NEW SOFFITCEILING HEIGHT. EXTEND GYPSUM BOARD TO NEW SOFFITCEILING AS REQUIRED TO ACCOMMODATE NEW SOFFITCEILING HEIGHT.
5. REMOVE OR PREP EXISTING FINISHES WHERE NEW FINISHES ARE SCHEDULED IN THE NEW FINISH SCHEDULE.
6. UNLESS NOTED OTHERWISE, EXISTING PARTITIONS ARE TO BE DECONSTRUCTED OF METAL STUDS WITH GYPSUM BOARD ON BOTH SIDES.

DEMOLITION KEYED NOTES

- A** REMOVE CASEWORK AND PLUMBING FIXTURES IN THEIR ENTIRETY. TURN OVER PLUMBING FIXTURES TO OWNER. SALVAGE DISHWASHER AND FRIDGE FOR REUSE.
- B** REMOVE PAPER TOWEL DISPENSER, TACK BOARD AND CAN CRUSHER. TURN OVER TO OWNER.
- C** MOVABLE WORK STATIONS TO BE RELOCATED IN NEW WORK AREA LAYOUT.
- D** REMOVE LITE AND SMALL COUNTERTOP AND TURN OVER TO OWNER.
- E** DEMO DOOR SLAB ONLY - TURN OVER TO OWNER. FRAME TO REMAIN. SALVAGE HARDWARE TO BE REINSTALLED ON NEW DOOR SLABS.
- F** DEMO WALL AS CLOSE AS POSSIBLE TO EXISTING ELECTRICAL PANEL WHILE LEAVING ENOUGH WALL TO REMAIN TO SUPPORT THE ELECTRICAL PANEL.
- G** REMOVE PAMPHLET RACK AND SALVAGE FOR REUSE - COORDINATE NEW MOUNTING LOCATION WITH OWNER.
- H** DEMO DOOR SLAB ONLY - TURN OVER TO OWNER. FRAME TO REMAIN.
- I** SALVAGE LITE AND COUNTER - SEE NEW WORK PLAN NOTE **1**



  **FIRST FLOOR DEMOLITION PLAN**
1/8" = 1'-0"

Architectural floor plan of the 10th floor. The plan shows various rooms and corridors, each labeled with a room number in a box. Key rooms include 1001, 1002, 1003, 1004, 1005, 1006, 1007, 1008, 1009, 1010, 1011A, 1012A, 1012B, 1013, 1014, 1015, 1016, 1017, 1018, 1019, 1020, 1021, 1022, 1023, 1024, 1025, 1026, 1027, 1028, 1029, 1030, 1031, 1032, 1033, 1034, 1035, 1036, 1037, 1038, 1039, 1040, 1041, 1042, 1043, 1044, 1045, 1046, 1047, 1048, 1049, 1050, 1051, 1052, 1053, 1054, 1055, 1056, 1057, 1058, 1059, 1060, 1061, 1062, 1063, 1064, 1065, 1066, 1067, 1068, 1069, 1070, 1071, 1072, 1073, 1074, 1075, 1076, 1077, 1078, 1079, 1080, 1081, 1082, 1083, 1084, 1085, 1086, 1087, 1088, 1089, 1090, 1091, 1092, 1093, 1094, 1095, 1096, 1097, 1098, 1099, 1100, 1101, 1102, 1103, 1104, 1105, 1106, 1107, 1108, 1109, 1110, 1111, 1112, 1113, 1114, 1115, 1116, 1117, 1118, 1119, 1120, 1121, 1122, 1123, 1124, 1125, 1126, 1127, 1128, 1129, 1130, 1131, 1132, 1133, 1134, 1135, 1136, 1137, 1138, 1139, 1140, 1141, 1142, 1143, 1144, 1145, 1146, 1147, 1148, 1149, 1150, 1151, 1152, 1153, 1154, 1155, 1156, 1157, 1158, 1159, 1160, 1161, 1162, 1163, 1164, 1165, 1166, 1167, 1168, 1169, 1170, 1171, 1172, 1173, 1174, 1175, 1176, 1177, 1178, 1179, 1180, 1181, 1182, 1183, 1184, 1185, 1186, 1187, 1188, 1189, 1190, 1191, 1192, 1193, 1194, 1195, 1196, 1197, 1198, 1199, 1200, 1201, 1202, 1203, 1204, 1205, 1206, 1207, 1208, 1209, 1210, 1211, 1212, 1213, 1214, 1215, 1216, 1217, 1218, 1219, 1220, 1221, 1222, 1223, 1224, 1225, 1226, 1227, 1228, 1229, 1230, 1231, 1232, 1233, 1234, 1235, 1236, 1237, 1238, 1239, 1240, 1241, 1242, 1243, 1244, 1245, 1246, 1247, 1248, 1249, 1250, 1251, 1252, 1253, 1254, 1255, 1256, 1257, 1258, 1259, 1260, 1261, 1262, 1263, 1264, 1265, 1266, 1267, 1268, 1269, 1270, 1271, 1272, 1273, 1274, 1275, 1276, 1277, 1278, 1279, 1280, 1281, 1282, 1283, 1284, 1285, 1286, 1287, 1288, 1289, 1290, 1291, 1292, 1293, 1294, 1295, 1296, 1297, 1298, 1299, 1300, 1301, 1302, 1303, 1304, 1305, 1306, 1307, 1308, 1309, 1310, 1311, 1312, 1313, 1314, 1315, 1316, 1317, 1318, 1319, 1320, 1321, 1322, 1323, 1324, 1325, 1326, 1327, 1328, 1329, 1330, 1331, 1332, 1333, 1334, 1335, 1336, 1337, 1338, 1339, 1340, 1341, 1342, 1343, 1344, 1345, 1346, 1347, 1348, 1349, 1350, 1351, 1352, 1353, 1354, 1355, 1356, 1357, 1358, 1359, 1360, 1361, 1362, 1363, 1364, 1365, 1366, 1367, 1368, 1369, 1370, 1371, 1372, 1373, 1374, 1375, 1376, 1377, 1378, 1379, 1380, 1381, 1382, 1383, 1384, 1385, 1386, 1387, 1388, 1389, 1390, 1391, 1392, 1393, 1394, 1395, 1396, 1397, 1398, 1399, 1400, 1401, 1402, 1403, 1404, 1405, 1406, 1407, 1408, 1409, 1410, 1411, 1412, 1413, 1414, 1415, 1416, 1417, 1418, 1419, 1420, 1421, 1422, 1423, 1424, 1425, 1426, 1427, 1428, 1429, 1430, 1431, 1432, 1433, 1434, 1435, 1436, 1437, 1438, 1439, 1440, 1441, 1442, 1443, 1444, 1445, 1446, 1447, 1448, 1449, 1450, 1451, 1452, 1453, 1454, 1455, 1456, 1457, 1458, 1459, 1460, 1461, 1462, 1463, 1464, 1465, 1466, 1467, 1468, 1469, 1470, 1471, 1472, 1473, 1474, 1475, 1476, 1477, 1478, 1479, 1480, 1481, 1482, 1483, 1484, 1485, 1486, 1487, 1488, 1489, 1490, 1491, 1492, 1493, 1494, 1495, 1496, 1497, 1498, 1499, 1500, 1501, 1502, 1503, 1504, 1505, 1506, 1507, 1508, 1509, 1510, 1511, 1512, 1513, 1514, 1515, 1516, 1517, 1518, 1519, 1520, 1521, 1522, 1523, 1524, 1525, 1526, 1527, 1528, 1529, 1530, 1531, 1532, 1533, 1534, 1535, 1536, 1537, 1538, 1539, 1540, 1541, 1542, 1543, 1544, 1545, 1546, 1547, 1548, 1549, 1550, 1551, 1552, 1553, 1554, 1555, 1556, 1557, 1558, 1559, 1560, 1561, 1562, 1563, 1564, 1565, 1566, 1567, 1568, 1569, 1570, 1571, 1572, 1573, 1574, 1575, 1576, 1577, 1578, 1579, 1580, 1581, 1582, 1583, 1584, 1585, 1586, 1587, 1588, 1589, 1590, 1591, 1592, 1593, 1594, 1595, 1596, 1597, 1598, 1599, 1600, 1601, 1602, 1603, 1604, 1605, 1606, 1607, 1608, 1609, 1610, 1611, 1612, 1613, 1614, 1615, 1616, 1617, 1618, 1619, 1620, 1621, 1622, 1623, 1624, 1625, 1626, 1627, 1628, 1629, 1630, 1631, 1632, 1633, 1634, 1635, 1636, 1637, 1638, 1639, 1640, 1641, 1642, 1643, 1644, 1645, 1646, 1647, 1648, 1649, 1650, 1651, 1652, 1653, 1654, 1655, 1656, 1657, 1658, 1659, 1660, 1661, 1662, 1663, 1664, 1665, 1666, 1667, 1668, 1669, 1

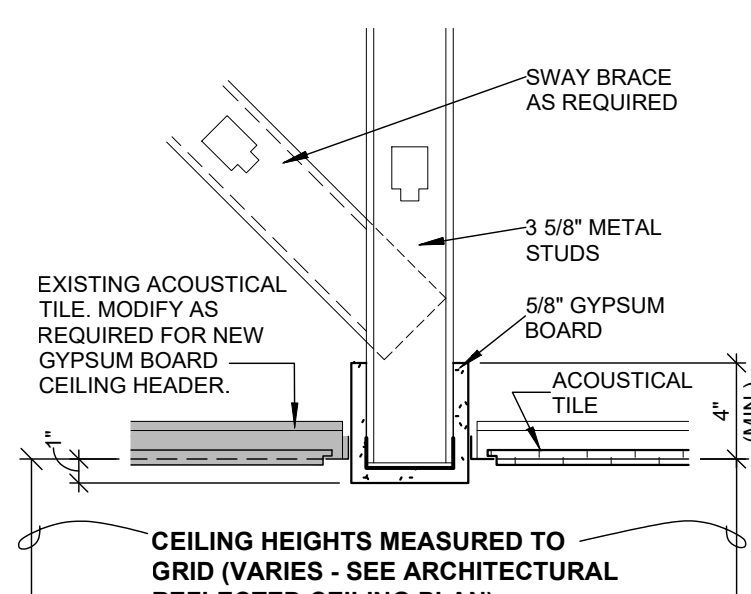
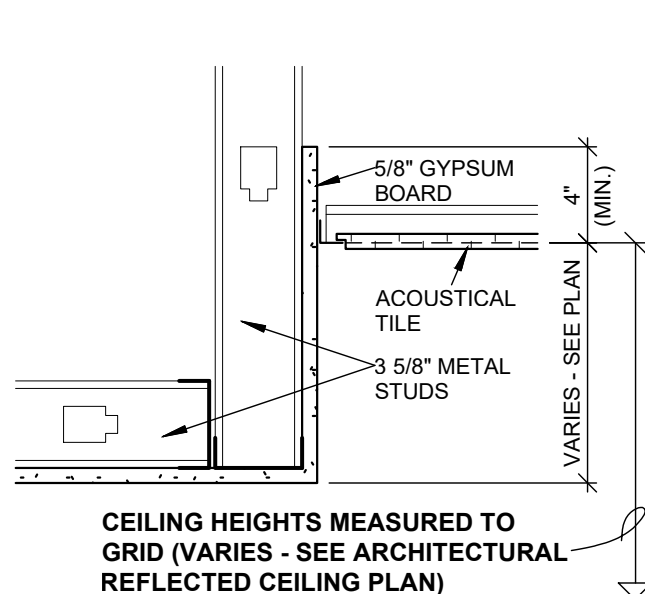
SYMBOLS KEY

ARCHITECTURAL

	ACCESS PANEL
	GYPSUM BOARD CEILING
HVAC	
★	PAINTED METAL PANEL
	SUPPLY DIFFUSER
	SUPPLY DIFFUSER
	RETURN GRILLE
	RETURN GRILLE
	RETURN GRILLE
	SLOT DIFFUSER
	EXHAUST GRILLE
	EXHAUST GRILLE
	OCCUPANCY SENSOR

ELECTRICAL

	RECESSED DOWN LIGHT, SURFACE / PENDANT
	2x4 LIGHT FIXTURE - RECESSED / SURFACE
	2x2 LIGHT FIXTURE - RECESSED / SURFACE
	1x4 LIGHT FIXTURE - RECESSED / SURFACE
	EMERGENCY BATTERY PACK
	EXIT SIGN/WARNING - SINGLE FACED
	EXIT SIGN - DOUBLE FACED
	OCCUPANCY SENSOR
	CEILING MOUNTED HORN/STROBE
	CEILING MOUNTED STROBE ONLY
	SMOKE DETECTOR
	THERMAL DETECTOR



G8	GYPSUM BOARD SOFFIT
A101	1 1/2" = 1'-0"

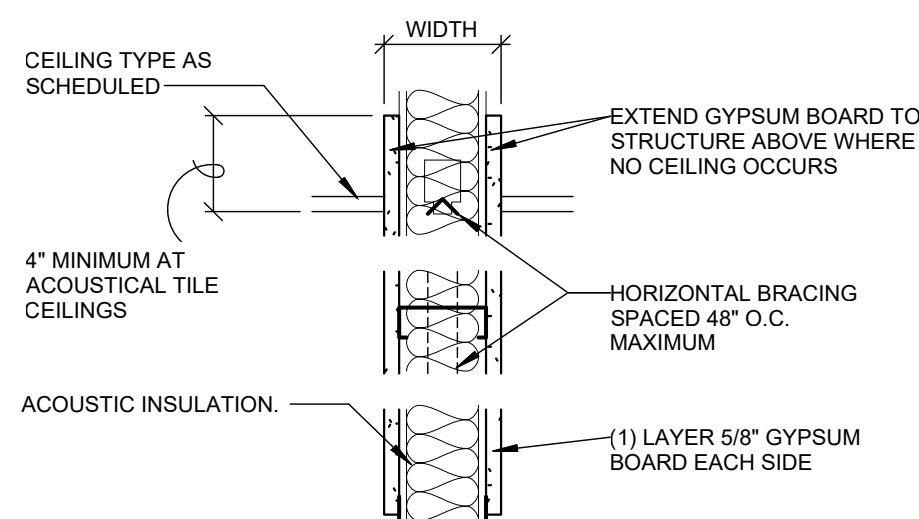
G10 CEILING HEADER
A101 1 1/2" = 1'-0"

 REFLECTED CEILING PLAN
1/8" = 1'-0"

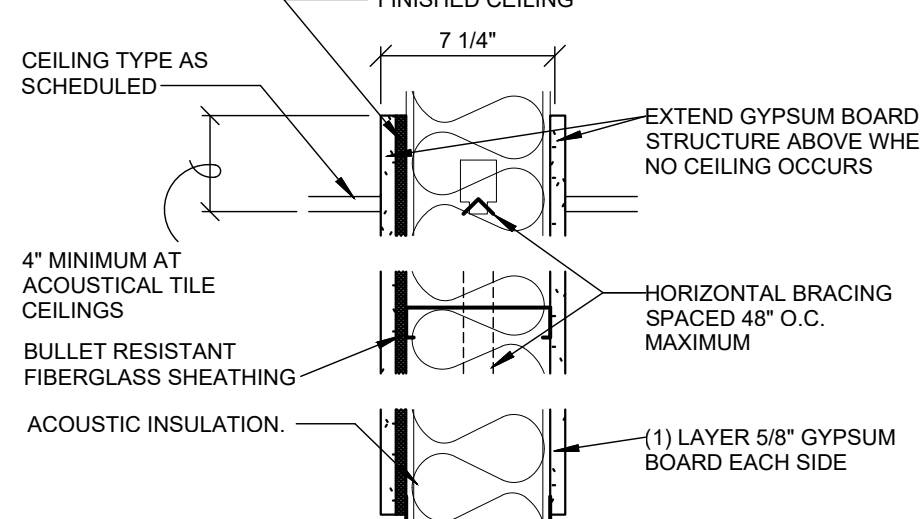
GENERAL NOTES:

- SEE ARCHITECTURAL DEMOLITION PLAN FOR NEW WORK INCLUDING BUT NOT LIMITED TO:
- A. WALL PATCHING AT CEILINGS THAT CHANGE HEIGHT, REMOVE AND INFILL DOORFRAMES, CEILING
- B. PATCHING OR PREP WORK OF EXISTING FINISHES AS REQUIRED FOR NEW ROOM FINISHES.
2. SEE MECHANICAL TRADES DRAWINGS FOR LOCATIONS OF NEW CUT IN DEVICES INTO EXISTING PARTITIONS THAT WILL RESULT IN REMOVAL OF EXISTING PARTITIONS.
3. SEE MECHANICAL TRADE DRAWINGS FOR AREAS OUTSIDE OF THE MAIN ARCHITECTURAL SCOPE OF WORK AREA THAT MAY REQUIRE TEMPORARY REMOVAL AND REINSTALLATION OF CEILINGS AND REMOVING MOUNTED EQUIPMENT FOR MECHANICAL TRADE WORK.
4. TRADES SHALL CAREFULLY COORDINATE WALL MOUNTED DEVICE COORDINATE WITH MECHANICAL TRADES TO VERIFY LOCATIONS ON THESE DRAWINGS. COORDINATE HEIGHTS OF DEVICES TO EXISTING PARTITION HEIGHTS. COORDINATE WITH MECHANICAL PROTECTION SHEETING AND CERAMIC WALL TILE WAINSCOTS.
- A. SEE ACCESSORY SCHEDULE FOR CLEARANCE REQUIREMENTS OF ELECTRICAL DEVICES WHERE ALCOHOL, AND HAND WASH COUNTERS ARE BEING REMOVED. COORDINATE WITH CONCRETE INSTALLATION OF ELECTRICAL DEVICES TO LEAVE SPACE TO REMOVE WALLS AND CEILING.
5. WHERE EXISTING DOOR BORROWED LITE FRAMES ARE SCHEDULED TO REMAIN IN NEW WORK AREAS, FRAMES SHALL BE REPAINTED PER SCHEDULED FRAME COLOR AS LISTED IN THE INTERIOR FINISH SCHEDULE.

- 1 ADD CASEWORK PANELS AS NEEDED UNDERNEATH EXISTING COUNTERTOP TO MAKE EXISTING COUNTERTOP ADA COMPLIANT. SEE DETAIL
- 2 PATCH TO MATCH WALL FINISHES, FLOORING, AND MODIFY CEILING GRID AND TILE WHERE DOOR AND WALL WERE REMOVED.
- 3 ADD 3/8" STEEL PLATE BELOW AND ON BOTH SIDES OF LITE



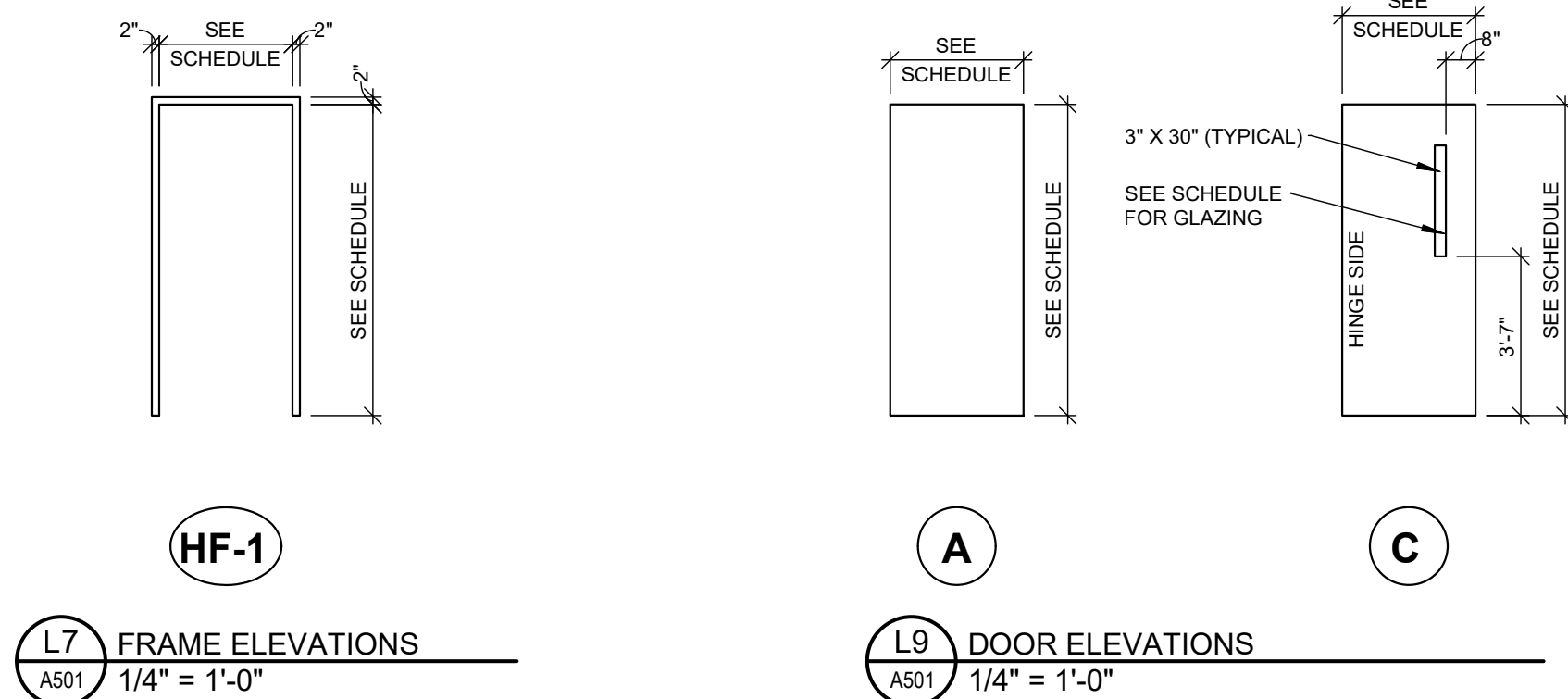
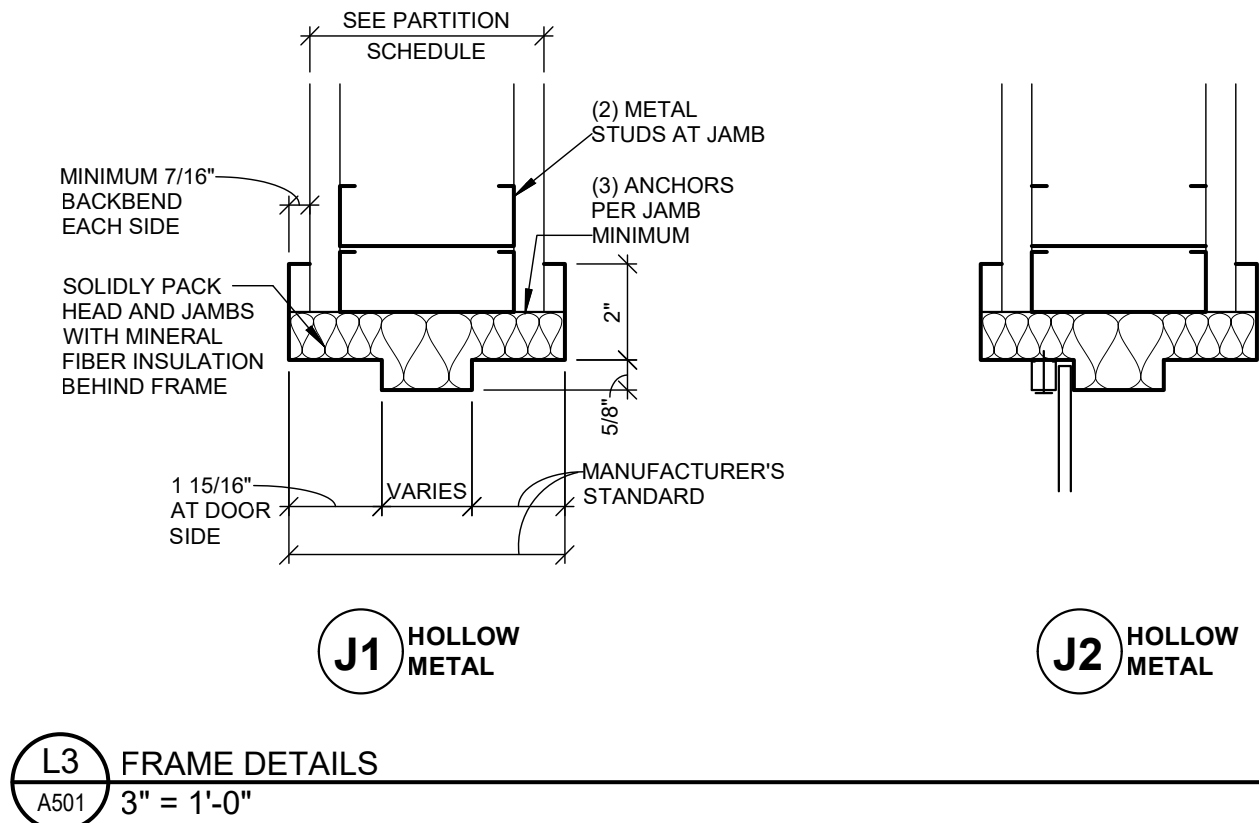
TYPE	WIDTH	WALL STRUCTURE	RATING/TEST	STC
S3A110	4 7/8"	3 5/8" METAL STUDS	N/A	N/A



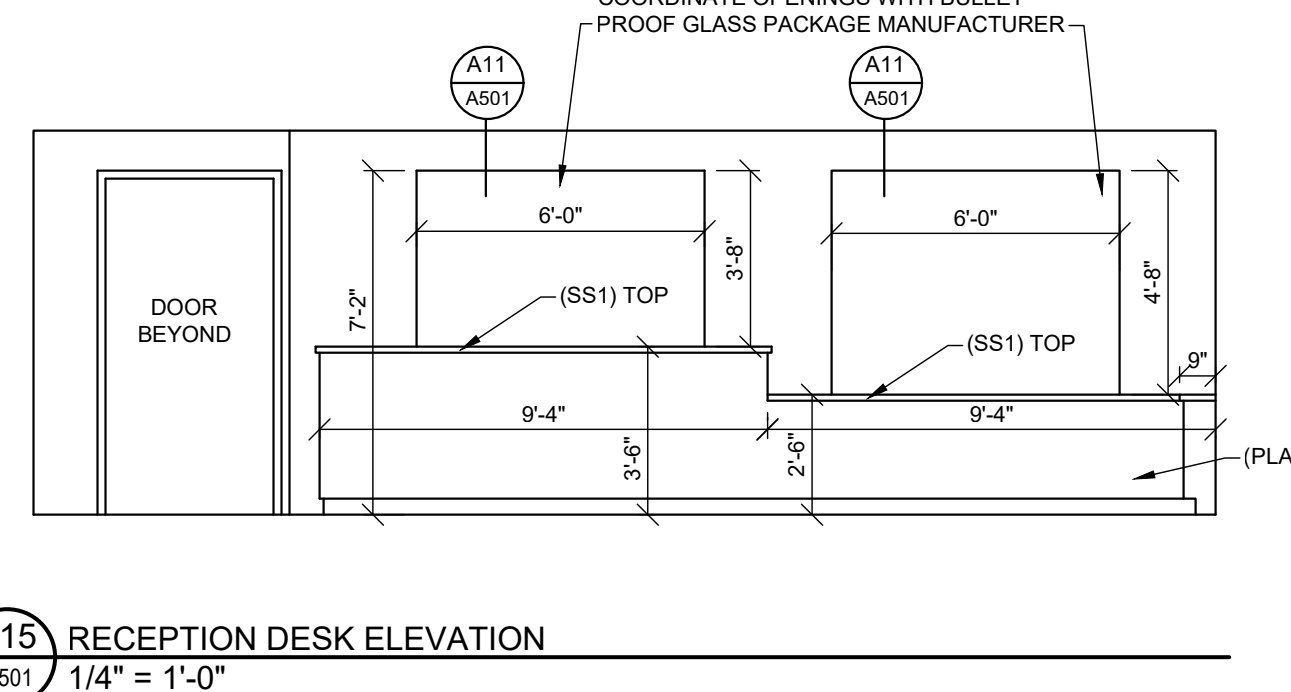
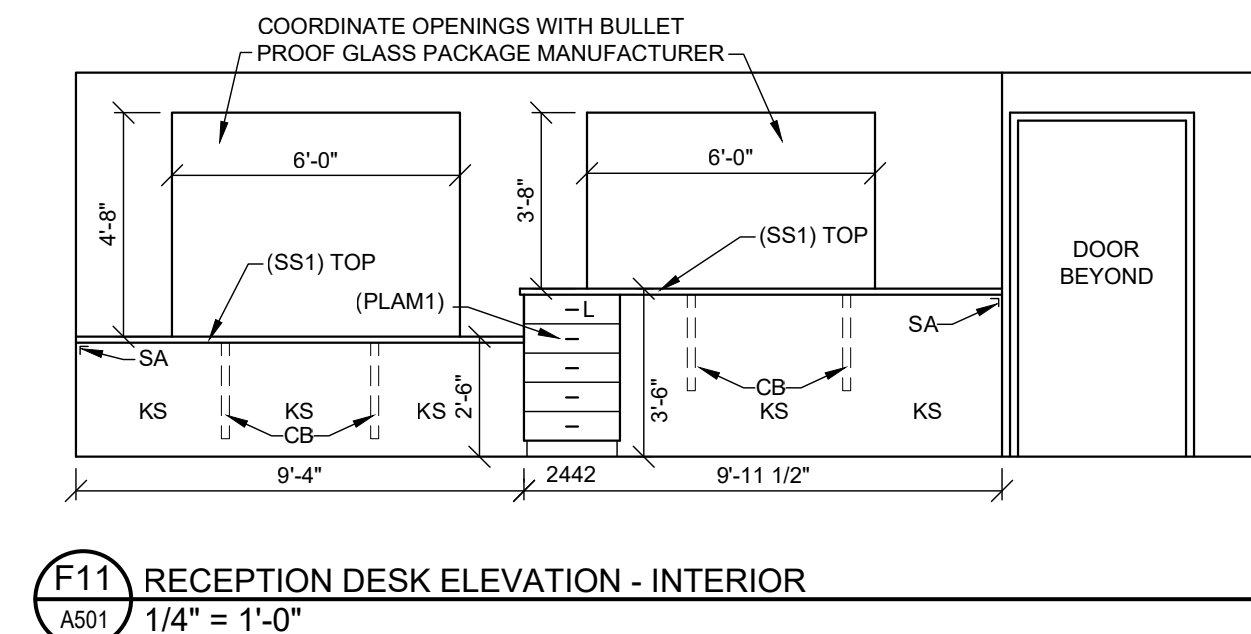
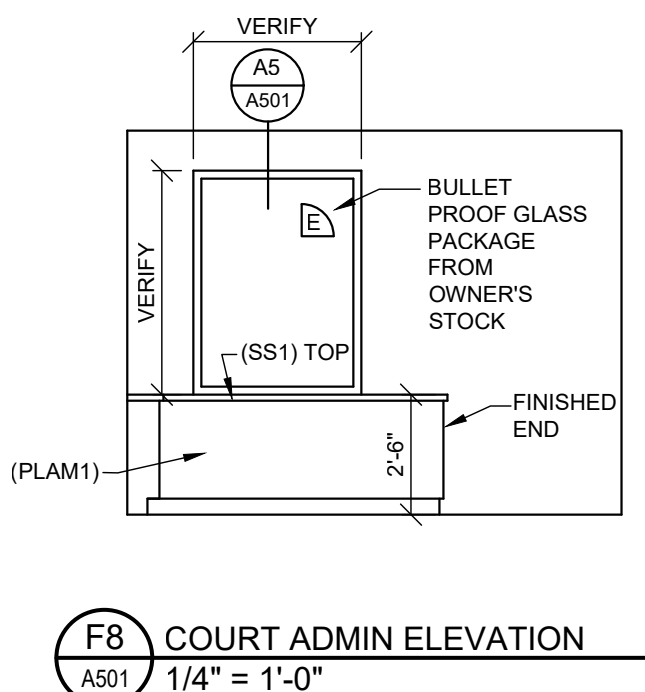
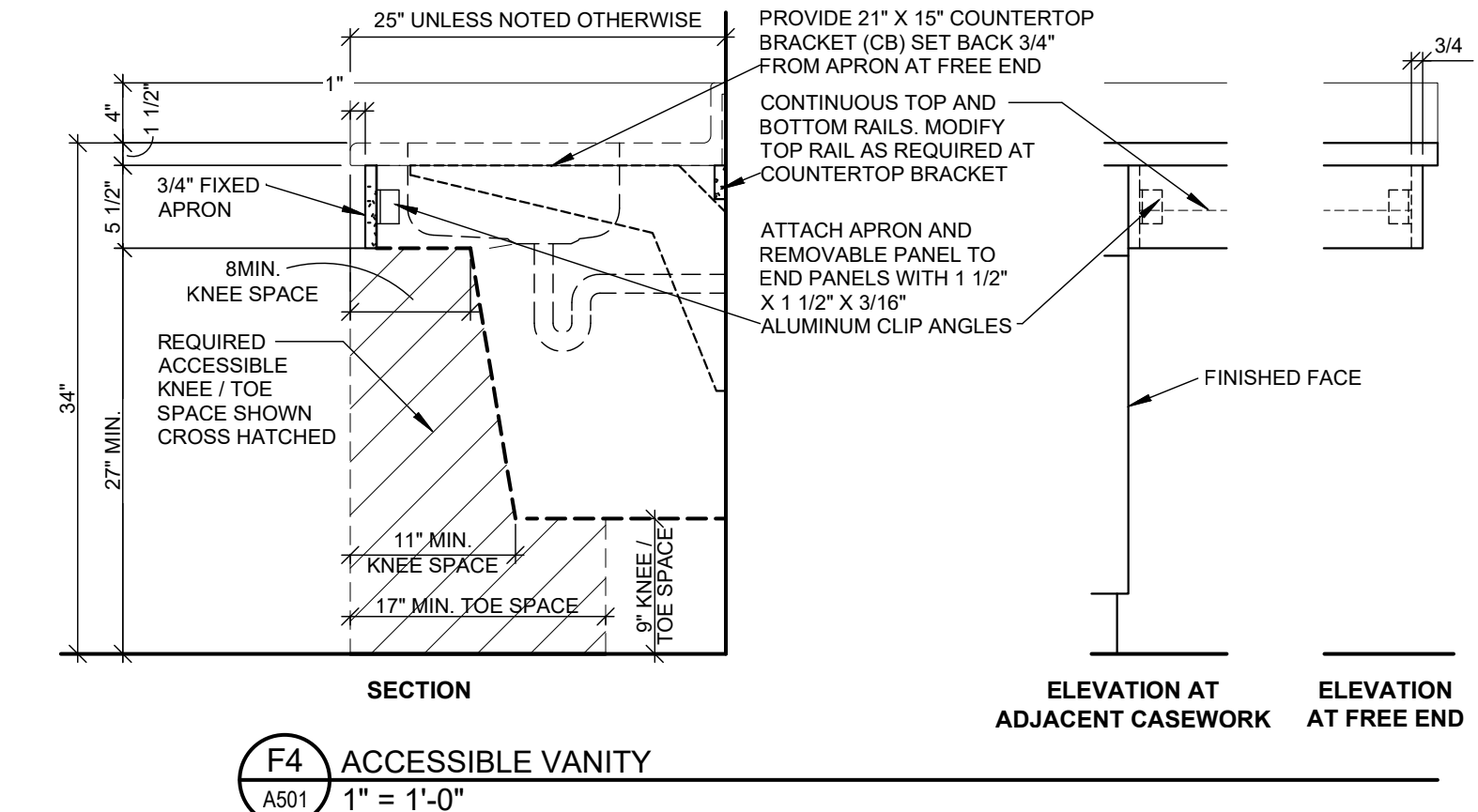
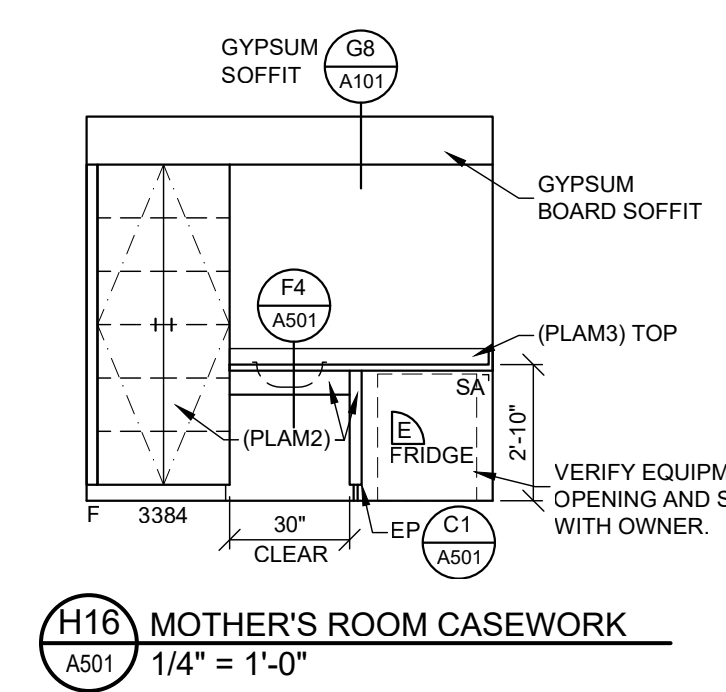
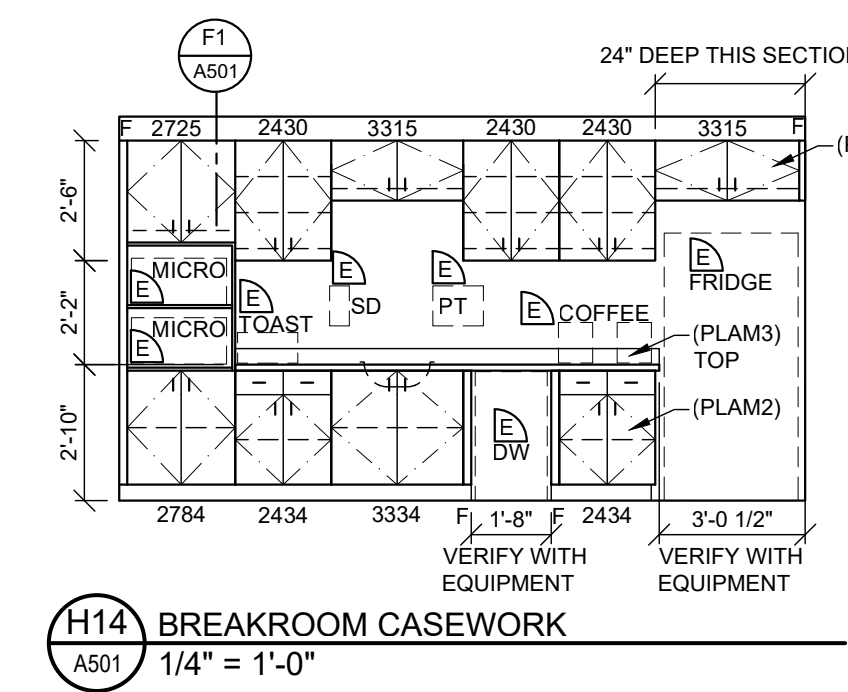
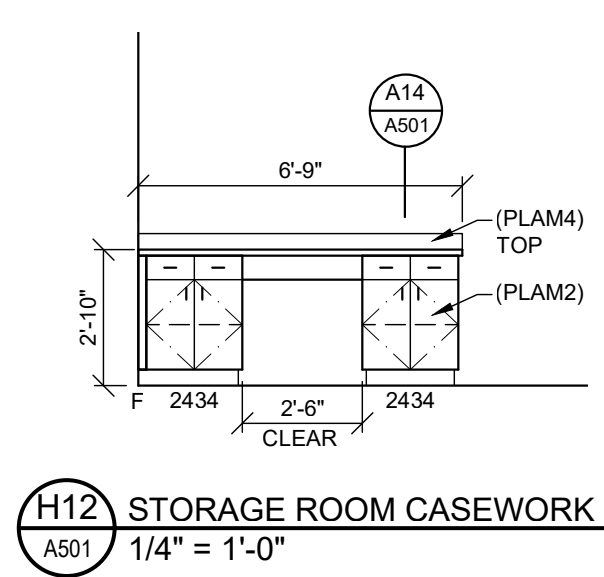
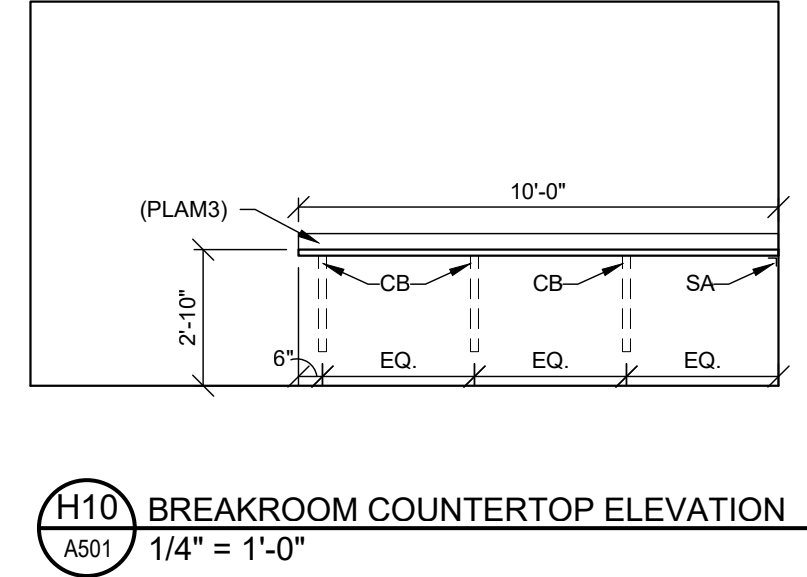
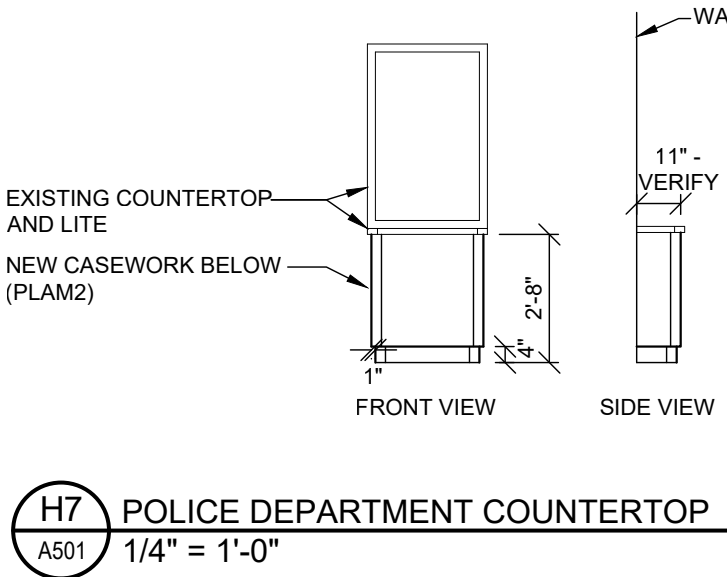
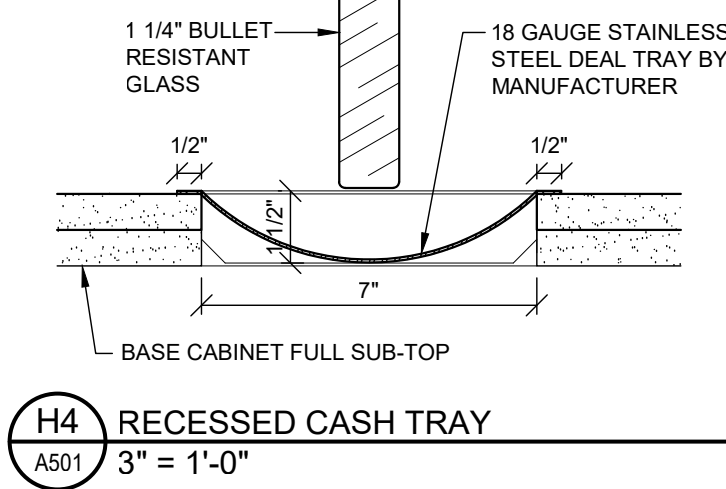
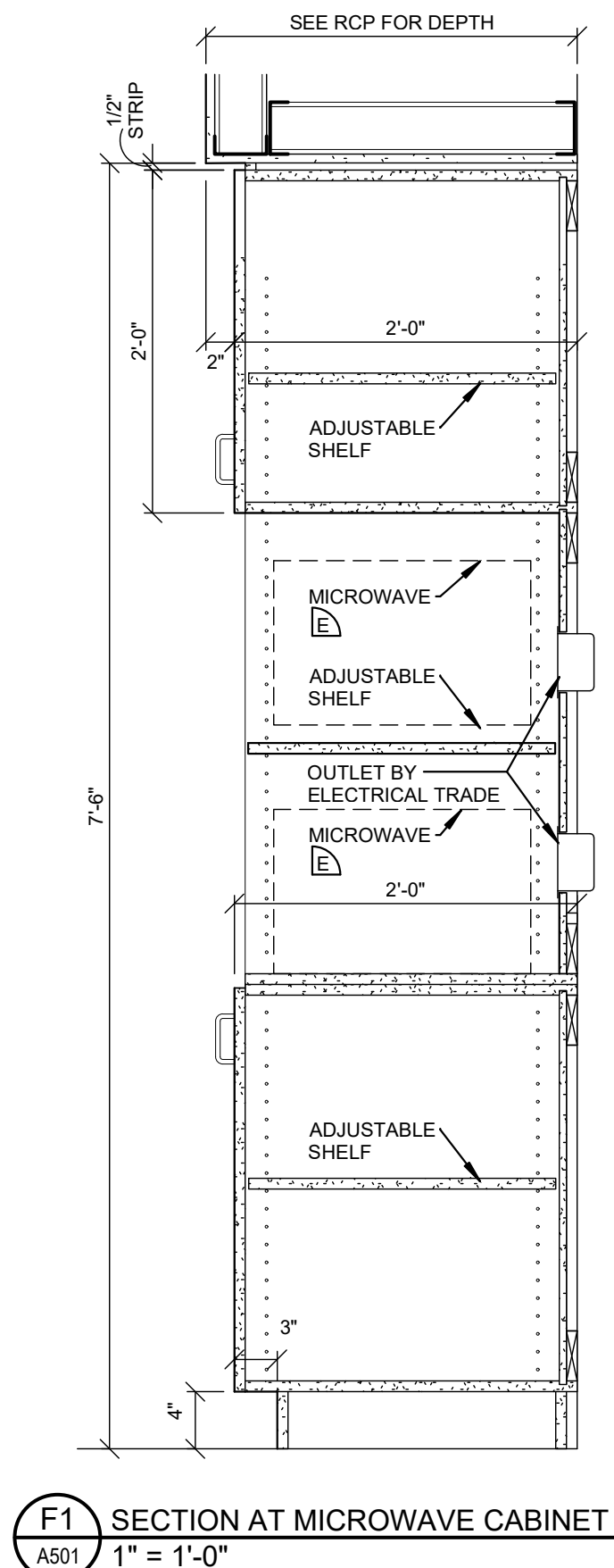
TYPE	WIDTH	WALL STRUCTURE	RATING/TEST	STC
S6F110	7 1/4"	6" METAL STUDS	N/A	N/A

A4 PARTITION SCHEDULE
A101 1 1/2" = 1'-0"

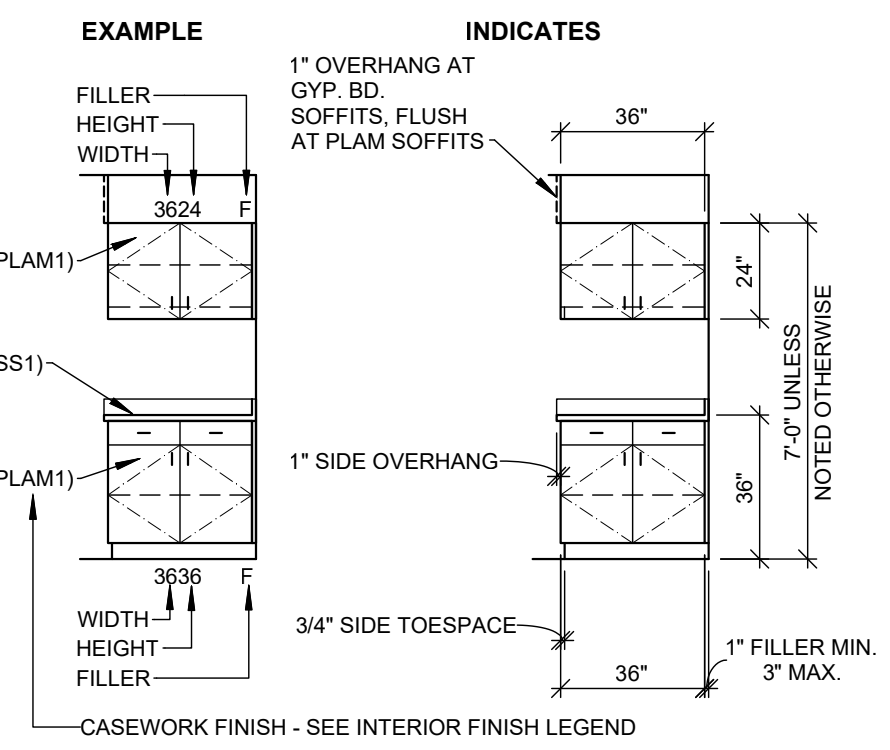
  **FIRST FLOOR NEW WORK PLAN**
A101 1/8" = 1' 0"



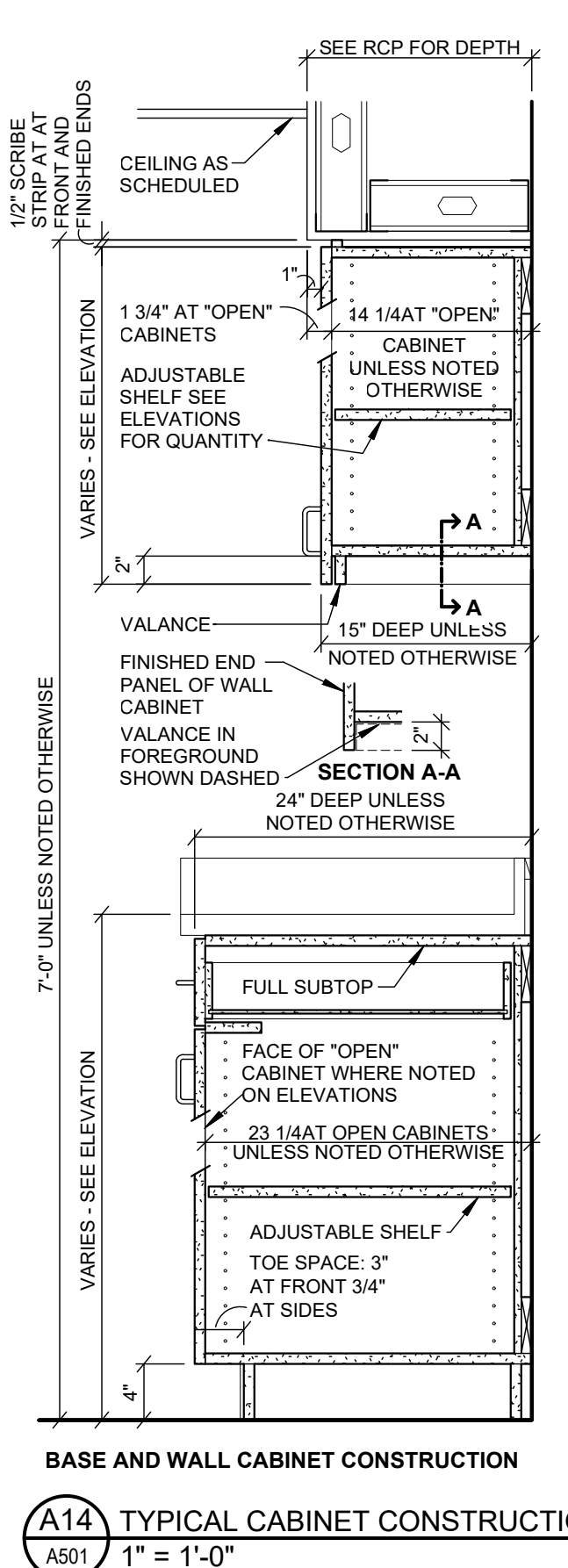
DOOR SCHEDULE																	
DOOR NUMBER	DOOR ELEVATION	DOOR MATERIAL	DOOR TYPE	WIDTH	DOOR HEIGHT	DOOR GLAZING	FRAME ELEVATION	FRAME MATERIAL	FRAME GLAZING	HEAD	JAMB	SILL	LABEL	HARDWARE	REMARKS		REVISION
1001	C	WOOD	SOLID	36	7'-0"	1/4" TEMPERED	-	-	-	-	-	-			FRAME TO REMAIN, REUSE DOOR HARDWARE		
1003	-	-	-	42	-	-	-	-	-	-	-	-			OWNERS STOCK		
1008A	A	WOOD	SOLID	42	7'-0"	-	HF-1	HOLLOW METAL	-	J1	J1	-			BULLET-PROOF DOOR. SEE GLASS PACKAGE		
1008B	-	-	-	72	-	-	-	-	-	-	-	-			BULLET-PROOF GLASS PACKAGE - BY OTHERS		
1008C	-	-	-	72	-	-	-	-	-	-	-	-			BULLET-PROOF GLASS PACKAGE - BY OTHERS		
1009	C	WOOD	SOLID	36	7'-0"	1/4" TEMPERED	-	-	-	-	-	-			FRAME TO REMAIN, REUSE DOOR HARDWARE		
1011A	C	WOOD	SOLID	36	7'-0"	1/4" TEMPERED	HF-1	HOLLOW METAL	-	J1	J1	-					
1011B	C	WOOD	SOLID	36	7'-0"	1/4" TEMPERED	HF-1	HOLLOW METAL	-	J1	J1	-					
1011C	C	WOOD	SOLID	36	7'-0"	1/4" TEMPERED	HF-1	HOLLOW METAL	-	J1	J1	-					
1013	C	WOOD	SOLID	36	7'-0"	1/4" TEMPERED	-	-	-	-	-	-			FRAME TO REMAIN, REUSE DOOR HARDWARE		
1014	C	WOOD	SOLID	36	7'-0"	1/4" TEMPERED	-	-	-	-	-	-			FRAME TO REMAIN, REUSE DOOR HARDWARE		
1016A	C	WOOD	SOLID	36	7'-0"	1/4" TEMPERED	HF-1	HOLLOW METAL	-	J1	J1	-					
1017	A	WOOD	SOLID	36	7'-0"	-	-	-	-	-	-	-					
1019	A	WOOD	SOLID	42	7'-0"	-	HF-1	HOLLOW METAL	-	J1	J1	-			FRAME TO REMAIN		



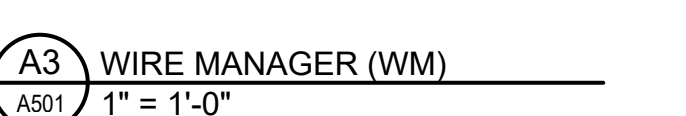
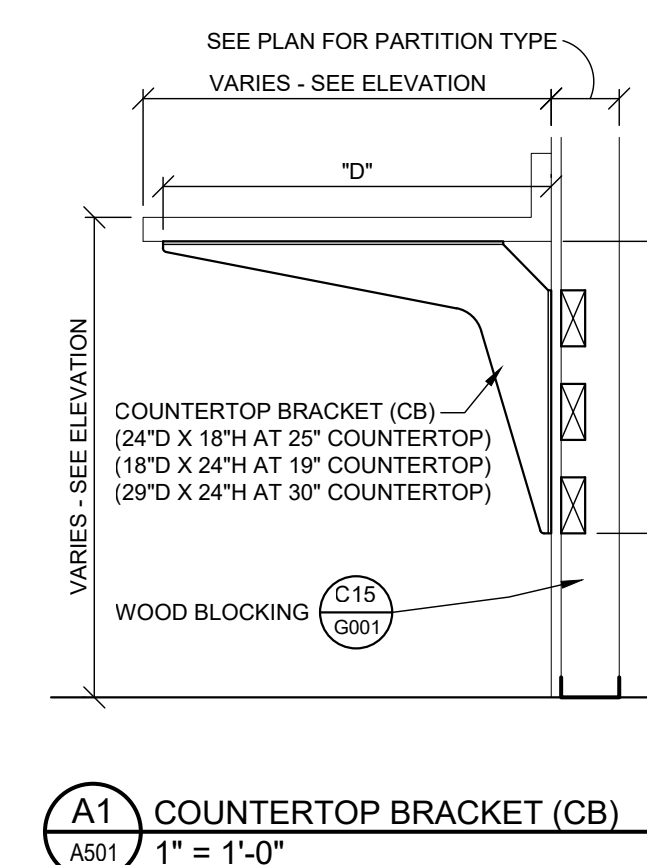
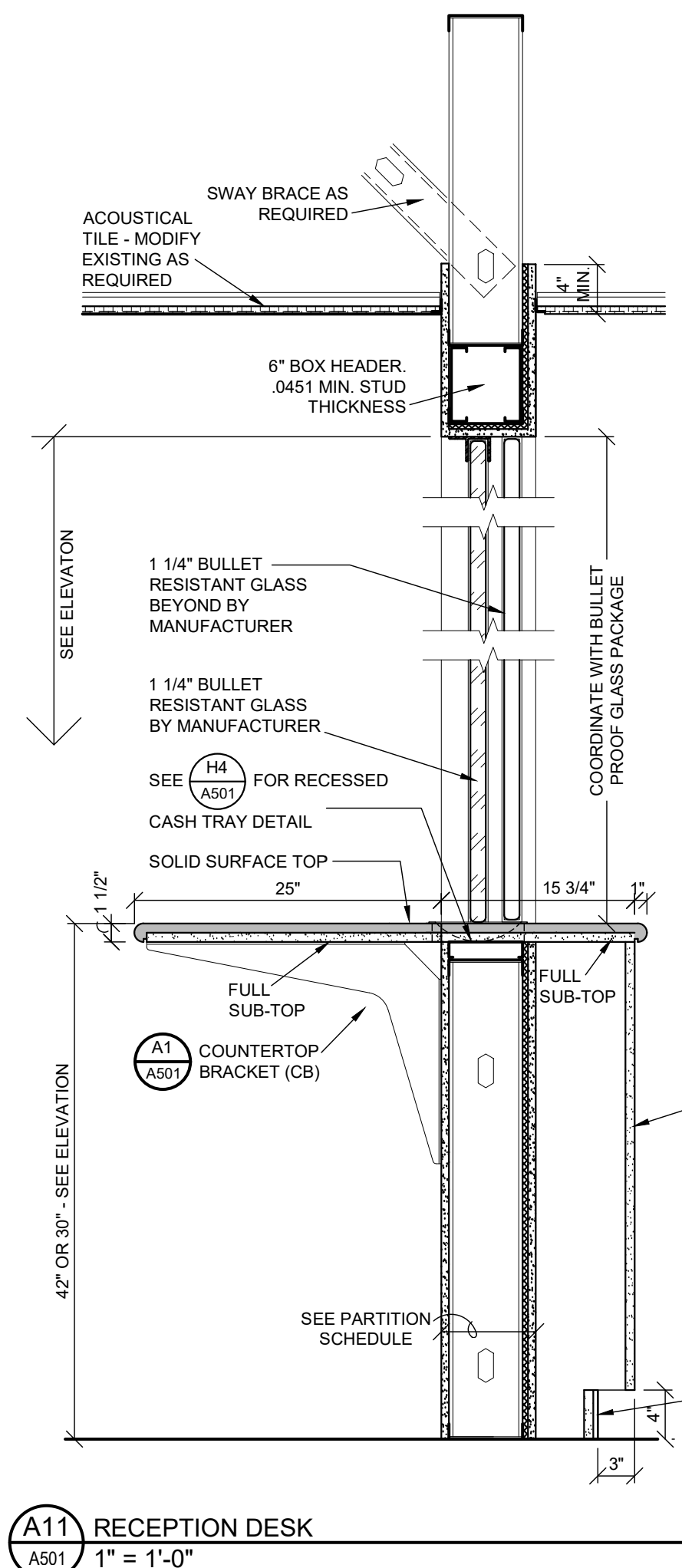
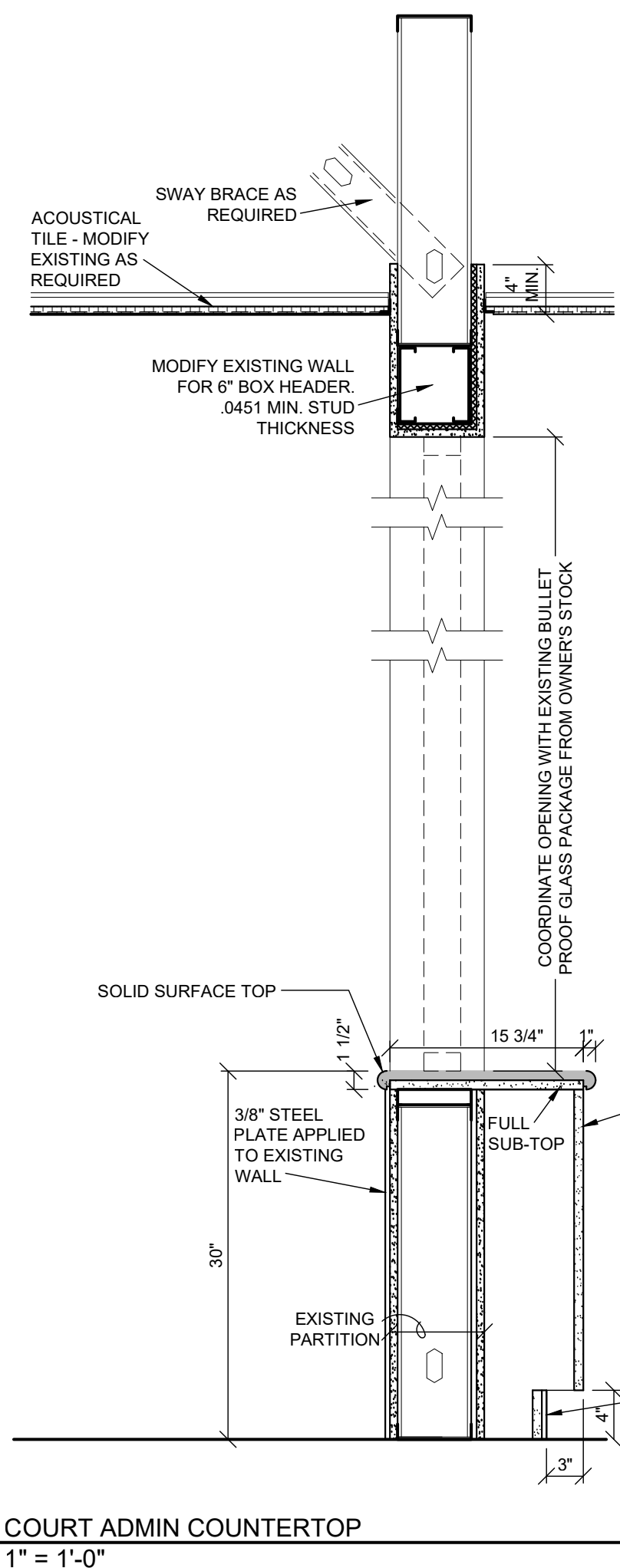
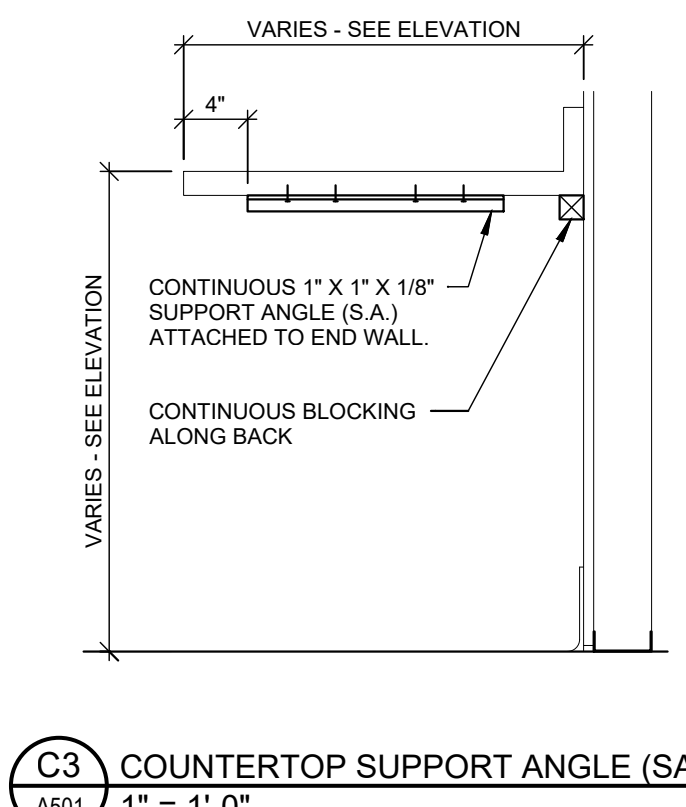
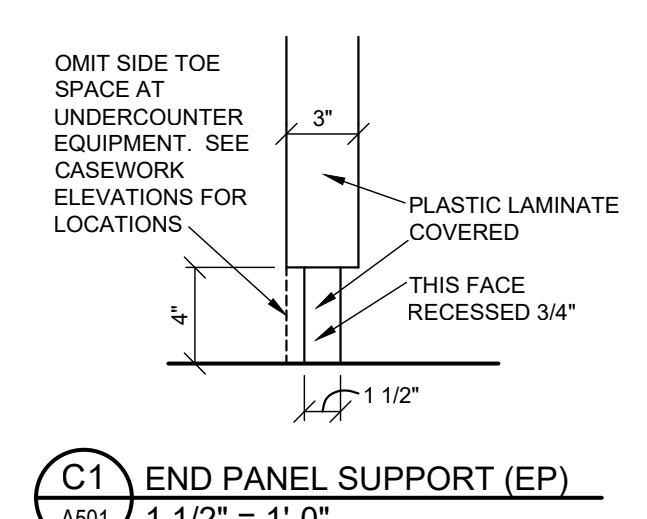
PLASTIC LAMINATE CASEWORK LEGEND



- GENERAL PLASTIC LAMINATE CASEWORK SYMBOLS:**
- CB COUNTERTOP BRACKET, SEE: A1 A501
 - EP END PANEL SUPPORT, SEE: C1 A501
 - G GROMMET TO BE LOCATED APPROXIMATELY 2" FROM BACK OF COUNTERTOPS
 - KS KNEE SPACE
 - SA SUPPORT ANGLE, SEE: C3 A501
 - WM WIRE MANAGEMENT SYSTEM, SEE: A3 A501
 - L CASEWORK LOCK
- FOR TYPICAL CABINET CONSTRUCTION, SEE: A11 A501
- STANDARD PLASTIC LAMINATE CASEWORK NOTES** (UNLESS NOTED OTHERWISE)
- LIGHTS AND OUTLETS BY ELECTRICAL TRADE
- FIELD VERIFY WALL TO WALL DIMENSIONS. COORDINATE DIMENSIONS PRIOR TO CABINET FABRICATION. HIGHLIGHT ANY ADJUSTMENTS MADE TO CABINETS ON SHOP DRAWINGS FOR APPROVAL.
- ALL DIMENSIONS GIVEN AT CASEWORK ELEVATIONS ARE IN INDIVIDUAL UNIT DIMENSIONS. NO VERTICAL DIVIDER PANELS SHALL OCCUR WITHIN ANY INDIVIDUAL CASEWORK UNITS LESS THAN 42"
- WHERE KNEES SPACES ARE SHOWN ON ELEVATIONS WITH GROMMETS ABOVE, PROVIDE WIRE MANAGEMENT SYSTEMS BELOW COUNTERTOP.
- WOOD TRIM SHALL BE SOLID WOOD. REFERENCE ARCHITECTURAL SPECIFICATIONS FOR QUALITY INFORMATION.
- CABINET BODIES SHALL BE FINISHED PER BELOW (AS DEFINED BY AWS EDITION 1):
- EXPOSED EXTERIOR - COLOR LISTED ON ELEVATIONS
 - EXPOSED INTERIOR - (INCLUDING WHERE CABINETS ARE DENOTED AS "OPEN" EXCLUDING TOE SPACES) - COLOR LISTED ON ELEVATIONS
 - SEM-EXPOSED - WHITE MELAMINE
 - CONCEALED - ONE COAT SEALER OR WHITE MELAMINE
- PROVIDE STAIN AND URETHANE SAMPLES ON ALL INDICATED SUBSTRATES WITH STAIN COLOR FOR ARCHITECTS APPROVAL PRIOR TO ANY WORK.
- COUNTERTOP BRACKET SHALL BE PAINTED TO MATCH ADJACENT CASEWORK COLOR OR WALL COLOR.
- SEE INTERIOR FINISH LEGEND FOR ADDITIONAL CASEWORK AND ACCESSORY FINISHES.
- ALL SINKS IN PLASTIC LAMINATE COUNTERTOPS BY PLUMBING TRADE



- GENERAL CASEWORK NOTES UNLESS NOTED OTHERWISE:**
- CABINETS SHALL BE FABRICATED WITH 3/4" MATERIAL, EXCEPT AS FOLLOWS:
 - SHELVES OVER 20" SHALL BE 1".
 - CABINET BACKS SHALL BE 1/2" OR 1/4" MDF DADOED INTO TOP, BOTTOM, AND SIDES
 - DRAWER SLIDES, BACK, SUBFRONT, AND BOTTOM SHALL BE 1/2"
 - DRAWER BOTTOMS SHALL BE 1/2" OR 1/4" MDF DADOED INTO SIDES AND BACK.
 - PROVIDE GYPSUM BOARD SOFFIT ABOVE ALL WALL/FULL HEIGHT CABINETS. SOFFIT SHALL BE CONSTRUCTED WITH 5/8" METAL STUDS WITH 5/8" GYPSUM BOARD.
 - VALANCE AT WALL CABINETS SHALL BE ACROSS FRONT OF CABINETS AND AT FINISHED ENDS ONLY. VALANCE AT FINISHED ENDS SHALL BE CONSTRUCTED AS PART OF FINISHED END PANEL OF WALL CABINET. DO NOT PROVIDE VALANCE BETWEEN EACH WALL CABINET.
 - BASE MATERIAL AT TOE SPACE SHALL BE AS LISTED IN NEW ROOM FINISH SCHEDULE.
 - ALL BASE CABINETS WITH SINKS SHALL BE FABRICATED USING MOISTURE RESISTANT PARTICLE BOARD.
 - BASE / FULL HEIGHT CABINETS WHICH OCCUR ON EITHER SIDE OF CABINETS CONTAINING SINKS SHALL BE FABRICATED USING MOISTURE RESISTANT PARTICLE BOARD.



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DE PERE

335 SOUTH BROADWAY, DE PERE, WI 54115

CITY HALL FIRST FLOOR
REMODEL

Sheet Title:

DETAILS AND SCHEDULES

Revisions:

No.	Date:	Description:
01	04/25/25	OWNER REVIEW SET
02	07/02/25	BID DOCUMENT SET

BID DOCUMENT SET

GRAPHIC SCALE

UNLESS NOTED OTHERWISE

PROJECT NUMBER

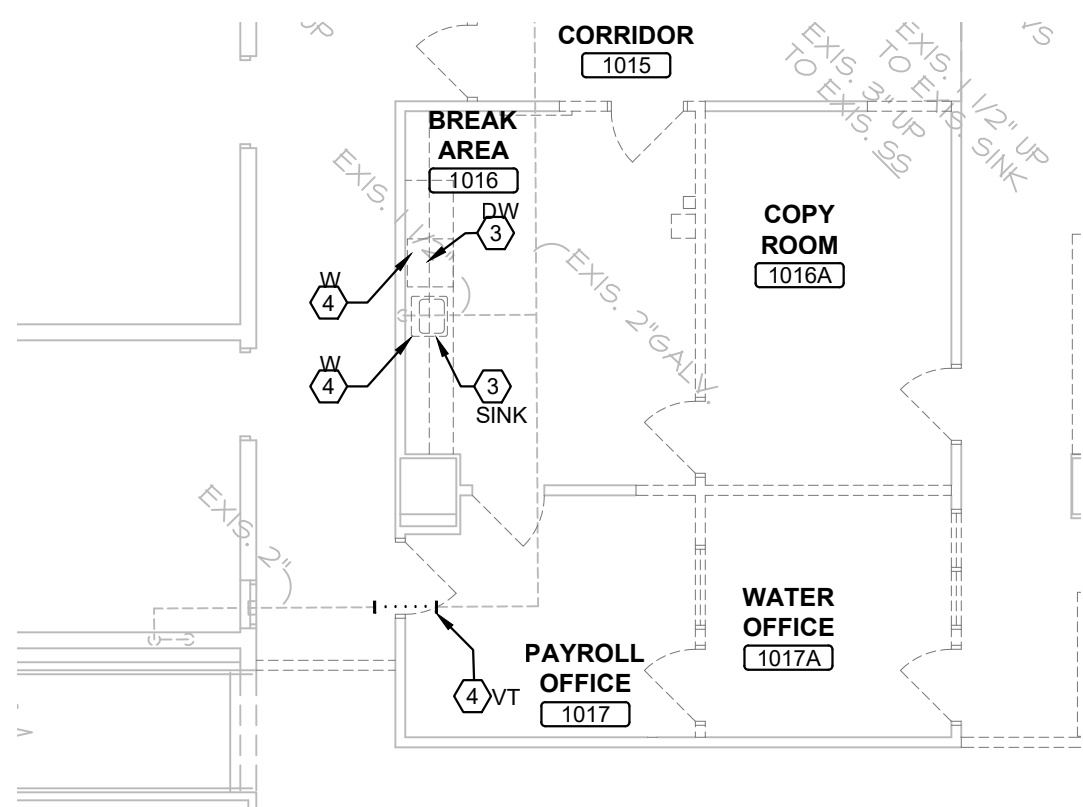
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DATE ISSUED

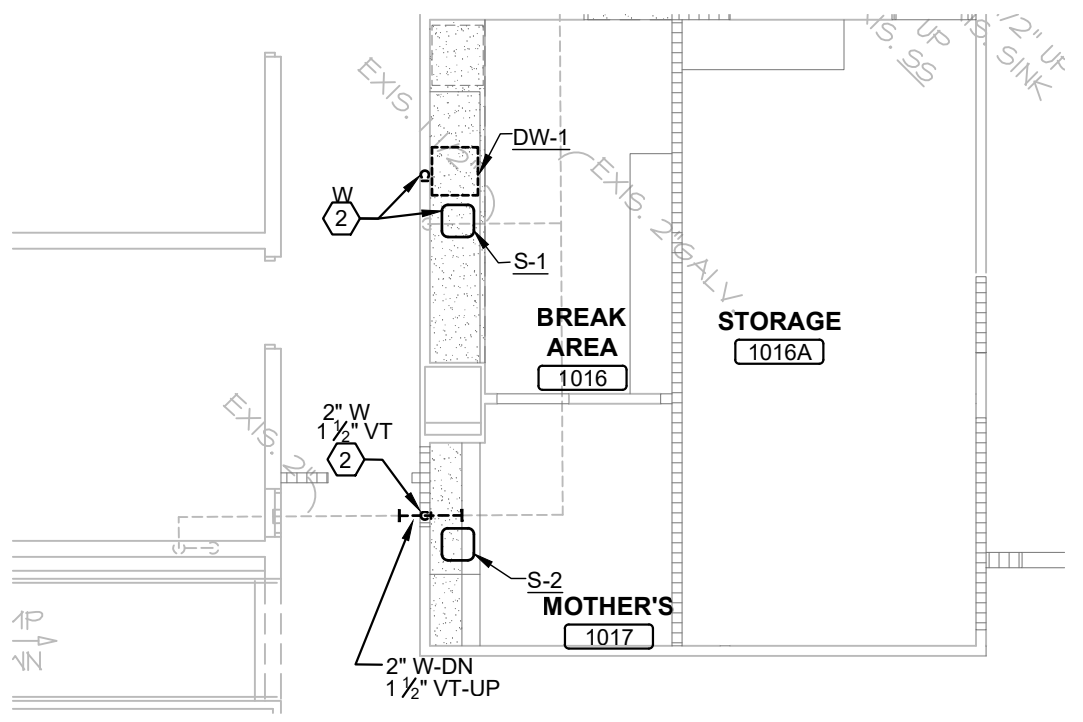
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SHEET NUMBER

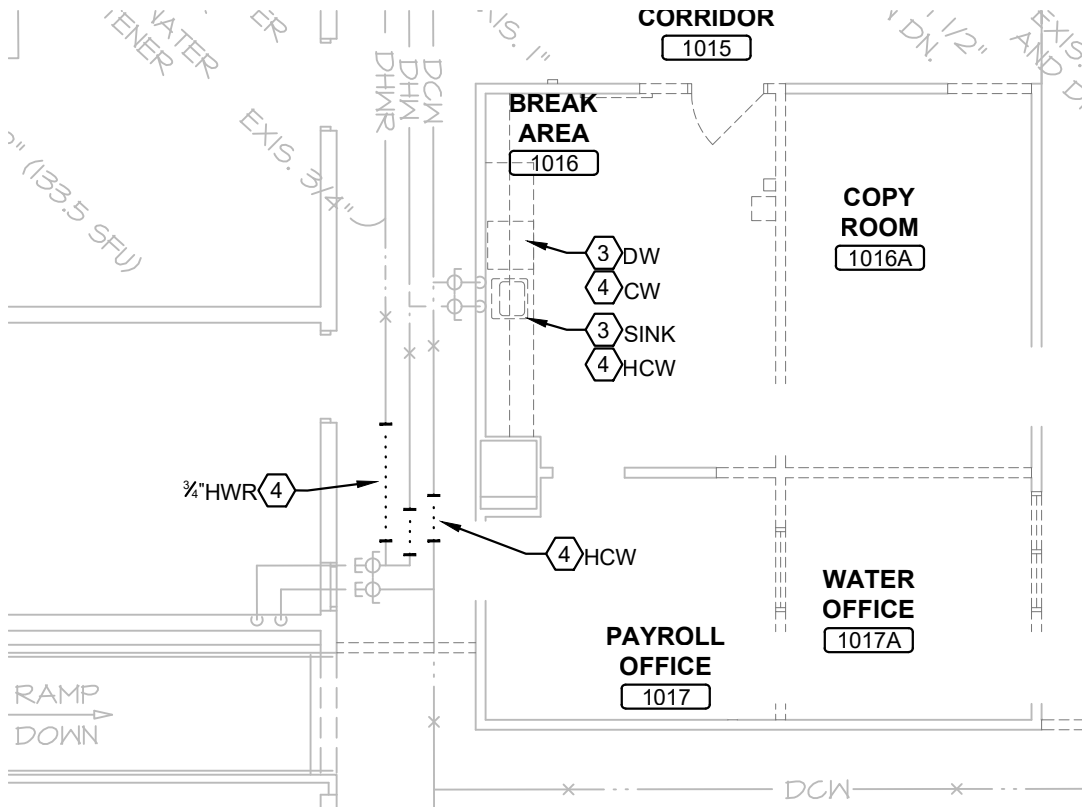
A501



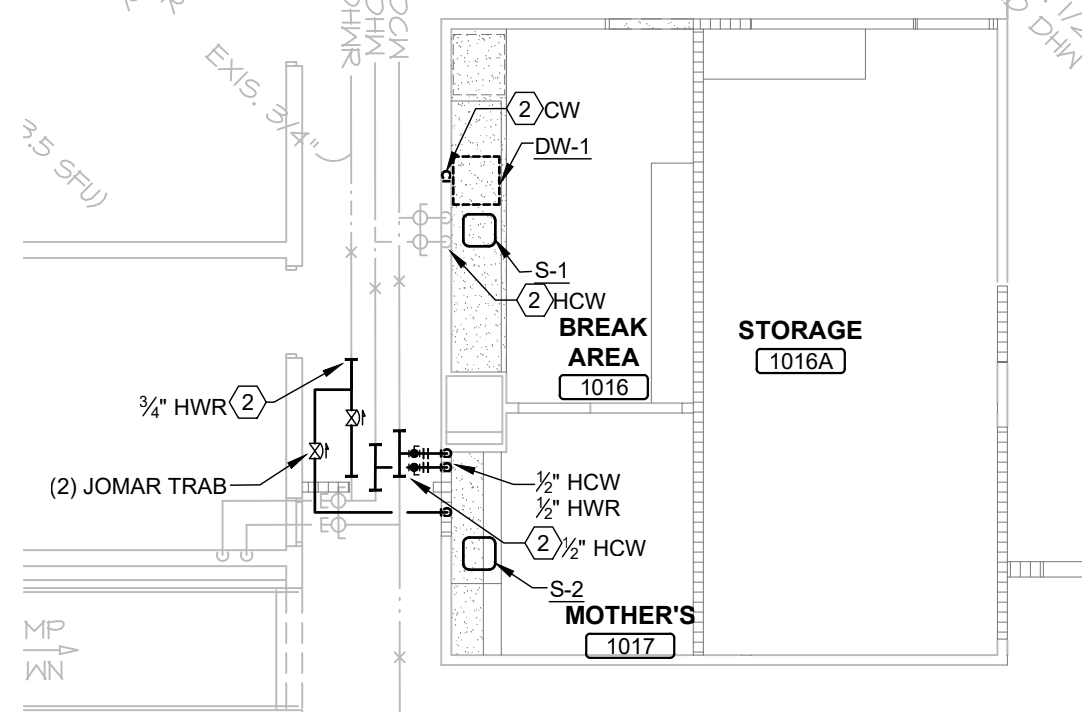
K2 FIRST FLOOR SANITARY AND VENT - DEMO
1/8" = 1'-0"



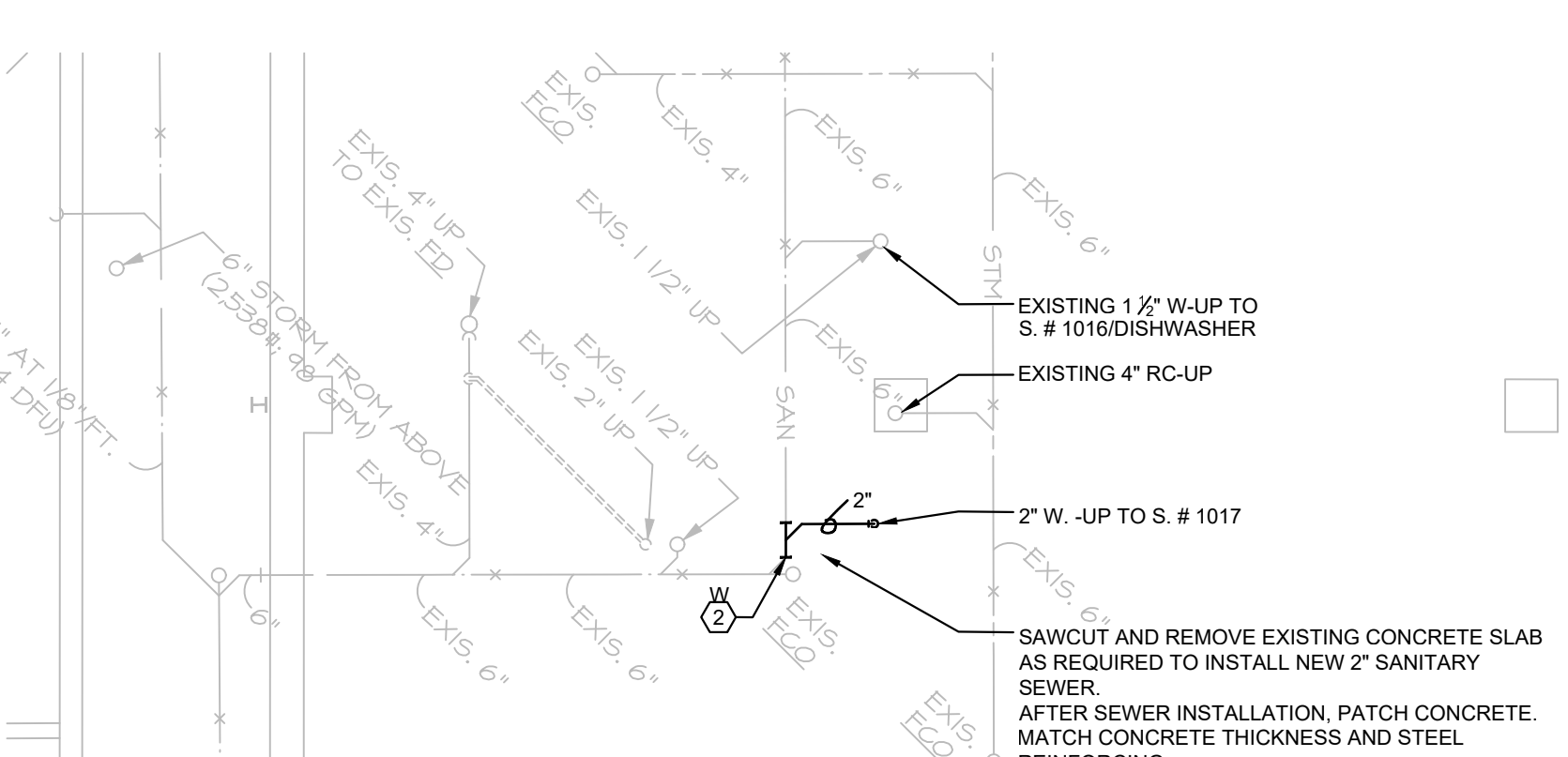
H2 FIRST FLOOR SANITARY AND VENT - NEW WORK
1/8" = 1'-0"



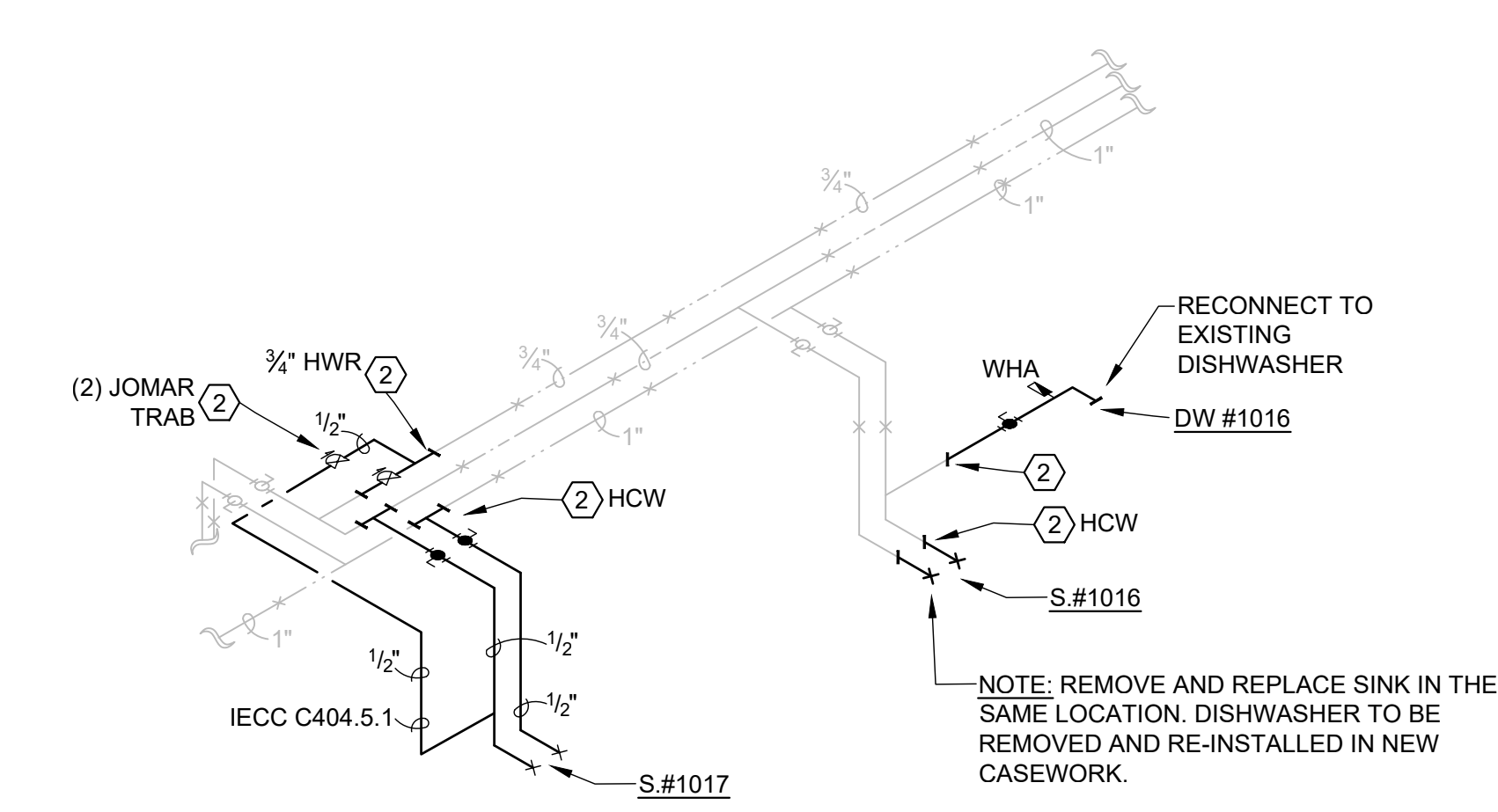
K6 FIRST FLOOR WATER - DEMO
1/8" = 1'-0"



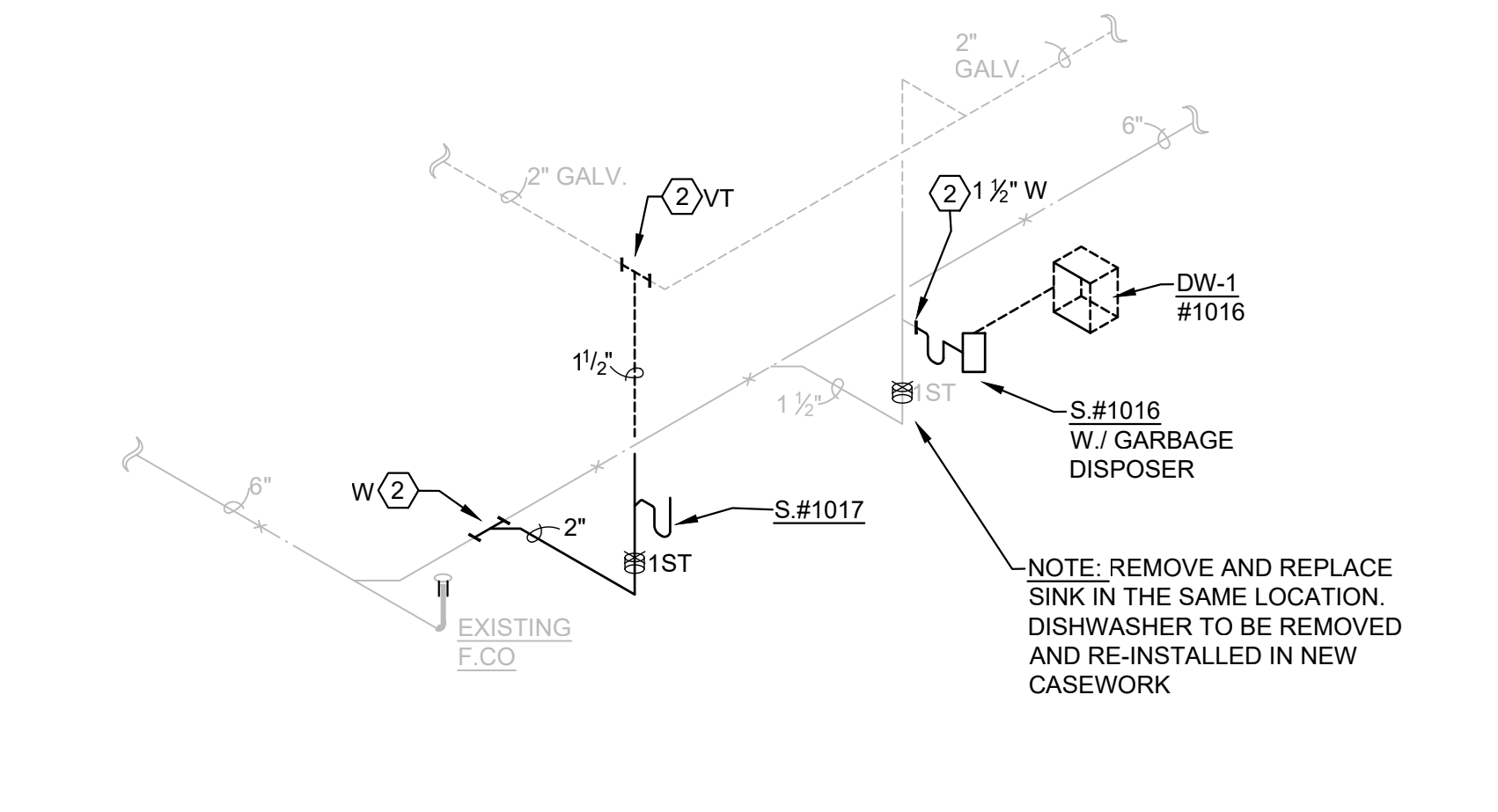
H6 FIRST FLOOR WATER - NEW WORK
1/8" = 1'-0"



K9 FOUNDATION PLAN SANITARY AND VENT - NEW WORK
1/8" = 1'-0"



F2 WATER ISOMETRIC
NO SCALE



F7 SANITARY ISOMETRIC
NO SCALE

PLAN KEYED NOTES

- PLUMBING FIXTURE OR EQUIPMENT TO REMAIN - NO CHANGE.
- MAKE NEW CONNECTION TO EXISTING PIPING.
- REMOVE PLUMBING FIXTURE OR EQUIPMENT. TEMPORARILY CAP SERVICE PIPING AT WALL.
- FUTURE POINT OF CONNECTION.

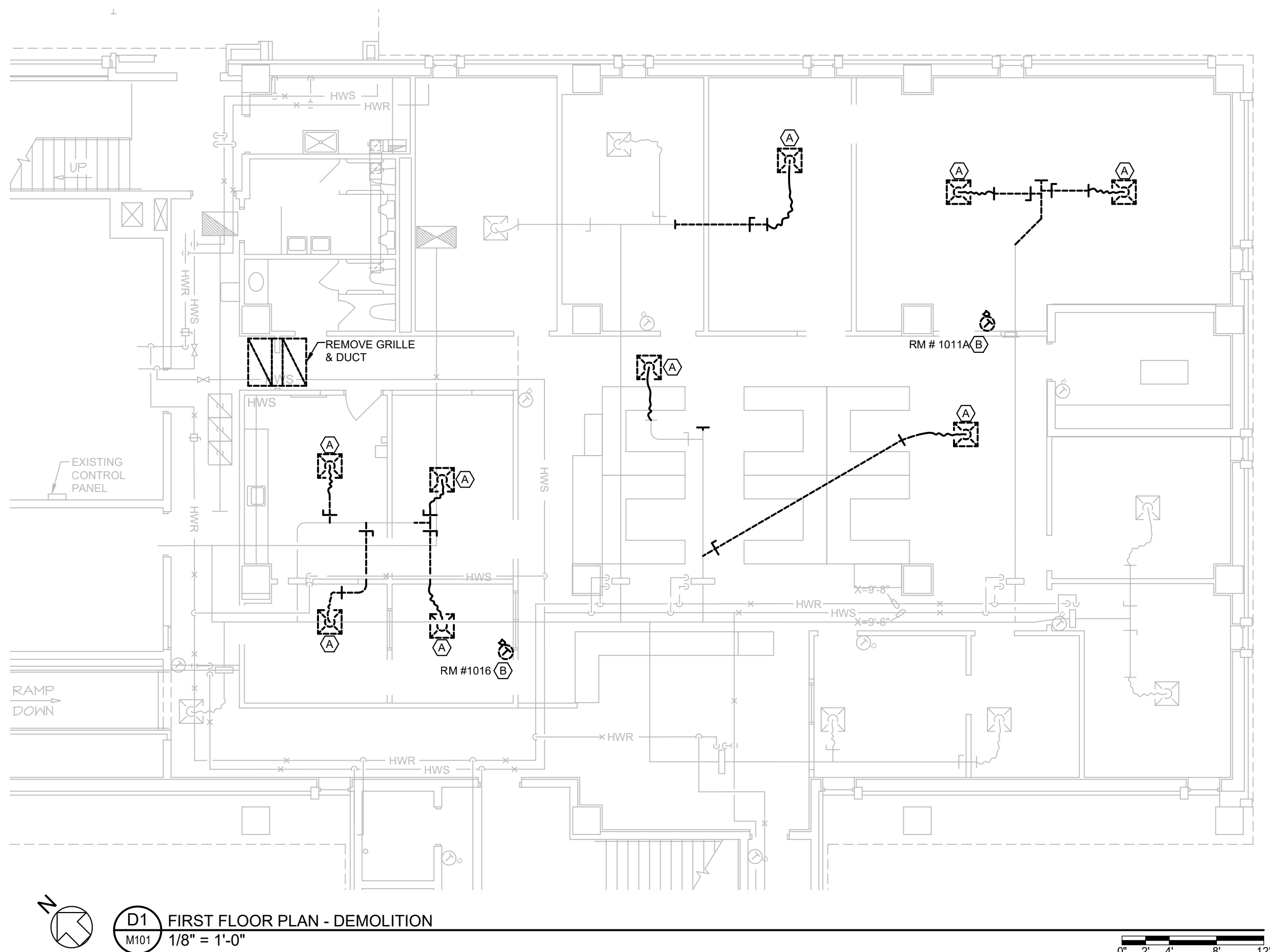
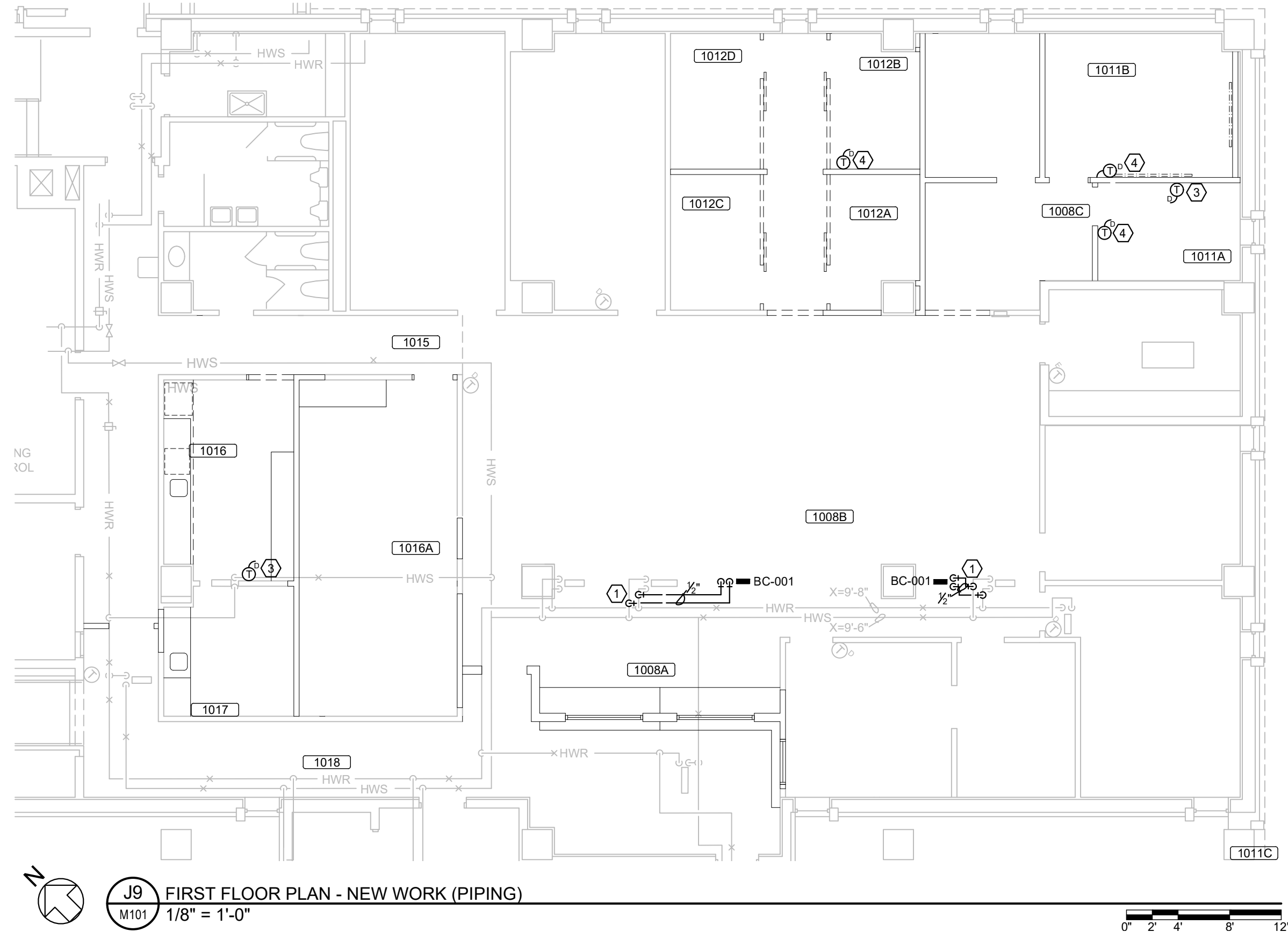
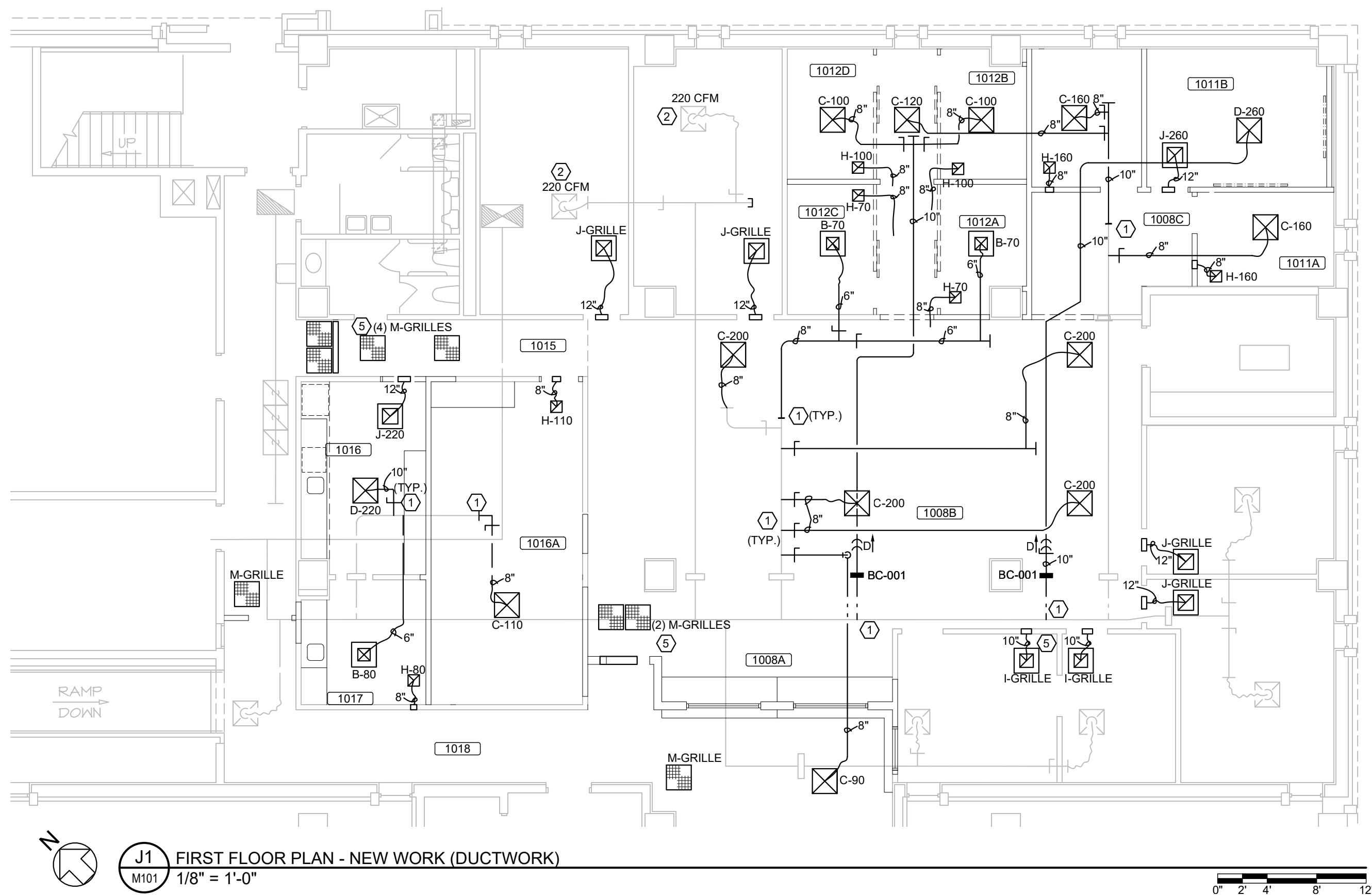
SYMBOLS/ ABBREVIATIONS

SYMBOL	DESCRIPTION
---	SANITARY PIPING - BELOW GROUND (BG) [SAN.]
---	SANITARY PIPING - ABOVE GROUND (AG) [SAN.]
---	SANITARY VENT PIPING - BELOW GROUND (BG) [VT.]
---	SANITARY VENT PIPING - ABOVE GROUND (AG) [VT.]
---	STORM AND CLEARWATER DRAINAGE PIPING - BELOW GROUND (BG) [ST.]
---	STORM AND CLEARWATER DRAINAGE PIPING - ABOVE GROUND (AG) [ST.]
---	STORM VENT PIPING - BELOW GROUND (BG) [ST.VT.]
---	STORM VENT PIPING - ABOVE GROUND (AG) [ST.VT.]
---	COLD WATER MAIN OR DISTRIBUTION PIPING - ABOVE GROUND (AG) [CW]
---	HOT WATER DISTRIBUTION PIPING (AG) [HW] (110°-120°F)
---	HOT WATER RECIRCULATION PIPING [HWR]
---	EXISTING PIPING TO BE REMOVED OR ABANDONED - SEE PLAN FOR NOTES
---	ARROW INDICATES DIRECTION OF FLOW IN DISTRIBUTION OR DRAINAGE PIPING
---	ANY OF THE ABOVE PIPING SYMBOLS INDICATED WITH "X" IMPLIES PIPING IS EXISTING. -SEE PLAN FOR NOTES.
---	SAME AS ABOVE - EXCEPT PIPING IS BELOW GROUND (BG)
---	SAME AS ABOVE - EXISTING VENT PIPING IS BELOW GROUND (BG)
---	CLEANOUT
---	DROP AT 45° - IN PIPING
---	GATE VALVE
---	CHECK VALVE
---	BALL VALVE
---	HOT WATER RETURN BALANCING VALVE ASSEMBLY
---	CIRCUIT SETTER
---	STRAINER
---	UNION
---	ROOM NUMBER
---	DETAIL OR DIAGRAM NUMBER
---	SHEET DETAIL OR DIAGRAM IS DRAWN ON
---	DRAINAGE FIXTURE UNIT TOTALS (DFU)
---	WATER SUPPLY FIXTURE UNIT TOTALS (WSFU)
---	FLOOR CLEANOUT
---	WATER HAMMER ARRESTOR
---	TYPICAL FIXTURE STOP
---	THERMOMETER
---	CORE DRILL
---	KEYED PLAN NOTE
---	EXISTING
---	ACCESS PANEL
---	CLEANOUT
---	DISHWASHER
---	ELECTRIC WATER COOLER
---	FLOOR CLEANOUT
---	FLOOR DRAIN (ALL FLOOR DRAINS TO HAVE REMOVABLE STRAINERS)
---	HOT AND COLD WATER
---	JANITORS CURB
---	LAVATORY
---	LOOP VENT
---	NO CHANGE
---	PLUMBING TRADE
---	ROOF CONDUCTOR
---	ROOF DRAIN
---	SANITARY SEWER
---	SOIL STACK
---	STORM OR CLEARWATER PIPING
---	STORM VENT
---	THRU ROOF
---	VENT
---	VENT STACK
---	WALL CLEANOUT
---	WASTE PIPING
---	WATER HAMMER ARRESTOR
---	WASTE STACK
---	WATERPROOF
---	WATER CLOSET
---	DISTANCE FROM FINISHED FLOOR TO C OF PIPE OR BOTTOM OF EQUIPMENT

No.	Date:	Description:
01	04/25/25	OWNER REVIEW SET
02	07/02/25	BID DOCUMENT SET

BID DOCUMENT SET

GRAPHIC SCALE	0' 2' 4' 8' 12'
PROJECT NUMBER	25CDEP01.00
DATE ISSUED	2 JULY, 2025
SHEET NUMBER	P101



ABBREVIATIONS SCHEDULE			
EQUIPMENT			
Abbreviation	Description		Abbreviation Description
FD	Fire Damper		MAU Make-up Air Unit
FF	Final Filter		OAI Outside Air Intake
GR	Grille or Diffuser		RF Return Fan
HC	Heating Coil		RG Return Grille
HD	Hood		SA Sound Attenuator
HP	Heat Pump		S- Supply Air Diffuser
HW	Hot Water		SF Supply Fan
HWHC	Hot Water Heating Coil		TCP Temperature Control Panel
HWC	Hot Water Coil		UC Unit Cooler
HWP	Heating Hot Water Pump		UH Unit Heater
HX	Heat Exchanger		V Vent
			VAV Variable Air Volume
UNITS OF MEASURE			
Abbreviation	Description		Abbreviation Description
BTU	British Thermal Unit		SEER Seasonal Energy Efficient Ratio
BTUH	British Thermal Unit per Hour		SQ FT Square Foot (Feet)
DEG	Degree		SQ M Square Meter
DIA	Diameter		TD Temperature Difference
F	Fahrenheit		TSP Total Static Pressure
MBH	1000 BTUH		W Watts
MBTU	1,000 British Thermal Units Per Hour		WG Water Gauge
SAT	Supply Air Temperature		WPD Water Side Pressure Drop
			YR Year
GENERAL			
Abbreviation	Description		Abbreviation Description
A/E	Architects/Engineers		GPM Gallons Per Minute
AFF	Above Finished Floor		GT General Trade
AHU	Air Handling Unit		NC No Change Required
AP	Access Panel in Wall or Ceiling		NG Natural Gas
APD	Air Pressure Drop		OA Outside Air
ASME	American Society Of Mechanical Engineers		OR Operating Room
AD	Access Door in Duct		PH Phase
BC	Booster Coil		PT Plumbing Trade
BDD	Backdraft Damper		PVC Polyvinyl Chloride
BF	Boiler Feed		R/E Return or Exhaust
CENT	Centrifugal		RA Return Air
CO ₂	Carbon Dioxide		RM Room
CW	Cold Water (Potable)		RO Reverse Osmosis
D	Down or Drain		SA Supply Air
DRGR	Door Grille		SS Stainless Steel
EA	Exhaust Air		TAO Transfer Air Opening
ET	Electrical Trade		TB Tight to Beam
F&T	Float and Thermostat Trap		TS Tip Speed
FLA	Full Load Amps		TYP Typical
FLEX	Flexible		TV Turning Vane
FPI	Fins Per Inch		UNO Unless Noted Otherwise
FRPS	Fire Rated Pipe Sleeve		VD Volume Damper
GPC	General Prime Contractor		WS Wall Sleeve

COIL NUMBER	ROOM	CFM	SIZE	FACE AREA	LEAVING AIR TEMP.	ENTERING AIR TEMP.	MBTU	GPM	REMARKS
BC-001	1008B	375	12x9	0.75	100	55	8.1	0.6	
NOTES (APPLIES TO ALL BOOSTER COILS)									
1. 1 FPS MINIMUM WATER VELOCITY.									
2. 500 FPM COIL AIR VELOCITY. (MAX)									
3. 2" AIR PRESSURE DROP. (MAX)									
4. ALL COILS SHALL BE 1 OR 2 ROW, 144 FINS PER FOOT, WITH 180°F EWT AND 25°F WATER TEMPERATURE DROP.									
5. CHECK ALL COILS AT 72°F DISCHARGE AIR WITH 120°F WATER.									
6. REFER TO DETAIL C4/M501P FOR COIL PIPING AND INSTALLATION.									
7. REFER TO PLAN FOR QUANTITY OF COILS.									

GRILLE SCHEDULE					
CEILING SUSPENSION DIFFUSER					
KEY	GRILLE SIZE	CFM	GR. DUCT CONNECTION	BRANCH/ FLEX DUCT SIZE	MISC.
A	12 X 12	0 - 100	6in.	6in.	
B	24 X 24	0 - 100	6in.	6in.	
C	24 X 24	100 - 250	8in.	8in.	
D	24 X 24	250 - 400	10in.	10in.	
E	24 X 24	400 - 600	12in.	12in.	
F	24 X 24	600 - 950	14in.	14in.	

CEILING EX/HTR/RET GRILLES					
KEY	GRILLE SIZE	CFM	GR. DUCT CONNECTION	BRANCH/ FLEX DUCT SIZE	FREE AREA
G	6 X 6	0 - 100	6in.	6in.	.17
H	8 X 8	100 - 180	8in.	8in.	.36
I	10 X 10	190 - 280	10in.	10in.	.48
J	12 X 12	280 - 450	12in.	12in.	.75
K	18 X 18	450 - 900	18 X 18	SEE PLAN	1.73
L	24 X 24	900 - 1700	22 X 22	SEE PLAN	3.15
M	24 X 24	0 - 1700	EGG CRATE	SEE PLAN	

GENERAL SYMBOLS

	HOT WATER SUPPLY (180°F)
	HOT WATER RETURN (155°F)
	DRAIN
	VENT
	HOT GAS (REFRIGERANT)
	ANY OF THE ABOVE PIPING SYMBOLS INDICATED WITH AN (X) IMPLIES PIPING IS EXISTING.
	ANY OF THE ABOVE PIPING SYMBOLS INDICATED AS DASHED SHALL BE REMOVED.
	CAP PIPING
	STEAM CONDENSATE TRAP
	TRIPLE DUTY VALVE
	EXPANSION VALVE
	BALANCE VALVE
	CHECK VALVE
	GATE OR GLOBE VALVE
	BALL VALVE
	SOLENOID VALVE
	BUTTERFLY VALVE
	C2 SENSOR AT FOUR FEET ABOVE FINISHED FLOOR UNLESS OTHERWISE NOTED.
	THERMOSTAT AT FOUR FEET ABOVE FINISHED FLOOR UNLESS OTHERWISE NOTED. (DIGITAL OR PNEUMATIC)
	SWITCH AT FOUR FEET ABOVE FINISHED FLOOR UNLESS OTHERWISE NOTED.
	HUMIDITY SENSOR AT FOUR FEET ABOVE FINISHED FLOOR UNLESS OTHERWISE NOTED.
	ELEVATION - DISTANCE FROM CENTERLINE OF PIPE, OR BOTTOM OF DUCT OR EQUIPMENT FROM DATUM.
	DISTANCE FROM FINISHED FLOOR TO CENTERLINE OF PIPE, OR BOTTOM OF DUCT OR EQUIPMENT.
	RISE OR DROP IN DUCT (AS NOTED)
	INTERNAL DUCT INSULATION
	EXTERNAL DUCT INSULATION
	CAP DUCTWORK - SEAL ALL JOINTS
	CONTROL OR BACKDRIFT DAMPER

- ### PLAN KEYED NOTES (NEW WORK)

- ① NEW CONNECTION TO EXISTING PIPING AND/OR DUCTWORK.
- ② BALANCE GRILLE OR BRANCH DAMPER TO CFM INDICATED.
- ③ RELOCATED THERMOSTAT. REROUTE LOW VOLTAGE WIRING AND EXTEND TO EXISTING REHEAT VALVE.
- ④ NEW THERMOSTAT. EXISTING CONTROL SYSTEMS ARE LOW VOLTAGE DDC. EXTEND POWER FROM EXISTING SYSTEM.
- ⑤ PROVIDE 36x24 TRANSFER DUCT OPENING, ABOVE CEILING.

4. EXISTING LIGHT FIXTURE(S) AND LIGHT SWITCHES(S) SHOWN ON A LIGHT LINE WEIGHT TO REMAIN IN SERVICE.
5. EXISTING POWER DEVICE(S)/CONNECTION(S) SUCH AS RECEPTACLE(S) PUSH BUTTONS, BLACK BOXES, SPKS AND MOTORS SHOWN ON A LIGHT LINE WEIGHT TO REMAIN IN SERVICE.
6. DEVICES SHOWN ON NEW CASEWORK AT 10W HEIGHT ARE INTENDED TO BE KEPT WITHIN THE 10W SPACE OF THE NEW CASEWORK. COORDINATE WITH CASEWORK SUPPLIER/INSTALLER. REFERENCE THE ARCHITECTURAL CASEWORK DETAILS ON SHEET AS01.

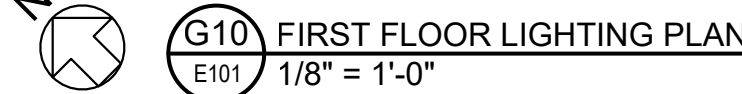
AT ALL TV LOCATIONS, EC SHALL COORDINATE WITH GC AND OWNER TO DETERMINE THE LOCATION OF THE TV. THE TV SHALL BE MOUNTED TO THE WALL. THE INTENT IS THE DEVICE SHALL BE LOCATED BEHIND THE TV, SIZE SELECTED BY OWNER, AND AVOID CONFLICTS WITH MOUNTING BRACKET/INSTALLED BY OWNER.

5. THE USE OF "X" TO "0" INDICATES THE DISTANCE FROM FINISHED FLOOR (AFF) TO THE BOTTOM OF ELECTRICAL EQUIPMENT.
6. EXISTING LOW VOLTAGE DEVICE(S) SUCH AS VOICE DATA OUTLET(S), DATA VOICES, AND DATA DEVICES(S) SHOWN ON A LIGHT LINE WEIGHT TO REMAIN IN SERVICE.
7. PROVIDE DATA DROP AT LOCATION FOR ALL WIRELESS ACCESS POINT(S) SHOWN ON THE FLOOR PLAN. PROVIDE 15FT. OF COILED CABLE ABOVE FINISHED CEILING.
8. ALL EXPOSED CABLE ABOVE CEILING SHALL BE PENULM RATED.

- ① EXISTING EXISTING CIRCUIT SALVAGED FROM DEMOLITION TO FEED NEW FUTURE(S). PROVIDE CONDUIT AND WIRING AS REQUIRED.
- ② EXISTING EXISTING EMERGENCY LIFE SAFETY POWER EGRESS LIGHTING CIRCUIT SALVAGED FROM DEMOLITION TO FEED NEW/RELOCATED FUTURE(S). PROVIDE CONDUIT AND WIRING AS REQUIRED.
- ③ CUT NEW BACK BOX INTO EXISTING WALL. FISH WALL CAVITY WITH FLEXIBLE CONDUIT TO FEED NEW RECEPTACLE/DATA OUTLET(S)/SWITCHES.
- ④ EXISTING EXISTING CIRCUIT SALVAGED FROM DEMOLITION TO FEED NEW DEVICE(S). PROVIDE CONDUIT AND WIRING AS REQUIRED.
- ⑤ EXISTING EXISTING SPARE 20A/1P BREAKER IN PANEL INDICATED TO FEED NEW RECEPTACLE(S).
- ⑥ EXTEND EXISTING POWER CIRCUIT TO FEED NEW/RELOCATED POWER POINT. PROVIDE CONDUIT AND WIRING AS REQUIRED. PROVIDE EIGHT (8) EA DATA DROPS PER POWER POLE - TWO (2) EA PER WORKSTATION.
- ⑦ REINSTALL EXISTING DEVICE(S) SALVAGED FROM DEMOLITION. MAINTAIN MINIMUM CLEARANCE OF 3'-6" FROM DIFFUSERS. PROVIDE CONDUIT AND WIRING AS REQUIRED.
- ⑧ PROVIDE A NEW SIMPLEX FIRE ALARM HEAT DETECTOR. CONDUIT, WIRING AND PROGRAMING AS REQUIRED. EXISTING F.A.C.P. IS LOCATED IN BASEMENT ROOM 0400.
- ⑨ EXISTING DATA POLE TO BE UTILIZED TO TERMINATE ALL NEW DATA OUTLET(S)/DROPS(S). EC TO PROVIDE ALL NECESSARY PATCH PANELS, PATCH CORDS, JACKS, PATCHPLATE, TERMINATIONS, ETC. FOR A FULLY FUNCTIONAL AND COMPLETE INSTALL.
- ⑩ EXISTING EXISTING SPARE BREAKER ON SQUARE D PANEL FOR ALL NEW LOADS.
- ⑪ EXTEND EXISTING LIGHTING CIRCUIT TO FEED NEW OR RELOCATED LIGHT FUTURE(S). PROVIDE CONDUIT AND WIRING AS REQUIRED.
- ⑫ EXISTING EXISTING EMERGENCY LIFE SAFETY POWER EGRESS LIGHTING CIRCUIT IN THE AREA TO FEED NEW/RELOCATED FUTURE(S). PROVIDE CONDUIT AND WIRING AS REQUIRED.
- ⑬ PLENUM RATED ACCESS CONTROL COMPOSITE CABLE TO ACCESS CONTROL BASED ON THE PROJECT REQUIREMENTS TO PROVIDE ALL NECESSARY J-hooks AND TERMINATIONS FOR A FULLY FUNCTIONAL AND COMPLETE INSTALL.
- ⑭ INSTALL TO PROVIDE ADDITIONAL SWITCH LOCATION FOR AREA SERVED.
- ⑮ NEW FIRE ALARM DEVICES TO MATCH EXISTING DEVICES IN BUILDING.

1. ALL ELECTRICAL EQUIPMENT/FIXTURES AND DEVICES SHOWN BOLD AND DASHED ON THE DEMOLITION PLAN ARE INTENDED TO BE REMOVED. ALL WIRING AND REMAINING ELECTRICAL ITEMS NOTED ON THE ELECTRICAL ITEMS REMOVED AND NOT RELIATED REMAIN THE PROPERTY OF THE OWNER. THE OWNER SHALL BE RESPONSIBLE FOR THE DISPOSAL OF ANY MATERIAL THE OWNER DOES NOT WANT TO REUSE OR RETAIN.
2. THE DRAWINGS ARE INTENDED TO INDICATE THE SCOPE OF WORK TO BE COMPLETED. THE CONTRACTOR SHALL VERIFY THE WORK THAT MUST BE REMOVED. THE CONTRACTOR SHALL VISIT THE SITE TO DETERMINE THE SCOPE OF DEMOLITION NECESSARY TO COMPLY WITH THE ELECTRICAL WORK. REFER TO SPECS FOR ADDITIONAL REQUIREMENTS.
3. GO SHALL REMOVE AND REPLACE ALL CEILING TILES AS REQUIRED TO REPAIR DAMAGE TO EXISTING SLAB. ALL ITEMS OF CONSTRUCTION DAMAGED TILES SHALL BE REPLACED BY THE GC WITH IDENTICAL MATERIAL.
4. EC TO RE-SUPPORT EXISTING CONDUITS TO REMAIN PER N.E.C. AS REQUIRED. RE-SPINNING OF EXISTING SLAB. RE-SPINNING CABLES TO REMAIN PER TIA/EIA STANDARDS AS REQUIRED.
5. DISCONNECT AND REMOVE ANY BOXES, CONDUIT, OR RACEWAY DETERMINED TO BE ABANDONED THAT IS EXPOSED BY DEMOLITION.
6. WHERE CONDUIT RUN IS EXPOSED, ALL ASSOCIATED SUPPORTS, HANGERS, CLAMPS, ETC. SHALL ALSO BE REMOVED. WHERE CONDUIT RUN IS IN CONCRETE, THE CONTRACTOR SHALL REMOVE BY CORE CUT, PULL OUT WIRE AND PILE THE OPENING AS REQUIRED BY FIRE CODE.
7. WHERE ELECTRICAL DEVICES (I.E. LIGHTS, RECEPTILES, SWITCHES, ETC.) ARE BEING REMOVED; ALL ASSOCIATED WIRE AND CONDUIT TO THE PANELBOARD OR FERRER JUNCTION BOX SHALL BE REMOVED. ALL REMAINING ELECTRICAL DEVICES TO REMAIN, CONDUIT IS ALLOWED TO REMAIN IN WALL WHEN NOT CONFLICTING WITH NEW DEVICES; SLAB SHALL BE REMOVED TO MOVE CEILING BACK TO FLOOR BOARD.

- A** DISCONNECT AND REMOVE EXISTING LIGHT FIXTURE(S). SALVAGE EXISTING CIRCUIT(S) FOR REUSE. REFERENCE THE LIGHTING PLAN.
- B** DISCONNECT/REMOVE AND SALVAGE EXISTING LIGHT FIXTURE(S) AND CIRCUIT FOR REUSE. REFERENCE THE LIGHTING PLAN.
- C** DISCONNECT AND REMOVE EXISTING DEVICE(S). SALVAGE EXISTING CIRCUIT(S) FOR REUSE. REFERENCE THE LIGHTING AND POWER/SYSTEMS PLANS.
- D** DISCONNECT/REMOVE AND SALVAGE EXISTING FIRE ALARM DEVICE(S) FOR REUSE. SALVAGE EXISTING CONDUIT AND WIRING FOR EXTENSION TO NEW LOCATION. REFERENCE THE POWER/SYSTEMS PLAN.
- E** DISCONNECT/REMOVE AND SALVAGE EXISTING POWER POLE(S) FOR REUSE. SALVAGE EXISTING CIRCUIT(S), CONDUIT AND WIRING FOR REUSE. REFERENCE THE POWER/SYSTEMS PLAN.
- F** EXISTING PANEL TO REMAIN.





1. EC TO PROVIDE 3/4" CONDUIT FROM DOOR FRAME TO CEILING SPACE OF SECURED SIDE OF DOOR. EC TO PROVIDE LOW VOLTAGE WIRING AS REQUIRED.
2. MANUFACTURER TO PROVIDE ALL DEVICES NECESSARY FOR A COMPLETE INSTALLATION. REFERENCE SPECIFICATION 08 71 00.
3. EC TO COORDINATE ELECTRICAL REQUIREMENTS WITH DOOR HARDWARE SUPPLIER.
4. EXISTING SYSTEM IS I STAR ULTRA. REFERENCE SPECIFICATIONS 28 13 00 ACCESS CONTROL SYSTEM FOR MORE INFORMATION.



NOTES:

- (a) SEE DEVICE HEIGHT LEGEND FOR MOUNTING HEIGHT.
- (b) FURNISHED WITH DOOR HARDWARE.
- (c) DEVICES ON EGRESS SIDE OF DOOR.
- (d) PLENUM RATED COMPOSITE CABLE.

4. PROVIDE MOUNTING ACCESSORIES APPROPRIATE FOR EACH INSTALLATION. MOUNT EXIT SIGN CENTERED WITHIN 24" ABOVE THE DOOR FRAME

1. EXTEND EXISTING CONDUIT AND CONDUCTORS TO NEW LOCATION.

NOTE:

- * THIS COMPRISES A COMPLETE LIST OF ITEMS. NOT ALL ABBREVIATIONS MAY NECESSARILY BE REPRESENTED ON THIS PROJECT.

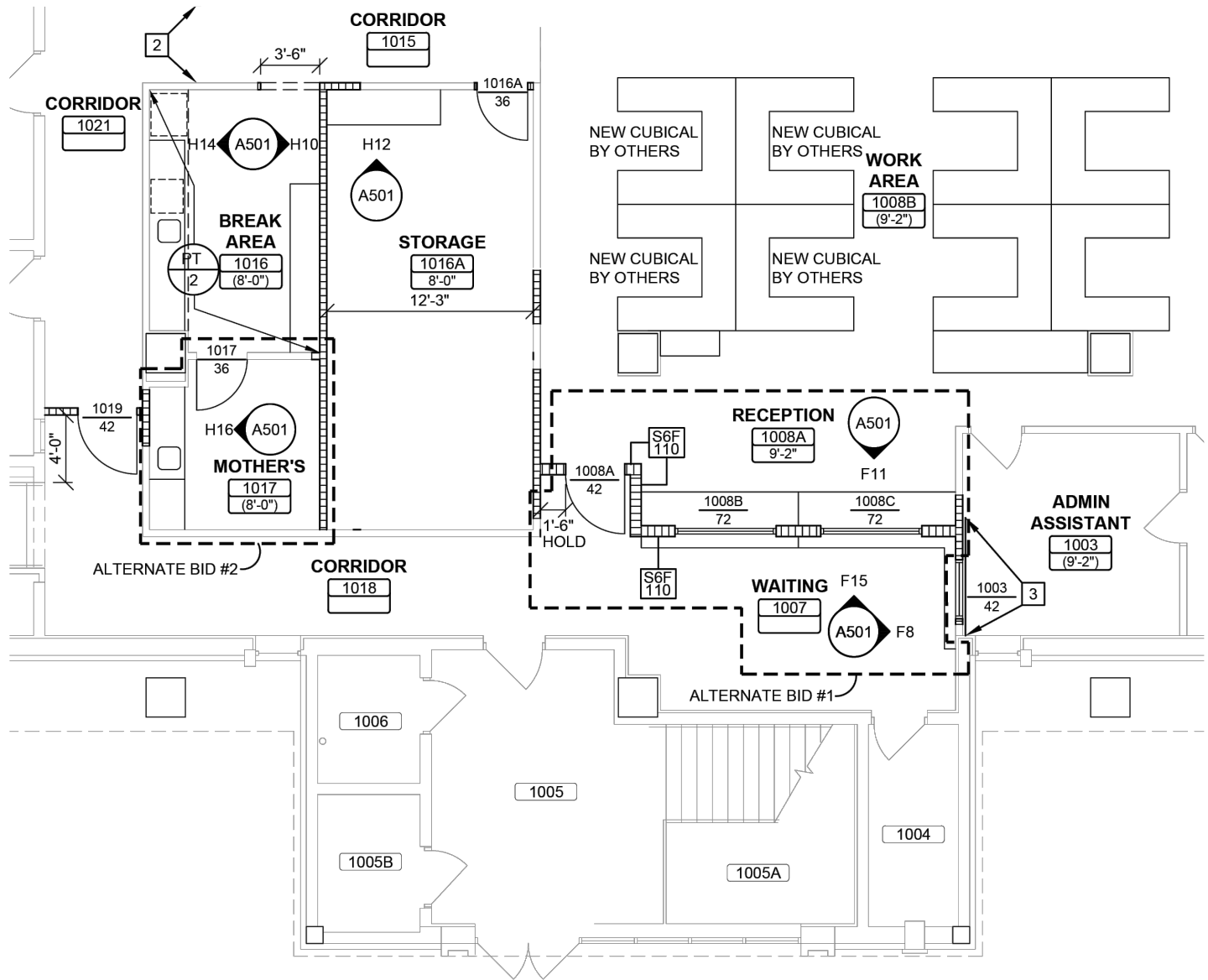
5. THE VACANCY FUNCTION SHALL BE UTILIZED FOR ALL OFFICES, CONFERENCE ROOMS, BOARD ROOMS, CONSULT ROOMS AND NON-PATIENT AREAS.

1. THE ABOVE LIST OF MOUNTING HEIGHTS SHALL BE USED FOR INSTALLATION OF DEVICES UNLESS NOTED OTHERWISE ON THE DRAWINGS.
2. EXACT MOUNTING HEIGHTS OF DEVICES MAY BE SLIGHTLY ADJUSTED IN THE FIELD TO ACCOMMODATE BLOCK COURSES AND UNIFORMITY OF THE WALL.
3. THE ABOVE ITEMS COMPRISE A COMPLETE LIST AND NOT ALL ITEMS MAY BE APPLICABLE TO THIS PROJECT.

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EXHIBIT C

DE PERE CITY HALL ALTERNATE BID AND STAGING PLANS



DE PERE



ENGINEERING DIVISION

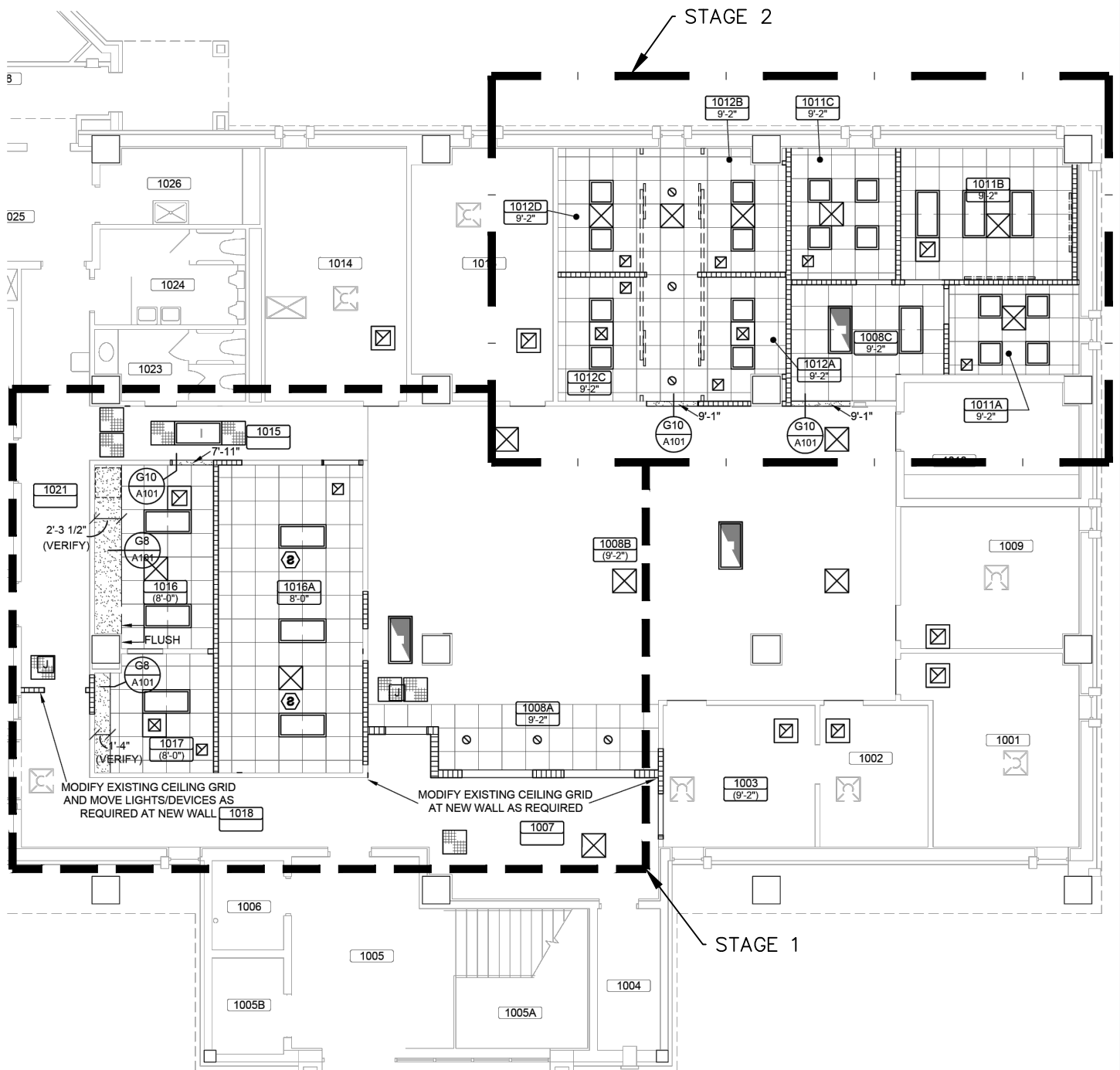
925 S. SIXTH ST
DE PERE, WI 54115

OFFICE 920-339-4061
FAX 920-339-4071

DE PERE CITY HALL
ALTERNATE BIDS

PROJECT: 25-21
CITY HALL FIRST FLOOR
REMODEL

DATE: 07/18/2025
BY: MAL
CHECKED: EPR



G13 REFLECTED CEILING PLAN
A101 1/8" = 1'-0"

DE PERE



ENGINEERING DIVISION
925 S. SIXTH ST
DE PERE, WI 54115
OFFICE 920-339-4061
FAX 920-339-4071

DE PERE CITY HALL
STAGING PLAN

PROJECT: 25-21
CITY HALL FIRST FLOOR
REMODEL

DATE: 07/18/2025
BY: MAL
CHECKED: EPR