Project Manual For

Brain and Memory Center

Broadlawns Medical Center
Des Moines, IA

SIMONSON
AND ASSOCIATES ARCHITECTS LLC

CONTRUCTION DOCUMENTS
September 25, 2026

SECTION 00 01 07

SEALS & SIGNATURES

	I hereby certify that the portion of this technical submission described below was prepared by me or under my direct supervision and responsible charge. I am a duly Licensed Architect under the laws of the State of Iowa. Name: Gregory E. Hayes _____ Signature Date Registration Expires: June 30, 2028 Iowa Reg No. 2779 Pages or sheets covered by this seal: Architectural Divisions: 01-14 as noted in TOC
	I hereby certify that the portion of this technical submission described below was prepared by me or under my direct supervision and responsible charge. I am a duly Registered Professional Engineer under the laws of the State of Iowa. Name: Sara Schmerbach _____ Signature Date Registration Expires: December 31, 2026 Iowa Reg No. 25319 Pages or sheets covered by this seal: Mechanical Divisions: 21-23 as noted in TOC
	I hereby certify that the portion of this technical submission described below was prepared by me or under my direct supervision and responsible charge. I am a duly Registered Professional Engineer under the laws of the State of Iowa. Name: Kenneth Thelen _____ Signature Date Registration Expires: December 31, 2027 Iowa Reg No. P2442534 Pages or sheets covered by this seal: Electrical Divisions: 26-28 as noted in TOC

END OF SECTION

SECTION 00 01 10
TABLE OF CONTENTS

PROCUREMENT AND CONTRACTING REQUIREMENTS
DIVISION 00 -- PROCUREMENT AND CONTRACTING REQUIREMENTS

00 01 07	SEALS PAGE	A
00 01 10	TABLE OF CONTENTS	A
00 01 11	NOTICE OF PUBLIC HEARING	CM
00 01 11	NOTICE TO BIDDERS	CM
00 11 00	PROJECT DIRECTORY	CM
00 12 00	INVITATION TO BID	CM
00 20 00	INSTRUCTION TO BIDDERS	CM
00 41 00	BID FORM – STIPULATED SUM	CM
00 42 00	ALTERNATES	A
00 50 00	AGREEMENT FORM	CM
00 50 00.01	AIA A132 CMA CONTRACT	CM
00 50 00.02	AIA A132 CMA TRADE CONTRACT	CM
00 60 00	GENERAL CONDITIONS	CM
00 70 00	INSURANCE REQUIREMENTS	CM
00 70 00.01	SAMPLE INSURANCE CERTIFICATE	CM
00 80 00	BID PACKAGE 00 – GENERAL REQUIREMENTS	CM
00 80 01	BID PACKAGE 01 – GENERAL TRADES	CM
00 80 02	BID PACKAGE 02 – HVAC AND PLUMBING	CM
00 80 03	BID PACKAGE 03 – ELECTRICAL	CM

SPECIFICATIONS
DIVISION 01 -- GENERAL REQUIREMENTS

01 10 00	SUMMARY	CM
01 15 20	PROJECT BID SCHEDULE	CM
01 15 20.01	PROJECT BID SCHEDULE SAMPLE	CM
01 35 20	SPECIAL PROCEDURES	CM
01 40 00	QUALITY REQUIREMENTS	CM
01 50 00	CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS	CM
01 52 00	PAY APPLICATION & SCHEDULE OF VALUES	CM
01 53 00	CONTRACTORS COST SUMMARY WORKSHEET	CM
01 53 00.01	CONTRACTORS COST SUMMARY WORKSHEET EXAMPLE	CM
01 60 00	PRODUCT REQUIREMENTS	CM
01 60 01	SUBSTITUTION REQUEST FORM	CM
01 70 00	EXECUTION AND CLOSEOUT REQUIREMENTS	CM
01 78 00	CLOSEOUT SUBMITTALS	CM

DIVISION 02 -- EXISTING CONDITIONS

02 41 00	SELECTIVE DEMOLITION	A

DIVISION 03 -- CONCRETE

03 05 16	UNDERSLAB VAPOR BARRIER	A
03 35 11	CONCRETE FLOOR FINISHES	A

DIVISION 04 -- MASONRY

04 20 00	UNIT MASONRY	A
04 26 13	MASONRY VENEER	A
04 72 00	CAST STONE MASONRY	A

DIVISION 05 -- METALS

05 50 00	METAL FABRICATIONS	A

05 52 13	EXTERIOR RAILINGS	A

DIVISION 06 -- WOOD, PLASTICS, AND COMPOSITES

06 10 53	MISCELLANEOUS ROUGH CARPENTRY	A
06 20 00	FINISH CARPENTRY	A
06 41 00	ARCHITECTURAL WOOD CASEWORK	A
06 83 16	FIBERGLASS REINFORCED PANELING	A

DIVISION 07 -- THERMAL AND MOISTURE PROTECTION

07 01 50.19	PREPARATION FOR RE-ROOFING	A
07 13 00	SHEET WATERPROOFING	A
07 21 00	THERMAL INSULATION	A
07 26 00	VAPOR RETARDERS	A
07 27 00	AIR BARRIERS	A
07 31 13	ASPHALT SHINGLES	A
07 42 13	METAL SOFFIT PANELS	A
07 46 46	FIBER-CEMENT SIDING	A
07 62 00	SHEET METAL FLASHING AND TRIM	A
07 92 00	JOINT SEALANTS	A

DIVISION 08 -- OPENINGS

08 11 13	HOLLOW METAL DOORS AND FRAMES	A
08 14 13	STILE AND RAIL WOOD DOORS	A
08 31 00	ACCESS DOORS AND PANELS	A
08 43 13	ALUMINUM-FRAMED STOREFRONTS	A
08 52 00	CLAD WOOD WINDOWS	A
08 71 00	DOOR HARDWARE	AHC
08 80 00	GLAZING	A

DIVISION 09 -- FINISHES

09 05 61	COMMON WORK RESULTS FOR FLOORING PREPARATION	A
09 21 16	GYPSUM BOARD ASSEMBLIES	A
09 30 00	TILING	A
09 51 00	ACOUSTICAL CEILINGS	A
09 65 00	RESILIENT FLOORING AND BASE	A
09 68 13	TILE CARPETING	A
09 72 00	WALL COVERINGS	A
09 91 13	EXTERIOR PAINTING	A
09 91 23	INTERIOR PAINTING	A

DIVISION 10 -- SPECIALTIES

10 21 23	CUBLICLE CURTAINS AND TRACK	A
10 28 00	TOILET ACCESSORIES	A
10 31 00	MANUFACTURED FIREPLACES	A
10 44 00	FIRE PROTECTION SPECIALTIES	A
10 51 29	PHENOLIC LOCKERS	A

DIVISION 11 – EQUIPMENT (NOT USED)

DIVISION 12 -- FURNISHINGS

12 22 16	DRAPERY TRACK AND ACCESSORIES	A
12 24 00	WINDOW SHADES	A
12 36 00	COUNTERTOPS	A

DIVISION 13 - SPECIAL CONSTRUCTION (NOT USED)

DIVISION 14 - CONVEYING EQUIPMENT (NOT USED)
DIVISION 21 - FIRE SUPPRESSION (NOT USED)

DIVISION 22 – PLUMBING **MEP**
22 05 00 PLUMBING COMMON WORK RESULTS
22 05 23 PLUMBING VALVES
22 11 00 PLUMBING PIPING
22 33 00 DOMESTIC WATER HEATERS
22 40 00 PLUMBING FIXTURES AND EQUIPMENT INSTALLATION

DIVISION 23 - HEATING, VENTILATING, AND AIR-CONDITIONING (HVAC) **MEP**
23 05 00 HVAC COMMON WORK RESULTS
23 05 29 PIPE HANGERS AND SUPPORTS
23 05 48 VIBRATION AND EXPANSION CONTROL
23 05 53 MECHANICAL IDENTIFICATION
23 05 93 CLEANING AND TESTING
23 05 94 TESTING ADJUSTING AND BALANCING
23 07 13 DUCTWORK INSULATION
23 07 19 PIPING INSULATION
23 11 26 NATURAL GAS PIPING
23 23 00 REFRIGERANT PIPING
23 31 13 METAL DUCTWORK
23 33 00 DUCTWORK ACCESSORIES
23 34 25 HVAC POWER VENTILATORS
23 37 00 AIR INLETS AND OUTLETS
23 54 00 CONDENSING FURNACES
23 72 00 ENERGY RECOVERY VENTILATION UNITS
23 81 26 SPLIT SYSTEM AIR CONDITIONERS
23 82 00 TERMINAL HEATING EQUIPMENT

DIVISION 26 – ELECTRICAL **MEP**
26 05 00 COMMON WORK RESULTS
26 05 02 DEMOLITION
26 05 04 CLEANING AND TESTING
26 05 19 LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLE
26 05 23 CONTROL CABLES
26 05 29 HANGERS AND SUPPORTS
26 05 33 RACEWAYS AND BOXES
26 05 53 IDENTIFICATION
26 09 43 DIGITAL LIGHTING CONTROLS
26 27 02 EQUIPMENT WIRING
26 27 26 WIRING DEVICES
26 27 28 DISCONNECT SWITCHES
26 51 13 INTERIOR LIGHTING
26 52 00 EMERGENCY LIGHTING

DIVISION 27 – COMMUNICATIONS **MEP**
27 05 13 COMMUNICATIONS COMMON WORK RESULTS
27 05 26 GROUNDING AND BONDING FOR COMMUNICATIONS SYSTEMS GENERAL
27 05 28 PATHWAYS FOR COMMUNICATION SYSTEMS
27 05 53 IDENTIFICATION FOR COMMUNICATION SYSTEMS
27 08 00 WARRANTY OF STRUCTURED CABLING
27 08 20 ACCEPTANCE OF COMMUNICATIONS COPPER CABLING
27 15 00 HORIZONTAL CABLING

27 51 19 SOUND MASKING SYSTEM

DIVISION 28 - ELECTRONIC SAFETY AND SECURITY **MEP**
28 31 00 FIRE DETECTION AND ALARM

DIVISION 31 – EARTHWORK (NOT USED)

DIVISION 32 - EXTERIOR IMPROVEMENTS (NOT USED)

DIVISION 33 – UTILITIES (NOT USED)

END OF SECTION

SECTION 00 01 11
NOTICE OF PUBLIC HEARING

BRAIN & MEMORY
BOARD OF TRUSTEES
BROADLAWNS MEDICAL CENTER
DES MOINES, IOWA

Notice is hereby given that a public hearing will be held at 2:00PM on Thursday, October 15th, 2026 in the Jenner Conference Room in Building 1 Room MP107 of the Medical Plaza at Broadlawns Medical Center, Des Moines, Iowa.

DESCRIPTION: Furnish all labor, material and equipment required to accomplish the construction described in the specifications, indicated on the plans, and according to the schedule. The project consists of the renovation of a 4,700 square foot building, the construction of a detached canopy and associated site and concrete improvements. The work includes, but is not limited to, HVAC, Electrical, Plumbing, Finish Upgrades and Roofing.

The public hearing will receive comments on the Brain & Memory project for Broadlawns Medical Center. Any individual may file written comments and/or be heard at said hearing.

Bidding Documents may be viewed at the office of the Construction Manager - Graham Construction Company, 421 Grand Ave, Des Moines, IA 50309.

END OF SECTION 00 01 11

SECTION 00 01 12
NOTICE TO BIDDERS

BRAIN & MEMORY
BOARD OF TRUSTEES
BROADLAWNS MEDICAL CENTER
DES MOINES, IOWA

Time and Place for Filing Sealed Proposals. On behalf of the Broadlawns Board of Trustees, sealed proposals for all labor, materials, and equipment for the Bid Packages outlined below will be received by the Construction Manager – Graham Construction at Broadlawns Medical Center (the "Hospital"), Building One, Jenner Conference Room, 1761 Hickman Road, Des Moines, IA on the 15th day of October 2026 from 1:00 PM to 2:00 PM. Bids received after 2:00 PM will not be considered and will be returned to the bidder unopened.

Time and Place Sealed Proposals Will be Opened and Considered. Sealed proposals will be opened at 2:05 PM on the 15th day of October at the Hospital, Building One, Jenner Conference Room, 1761 Hickman Road, Des Moines, IA. The Broadlawns Board of Trustees has delegated to the Broadlawns Chief Financial Officer the duty of receiving and opening bids, The CFO shall report the results of the bidding with the CFO's recommendations to the Board of Trustees at its next regularly scheduled meeting or at a special meeting called for such purpose.

DESCRIPTION: Furnish all labor, material and equipment required to accomplish the construction described in the specifications, indicated on the plans, and according to the schedule. The project consists of the renovation of a 4,700 square foot building, the construction of a detached canopy and associated site and concrete improvements. The work includes, but is not limited to, HVAC, Electrical, Plumbing, Finish Upgrades and Roofing.

Bids are for:
Bid Package 01 – General Trades
Bid Package 02 – HVAC & Plumbing
Bid Package 03 – Electrical

Bidding Documents. Bidding documents may be obtained starting October 1st, 2026 from Iowa Reprographics, 3 College Ave, Unit 3, Des Moines, IA 50314 (phone) 515-244-5705, upon deposit of the sum of one hundred dollars ($100.00). This deposit will be refunded upon return of the bidding documents in good condition within thirty days after receipt of bids. MBI bid cards will be accepted. Include a non-refundable check in the in the amount of twenty dollars ($20.00) for plans to be shipped.

Bidding documents may be examined at:

Graham Construction Company
421 Grand Avenue
Des Moines, IA 50309
515-244-1279

MBI One Source
Online Platform

Construction Update Plan Room & ISqFt
4100 Westown Parkway
West Des Moines, IA 50266
515-288-8904

BID SECURITY: Each Bidder shall accompany with its bid a bid security as defined in Iowa Code section 26.8 payable to Broadlawns Medical Center in an amount equal to at least 5%. The bid security may be in the form of a Certified Check, Cashier's Check drawn on an FDIC insured bank in Iowa or on an FDIC insured bank chartered under the laws of the United States, or a certified share draft drawn on a credit union in Iowa or chartered under the laws of the United States, or a bid bond executed by corporations authorized to contract as surety in the State of Iowa. The bid bond shall be executed by the Bidder on AIA Bond Document. Bid Security shall be in a separate envelope with the sealed bid and shall be forfeited to the Owner as liquidated damages in the event the bidder fails to enter into a contract and furnish a bond within ten days after his bid has been accepted. No Bidder may withdraw its bid for at least sixty (60) days after the scheduled closing time for the receipt of bids.

The successful Bidder will be required to furnish and pay for satisfactory Performance Bond and Labor and Material Payment Bond in the amount of 100% of the Contract Price. Bond to be issued by a responsible surety approved by the Board of Trustees of Broadlawns Medical Center.

The Notice to Proceed will be issued following acceptance of the executed Contract by the successful Bidder and the requisite Performance Bond and Labor and Material Payment Bond and insurance certificates, and a determination by the OWNER that it has secured permanent financing for the Project. All work for this package shall be completed within the given schedule.

QUALIFICATIONS: Broadlawns Medical Center reserves the right to request qualification forms before issuing documents or before Contract is awarded, and to further reject any or all proposals or to waive technicalities or irregularities.. By virtue of statutory authority, a preference shall be given to products and provisions grown and produced within the State of Iowa and to Iowa domestic labor.

END OF SECTION 00 01 12

SECTION 00 11 00
PROJECT DIRECTORY

Owner:
Broadlawns Medical Center
1801 Hickman Road

Project Manager, Plant Operations:
Adam Shaw
Phone: 515-282-5702
Email: AShaw@brownlawns.org

Brian Clark
Phone: 515-631-0299
Email: BMClark@broadlawns.org

Simonson & Associates Architects
1717 Ingersoll Ave #117
Des Moines, IA 50309
515-276-0467 Office

Architect
Greg Hayes
Phone: 515-440-0015
E-Mail: ghayes@simonsonassoc.com

Bishop Engineering
3501 104th St
Urbandale, IA 50322

515-276-0467

Civil Engineer
Levi Runciman
Phone: 515-276-0467

Email: lrunciman@bishopengr.com

Raker Rhodes Engineering, LLC
4717 Grand Ave.
Des Moines, IA 50312
515-277-0275

Structural Engineer
John Rhodes
Phone: 515-277-0275
Email: jrhodes@rakerrhodes.com

KEDbluestone
5518 NW 88th Street
Johnsotn, IA 50131
515-727-0700

Mechanical & Plumbing Engineer
Sara Schmerbach
Phone: 515-727-0700
Email: sara.schmerbach@kedbluestone.com

Electrical Engineers
Rich Larson
Phone: 515-727-0700
Email: rich.larson@kedbluestone.com

Kenny Thelen
Phone: 515-727-0700
Email: kenny.thelen@kedbluestone.com

Construction Manager:
Graham Construction
421 Grand Avenue
Des Moines, IA 50309

Project Manager (main contact):
Justin Fischer
515-360-3964 Cell Phone
515-244-1279 Office
E-Mail: jfischer@3gcos.com

Project Engineer:
Brittany Larson
515-802-4021 Cell Phone
515-244-1279 Office
E-Mail: blarson@3gcos.com

Project Coordinator:
Kamisha Wallace
515-244-1279 Office
E-Mail: kwallace@3gcos.com

Project Superintendent:
Mark Mathes
515-202-1255 Cell Phone
E-Mail: MMathes@3GCos.com

END OF SECTION 00 11 00

SECTION 00 12 00
INVITATION TO BID

A. Bids will be received from Contractors for the bid packages listed below for the complete construction of the Broadlawns Medical Center Brain & Memory. The owner is Broadlawns Medical Center. The Construction Manager is Graham Construction.

B. Bids will be received for the following Bid Packages:

Bid Package 01 – General Trades
Bid Package 02 – HVAC & Plumbing
Bid Package 03 – Electrical

C. Sealed bids will be received by the Owner and Construction Manager at Broadlawns Medical Center located at 1761 Hickman Road, Des Moines, IA 50314 in the Jenner Conference Room in Building 1 of the Medical Plaza at 2:00 P.M. CST on Thursday, October 15th, 2026. Each bid must be enclosed in a separate envelope and shall be marked:

Broadlawns Medical Center – Parking Lot Expansion
Attn: Mr. Proctor Lureman, CEO
Bid Package #(s):
Bid Package Title(s):

D. Bids received after this time will not be accepted.

E. Bids will be opened publicly.

F. **Bidding documents may be obtained from Iowa Reprographics**, 3 College Ave, Unit 3, Des Moines, IA 50314 (phone) 515-244-5705, upon deposit of the sum of one hundred dollars ($100.00). This deposit will be refunded upon return of the bidding documents in good condition within twenty days after receipt of bids. MBI bid cards will be accepted. Include a non-refundable check in the in the amount of twenty dollars ($20.00) for plans to be shipped.

G. A Pre-Bid Meeting will be held at 3714 Ingersoll Avenue, Des Moines, IA on Wednesday, October 7th, 2026, starting at 10:30 AM CST. All parties are invited to attend as this will be the only available time to walk the project areas

H. Bidding Documents may be examined at:

Graham Construction Company 421 Grand Avenue Des Moines, IA 50309 515-244-1279	iSqFt Online platform
Construction Update Plan Room 4100 Westown Parkway West Des Moines, IA 50266 515-288-8904	MBI One Source Online platform

I. Partial Sets of documents will not be made available

J. QUESTIONS: Pre-bid Requests for Information are due no later than Thursday, October 8th, 2026, at 12:00 PM CST to allow adequate time for the questions to be addressed. Direct all questions, in writing, to the following individuals:

Architect:
Simonson & Associates Architects, Greg Hayes
E-mail: ghayes@simonsonassoc.com

Structural:
Raker Rhodes Engineering, LLC, John Rhodes
Email: jrhodes@rakerrhodes.com

Mechanical & Plumbing:
KEDbluestone, Sara Schmerbach
Email: Sara.Schmerbach@KEDbluestone

Electrical:
KEDbluestone, Rich Larson
Email: Rich.Larson@KEDbluestone.com

Civil:
Bishop Engineering, Levi Runciman
E-mail: lrunciman@bishopengr.com

Bid Package Descriptions, General Conditions, etc.:
Graham Construction, Justin Fischer
E-mail: jfischer@3gcos.com

K. BID SECURITY: Each bid shall be accompanied by bid security payable to Broadlawns Medical Center **in an amount equal to at least 5% of the highest total amount including Add Alternates**. The bid security may be in the form of cash, a certified check, a cashier's check or a bid bond executed by corporations authorized to contract as surety in the state of Iowa. The bid bond shall be executed by the bidder on Iowa Guide 31 or AIA Document 310. The bid security shall be in a separate envelope from the sealed bid and shall be forfeited to the Owner in the event the bidder fails to enter into a contract and furnish a bond within ten days after his bid has been accepted. No qualified bid will be accepted.

END OF SECTION 00 12 00

SECTION 00 20 00
INSTRUCTIONS TO BIDDERS

ARTICLE 1 - DEFINITIONS

1.01 Bidding documents include the bidding requirements and the contract documents. The bidding requirements include the advertisement or invitation to bid, instructions to bidders, the bid form, other sample bidding and contract forms and the contract documents including addenda issued prior to receipt of bids.

1.02 The contract documents for the work consist of the Owner/Contractor agreement, the conditions of the contract (general and supplementary conditions), the drawings, the specifications and all addenda issued prior to and all modifications issued after execution of contract.

1.03 Definitions set forth in AIA document A232 - 2009 "General Conditions of the Contract for Construction" Construction Manager – Adviser Edition, or in other contract documents applicable to the bidding documents.

ARTICLE 2 - BIDDER'S REPRESENTATIONS

2.01 The bidder by making a bid represents that the bidder has read and understands the bidding documents and the bid is made in accordance with those documents.

2.02 The bidder has read and understands the bidding documents or contract documents, to the extent that such documentation relates to the work for which the bid is submitted.

2.03 The bidder has visited the site, become familiar with local conditions under which the work is to be performed and has correlated the bidder's personal observations with the requirements of the contract documents.

2.04 The bid is based upon the materials, equipment and systems required by the bidding documents without exception.

ARTICLE 3 - BIDDING DOCUMENTS

3.01 Copies

A. **Complete sets of the bidding documents may be obtained from Iowa Reprographics, 3 College Ave, Unit 3, Des Moines, IA 50314 (phone) 515-244-5705,** for the deposit sum indicated in the Invitation to Bid. The deposit will be refunded to plan holders who return the bidding documents in good condition within 20 days after receipt of bids. The cost of replacement of missing or damaged documents will be deducted from the deposit. A bidder receiving a contract award may retain the bidding documents and his deposit will be refunded. Successful subcontractors and material suppliers may retain their bidding documents and their deposit will be refunded if the Construction Manager receives written notification within the 30 calendar day period following receipt of bids.

B. Bidders shall use complete sets of bidding documents in preparing bids. Neither the Owner nor the Architect assumes responsibility for errors or misinterpretations resulting from the use of incomplete sets of bidding documents. No partial sets will be issued.

C. In making copies of the bidding documents available on the above terms, the Owner and the Architect do so only for the purpose of obtaining bids on the work and do not confer a license or grant permission for any other use of the bidding documents.

3.02 Interpretation or correction of bidding documents

A. The bidder shall carefully study and compare the bidding documents with each other, and with other work being concurrently or presently under construction to the extent that it relates to the

work for which the bid is submitted, shall examine the site and local conditions, and shall at once report to the Architect errors, inconsistencies or ambiguities discovered.

B. Bidders and sub-bidders requiring clarification or interpretation of the bidding documents shall make a written request which shall reach the Architect at least nine calendar days prior to the date for receipt of bids.

C. Interpretations, corrections and changes of the bidding documents will be made by addendum. Interpretations, corrections and changes the bidding documents made in any other manner will not be binding and bidders shall not rely upon them.

3.03 Substitutions

A. The materials, products and equipment described in the bidding documents establish a standard of required function, dimension, appearance and quality to be met by any proposed substitution.

B. If the Architect or Construction Manager approves a proposed substitution prior to receipt of bids, such approval will be set forth in an addendum. Bidders shall not rely upon approvals made in any other manner.

3.04 Addenda

A. Addenda will be mailed or delivered to all who are known by the Construction Manager to have a complete set of bidding documents.

B. Copies of Addenda will be made available for inspection wherever bidding documents are on file for that purpose.

C. No Addenda will be issued later than two (2) days prior to the date for receipt of bids except: (1) an Addendum withdrawing the request for bids; (2) an Addendum which includes postponement of the date for receipt of bids; or (3) an Addendum issued after receipt of bids and prior to execution of the contract.

D. Each bidder shall ascertain prior to submitting a bid that he has received all Addendums issued, and the bidder shall acknowledge their receipt in the proper location on the bid form.

ARTICLE 4 - BIDDING PROCEDURES

4.01 Form and style of bids

A. Submit bids in duplicate on forms identical to the form included with the bidding documents.

B. Submit a copy of the Bid Package Description for each portion of the work included in the Bid. Fill in all blanks on the Bid Package Description by typewriter or manually by ink. All unit prices requested shall be submitted.

C. Fill in all blanks on the bid form by typewriter or manually in ink.

D. Where so indicated by the makeup of the bid form, sums shall be expressed in both words and figures, and in case of discrepancy between the two, the amount written in words shall govern.

E. Interlineations, alterations or erasures shall be initialed by the signer of the bid.

F. All requested alternates shall be bid. If no change in the base bid is required, enter "No Change". If the alternate does not pertain to your bid package enter “Not Applicable”. Bids may be rejected if alternate pricing is not included.

G. Where two or more bids for designated portions of the work have been requested, the bidder may state the bidder's refusal to accept award of less than the combination of bids stipulated by the bidder.

H. Each copy of the bid shall include the legal name of the bidder and a statement that the bidder is a sole proprietor, a partnership, a corporation or some other legal entity. Each copy shall be signed by the person or persons legally authorized to bind the bidder to a contract. A bid by a corporation shall further give the state of incorporation and have the corporate seal affixed. A bid submitted by an agent shall have a current power of attorney attached certifying the agent’s authority to bind the bidder.

4.02 Bid Security

A. Each bid shall be accompanied by a bid security in the amount of 5% of the base bid and in the form of surety bond, cashier's check, cash or certified check pledging that the bidder will enter into a contract with the Owner on the items stated in his bid and will, if required, furnish bonds covering the faithful performance of the contract and the payment of all obligations arising there under. Should the bidder refuse to enter into such contract or fail to furnish such bonds if required, the amount of the bid security shall be forfeited to the Owner as liquidated damages, not as a penalty.

B. Surety bond shall be written on AIA Document A310-2010 "Bid Bond" and the attorney-in-fact who executes the bond on behalf of the surety shall affix to the bond a certified and current copy of power of attorney.

C. The Owner will have the right to retain the bid security of bidders to whom an award is being considered until either:

1. the contract has been executed and bonds have been furnished
2. the specified time has elapsed so that bids may be withdrawn
3. all bids have been rejected

4.03 Submission of bids

A. All copies of the bid shall be enclosed in a sealed opaque envelope. The envelope shall be addressed to the party receiving the bids and shall be identified with the project name, bid package number, the bidder's name and address. If the bid is sent by mail the sealed envelope shall be enclosed in a separate mailing envelope with the notation "SEALED BID ENCLOSED" on the face of the envelope. Include the project name, bid package number and bid package title.

B. Bids shall be deposited at the designated location prior to the time and date for receipt of bids.

C. The bidder shall assume full responsibility for timely delivery at the location designated for receipt of bids.

D. Oral, telephonic, or telegraphic Bids are invalid and will not receive consideration.

4.04 Modification or withdrawal of bid

A. A bid may not be modified, withdrawn or canceled by the bidder after the stipulated time and date designated for the receipt of bids, and each bidder so agrees in submitting his bid.

B. Prior to the time and date designated for receipt of bids, a bid submitted may be modified or withdrawn by notice to the party receiving bids at the place designated for receipt of bids. Such notice shall be in writing over the signature of the bidder or by telegram; if by telegram, written confirmation over the signature of the bidder shall be mailed .and postmarked on or before the date and time set for receipt of bids, and it shall be so worded as not to reveal the amount of the original bid.

C. Withdrawn bids may be resubmitted up to the time designated for the receipt of bids provided that they are then fully in conformance with these instructions to bidders.

D. Bid security shall be in an amount sufficient for the bid as modified or resubmitted.

ARTICLE 5 - CONSIDERATION OF BIDS

5.01 Opening of bids

A. The properly identified bids received on time will be opened publicly. An abstract of the information may, at the discretion of Owner, be made available to the bidders within a reasonable time.

5.02 Rejection of bids

A. The Owner will have the right to reject any or all bids.

5.03 Acceptance of bid (award)

A. It is the intent of the Owner to award a contract to the lowest responsible bidder provided the bid has been submitted in accordance with the requirements of the bidding documents and does not

exceed the funds available. The Owner will have the right to waive informalities or irregularities in a bid received and to accept the bid which, in his judgment, is in his own best interest.

B. The Owner will have the right to accept alternates in any order or combination and to determine the low bidder on the basis of the sum of the base bid and the alternates accepted.

ARTICLE 6 - POST BID INFORMATION

6.01 Submittals

A. The bidder shall, within seven days of notification of selection for the award of a contract for the work, submit the following information to the Construction Manager

1. A designation of the work to be performed by the bidder with the bidder's own forces;
2. The proprietary names and the suppliers or principal items or systems of materials and equipment proposed for the work;
3. A list of names of the subcontractors or other persons or entities proposed for the principal portions of the work.

B. The bidder will be required to establish to the satisfaction of the Construction Manager and Owner the reliability and responsibility of the persons or entities proposed to furnish and perform the work described in the bidding documents.

C. Prior to the award of the contract, the Construction Manager will notify the bidder in writing if either the Owner or the Construction Manger, after due investigation, has reasonable objection to any such proposed person or entity. If the Owner or Construction Manager has reasonable objection to such proposed person or entity, the bidder may, at the bidder's option:

1. Withdraw the bid
2. Submit an acceptable substitute person or entity with an adjustment in the bid price to cover the difference in cost occasioned by such substitution.

D. The Owner may accept the adjusted bid or price may disqualify the bidder.

ARTICLE 7- PERFORMANCE BOND AND LABOR AND MATERIAL PAYMENT BOND

7 .01 Bond requirements

A. The bidder shall furnish bonds covering the faithful performance of contract and the payment of all obligations arising there under. Bonds may be secured through the bidder's usual sources. The cost furnishing of such bonds shall be included in the bid.

B. If the Owner requires that bonds be obtained from other than the bidder's usual source, all change in cost will be adjusted as provided in the contract documents.

7.02 The time of delivery and form of bonds

A. The bidder shall deliver the required bonds to the Construction Manager not later than three days following the date of execution of the contract. If the work is to be commenced prior thereto in a response to a letter of intent, the bidder shall, prior to commencement of the work, submit evidence satisfactory to the Construction Manager that such bonds will be furnished and delivered.

B. The bonds shall be written on AIA Document A312-2010 “Performance Bond and Payment Bond.” Both bonds shall be written in the amount of the contract sum.

C. The bonds shall be dated on or after the date of the contract.

D. The bidder shall require the attorney-in-fact who executes the required bonds on behalf of the surety to affix a current and certified copy of the power of attorney.

END OF SECTION 00 20 00

SECTION 00 41 00
BID FORM - STIPULATED SUM

PROJECT: Broadlawns Medical Center – Brain and Memory Center

BID TO: Broadlawns Medical Center
1801 Hickman Road
Des Moines, IA 50314
Attention: Mr. Proctor Lureman

BID FROM:

_____	_____
Bidder's Company Name	Telephone Number
_____	_____
Date of Proposal	Fax Number
_____	_____
Contact Person	E-mail Address

*******ATTACH A COPY OF THE BID PACKAGE DESCRIPTION(S) TO THIS BID*******

BID FOR: Contract work for the Broadlawns Medical Brain and Memory Center project as shown in Bidding Documents Dated: September 29th, 2026.

BID PLACE: Bids are to be submitted to Graham Construction on behalf of Mr. Proctor Lureman, Broadlawns Medical Center.

Bids will be received between the hours of 01:00 PM and 2:00 PM CST.

BIDS SHALL BE DELIVERED TO: Broadlawns Medical Center
Jenner Conference Room, Building 1 Room MP107
1761 Hickman Road
Des Moines, IA 50314

Hand deliver bids to the address listed above.

BID DATE: Bids are due on Thursday, the 15th of October, 2026.

BID TIME: Bids are due no later than 2:00 PM CST.

1. The undersigned BIDDER agrees, if the Bid is accepted, to enter into an agreement with OWNER, in the form included in the Bidding Documents, to perform and furnish the Work as specified or indicated in the Bidding Documents for the Bid Price and within the Bid Time indicated in this Bid and in accordance with the other terms and conditions of the Contract Documents.

2. In submitting this Bid, BIDDER represents, as more fully set forth in the Agreement, that:

    A. This Bid will remain subject to acceptance for 60 days after the day of Bid opening;

B. To the extent permitted by law, the Owner has the right to accept or reject this Bid, including alternate bids, and to waive minor informalities in the bidding;

C. BIDDER accepts the provisions of the Instructions and Supplementary Instructions to Bidders regarding disposition of Bid Security;

D. BIDDER will sign and submit the Agreement with the Bonds and other documents required by the Bidding Requirements within 10 days after the date of Owner's Notice of Award;

E. BIDDER has examined copies of all the Bidding Documents;

F. BIDDER has visited the site and become familiar with the general, local and site conditions;

G. BIDDER is familiar with federal, state, and local laws and regulations;

H. BIDDER has correlated the information known to BIDDER, information and observations obtained from visits to the site, reports and drawings identified in the Bidding Documents and additional examinations, investigations, explorations, tests, studies and data with the Bidding Documents;

I. This Bid is genuine and not made in the interest of or on behalf of an undisclosed person, firm or corporation and is not submitted in conformity with an agreement or rules of a group, association, organization or corporation; BIDDER has not directly or indirectly induced or solicited another Bidder to submit a false or sham Bid; BIDDER has not solicited or induced a person, firm or corporation to refrain from bidding; and BIDDER has not sought by collusion to obtain for itself an advantage over another BIDDER or over OWNER.

J. Qualified Bids will not be accepted.

K. This project is sales tax exempt. The owner will issue an exemption certificate for the purchase or use of building materials, supplies, and equipment that will be used in the performance of the construction contract.

L. Combined bids will not be accepted. Bidders may bid more than one Package.

3. BIDDER has received the following Addenda. Receipt of which is hereby acknowledged;

Addendum No. _____ _____ Addendum No. _____ _____

4. BIDDER hereby acknowledges that sales tax has not been included in the bid values listed below.

5. BIDDER will complete the work for the Bid Package(s) listed below in accordance with the Contract Documents (all bids will be Prime Contract bids to include all labor, material, shop drawings, superintendence, project management, delivery, unloading, tools, equipment, rigging, cleaning, adjusting, etc. to complete the work):

Bid Pkg	Bid Package Title	Written Bid Amount	Numerical Bid Amount
00	General Requirements	INCLUDED BY REFERENCE TO BE PART OF ALL BID PACKAGES	INCLUDED
01	General Trades		$
02	HVAC & Plumbing		$

03	Electrical		$
Alt 1	Port Cochere		
Alt 2	Nurses Workstation		

6. ALTERNATES – refer to Specification Section 00 4200 for descriptions. If the items below are left blank it will be considered "No Change" and zero dollars if the alternate is accepted.

A. Alternate No. 1 – Port Cochere

BP #01: ADD / DEDUCT _____ Dollars $_____
(circle one)

BP #02: ADD / DEDUCT _____ Dollars $_____
(circle one)

BP #03: ADD / DEDUCT _____ Dollars $_____
(circle one)

B. Alternate No. 2 – Nurses Workstation

BP #01: ADD / DEDUCT _____ Dollars $_____
(circle one)

BP #02: ADD / DEDUCT _____ Dollars $_____
(circle one)

BP #03: ADD / DEDUCT _____ Dollars $_____

C. Note: If any Alternates are accepted by the owner, the owner reserves the right to reject and remove any other bid packages and their scopes entirely from the project scope.

7. BIDDER agrees that all Work will be substantially complete per the schedule as outlined in Specification Section 01 15 20 & 01 15 20.01.

8. BID FORM SIGNATURE(S):

SUBMITTED: _____, 20_____
(Date)

BY: _____
(Bidder - print the full name of your firm)

_____
(Signature and *printed* name of person authorized to sign) (Title)

END OF SECTION 00 41 00

SECTION 00 42 00
ALTERNATES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Description of Alternates.

B. Procedures for pricing Alternates.

C. Documentation of changes to Contract Sum and Contract Time.

1.02 ACCEPTANCE OF ALTERNATES

A. Alternates quoted on Bid Forms will be reviewed and accepted or rejected at Owner's option. Accepted Alternates will be identified in the Owner-Contractor Agreement.

B. Coordinate related work and modify surrounding work to integrate the Work of each Alternate.

1.03 SCHEDULE OF ALTERNATES

A. Alternate #1: Porte Cochere
   1. Base Bid: Provide and install porte cochere as shown on the drawings.
   2. Alternate Bid: Delete porte cochere from this project, including all associated elements, such as foundation for the columns, the island under the east side of the porte cochere and the bollards. Paint lane lines where the outline of the island is shown with diagonal lines in the area bounded by the lane lines.

B. Altenrate #2: Nurses Workstation.
   1. Base Bid: In Nurses 105, re-face the existing workstation front, side facing away from the middle of the workstation, and the return facing door 105. Remove the center island cabinet and countertop. Remove all cork from all the walls and repair wall finish. Maintain existing cabinets and worksurfaces.
   2. Alternate Bid: In Nurses 105, remove existing nurses workstation and install new workstation as shown on the drawings.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 00 50 00
AGREEMENT FORM

ARTICLE 1 – AGREEMENT FORM

1. AIA Document A132/CMa Standard Form of Agreement Between Owner and Contractor, 2019 Construction Manager as Adviser Edition, is bound within this project manual as part of the Contract Documents. This is the final modified agreement to be used for the parties.

   Modified AIA A132/CMa Contract Attached

END OF SECTION 00 50 00

AIA® Document A132® – 2019

Standard Form of Agreement Between Owner and Contractor, Construction Manager as Adviser Edition

AGREEMENT made as of the Twenty-fourth day of September in the year Two Thousand Twenty-Six
(In words, indicate day, month, and year.)

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

Broadlawns Medical Center
1801 Hickman Rd
Des Moines, IA 50314
515-282-2200

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

To be determined by Public bid.

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

Broadlawns Medical Center Brain & Memory Clinic
3714 Ingersoll Ave
Des Moines, IA 50312

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

Graham Construction - DSM
421 Grand Ave
Des Moines, IA 50309
515-244-1279

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

Simonson + Associates Architects, L.L.C.
1717 Ingersoll Ave, Suite 117
Des Moines, IA 50309
515-440-5626

The Owner and Contractor agree as follows.

ADDITIONS AND DELETIONS: The author of this document may have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added to or deleted from the original AIA text.

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

This document is intended to be used in conjunction with AIA Documents A232™–2019, General Conditions of the Contract for Construction, Construction Manager as Adviser Edition; B132™–2019, Standard Form of Agreement Between Owner and Architect, Construction Manager as Adviser Edition; and C132™–2019, Standard Form of Agreement Between Owner and Construction Manager as Adviser.

AIA Document A232™–2019 is adopted in this document by reference. Do not use with other general conditions unless this document is modified.

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TABLE OF ARTICLES

1 THE CONTRACT DOCUMENTS

2 THE WORK OF THIS CONTRACT

3 DATE OF COMMENCEMENT AND DATES OF SUBSTANTIAL COMPLETION

4 CONTRACT SUM

5 PAYMENTS

6 DISPUTE RESOLUTION

7 TERMINATION OR SUSPENSION

8 MISCELLANEOUS PROVISIONS

9 ENUMERATION OF CONTRACT DOCUMENTS

EXHIBIT A INSURANCE AND BONDS
EXHIBIT B DETERMINATION OF THE COST OF THE WORK

ARTICLE 1 THE CONTRACT DOCUMENTS

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

ARTICLE 2 THE WORK OF THIS CONTRACT

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

ARTICLE 3 DATE OF COMMENCEMENT AND DATES OF SUBSTANTIAL COMPLETION

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

[X] The date of this Agreement.

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

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

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

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

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§ 3.3 Substantial Completion of the Project or Portions Thereof

§ 3.3.1 Subject to adjustments of the Contract Time as provided in the Contract Documents, the date of Substantial Completion of the Work of all of the Contractors for the Project will be:
(Insert the date of Substantial Completion of the Work of all Contractors for the Project.)

TBD

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

Portion of Work	Substantial Completion Date
N/A	N/A

§ 3.4 When the Work of this Contract, or any Portion Thereof, is Substantially Complete

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

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

[X] By the following date: TBD

§ 3.4.2 Subject to adjustments of the Contract Time as provided in the Contract Documents, if portions of the Work of this Contract are to be substantially complete prior to when the entire Work of this Contract shall be substantially complete, the Contractor shall substantially complete such portions by the following dates:

Portion of Work	Date to be substantially complete
N/A	N/A

§ 3.4.3 If the Contractor fails to substantially complete the Work of this Contract, or portions thereof, as provided in this Section 3.4, liquidated damages, if any, shall be assessed as set forth in Section 4.5.

ARTICLE 4 CONTRACT SUM

§ 4.1 The Owner shall pay the Contractor the Contract Sum in current funds for the Contractor's performance of the Contract. The Contract Sum shall be one of the following:
(Check the appropriate box.)

[X] Stipulated Sum, in accordance with Section 4.2 below

[ ] Cost of the Work plus the Contractor's Fee, in accordance with Section 4.3 below

[ ] Cost of the Work plus the Contractor's Fee with a Guaranteed Maximum Price, in accordance with Section 4.4 below

(Based on the selection above, complete Section 4.2, 4.3 or 4.4 below.)

§ 4.2 Stipulated Sum

§ 4.2.1 The Contract Sum shall be ($ TBD), subject to additions and deductions as provided in the Contract Documents.

§ 4.2.2 Alternates

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

Item	Price

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

Item	Price	Conditions for Acceptance

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

Item	Price

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

Item	Units and Limitations	Price per Unit ($0.00)

§ 4.3 Liquidated damages, if any:
(Insert terms and conditions for liquidated damages, if any, to be assessed in accordance with Section 3.4.)

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

Cost savings of allowance(s) shall be returned to the Owner upon substantial completion

ARTICLE 5 PAYMENTS

§ 5.1 Progress Payments

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

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

§ 5.1.3 Provided that an Application for Payment is received by the Construction Manager not later than the Twenty-Fourth day of a month, the Owner shall make payment of the amount certified to the Contractor not later than the Thirtieth day of the following month. If an Application for Payment is received by the Construction Manager after the application date fixed above, payment of the amount certified shall be made by the Owner not later than Sixty (60) days after the Construction Manager receives the Application for Payment.
(Federal, state or local laws may require payment within a certain period of time.)

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§ 5.1.4 Progress Payments Where the Contract Sum is Based on a Stipulated Sum

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

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

§ 5.1.4.3 In accordance with AIA Document A232™–2019, General Conditions of the Contract for Construction, Construction Manager as Adviser Edition, and subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

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

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

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

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

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

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

.2 The amount, if any, for Work that remains uncorrected and for which the Architect has previously withheld a Certificate for Payment as provided in Article 9 of AIA Document A232–2019;

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

.4 For Work performed or defects discovered since the last payment application, any amount for which the Architect may withhold payment, or nullify a Certificate of Payment in whole or in part, as provided in Article 9 of AIA Document A232–2019; and

.5 Retainage withheld pursuant to Section 5.1.7.

§ 5.1.5 Retainage

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

3%

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

§ 5.1.5.2 Reduction or limitation of retainage, if any, shall be as follows:
(If the retainage established in Section 5.1.7.1 is to be modified prior to when the entire Work of this Contract is substantially complete, including modifications for completion of portions of the Work as provided in Section 3.4.2, insert provisions for such modifications.)

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§ 5.1.5.3 Except as set forth in this Section 5.1.7.3, when the Work of this Contract is substantially complete, the Contractor may submit an Application for Payment that includes the retainage withheld from prior Applications for Payment pursuant to this Section 5.1.7. The Application for Payment submitted when the Work of this Contract is substantially complete shall not include retainage as follows:
(Insert any other conditions for release of retainage when the Work of this Contract is substantially complete, or upon Substantial Completion of the Work of all Contractors on the Project or portions thereof.)

§ 5.2 Final Payment

§ 5.2.1 Final Payment Where the Contract Sum is Based on a Stipulated Sum

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

.1 the Contractor has fully performed the Contract except for the Contractor's responsibility to correct Work as provided in Article 12 of AIA Document A232–2019, and to satisfy other requirements, if any, which extend beyond final payment; and

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

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

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

18.00 % per annum

ARTICLE 6 DISPUTE RESOLUTION

§ 6.1 Initial Decision Maker

The Architect will serve as Initial Decision Maker pursuant to Article 15 of AIA Document A232–2019, unless the parties appoint below another individual, not a party to this Agreement, to serve as Initial Decision Maker.
(If the parties mutually agree, insert the name, address and other contact information of the Initial Decision Maker, if other than the Architect.)

§ 6.2 Binding Dispute Resolution

For any Claim subject to, but not resolved by, mediation pursuant to Article 15 of AIA Document A232–2019, the method of binding dispute resolution shall be as follows:
(Check the appropriate box.)

[X] Arbitration pursuant to Article 15 of AIA Document A232–2019.

[ ] Litigation in a court of competent jurisdiction.

[ ] Other: *(Specify)*

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

ARTICLE 7 TERMINATION OR SUSPENSION

§ 7.1 Where the Contract Sum is a Stipulated Sum

§ 7.1.1 The Contract may be terminated by the Owner or the Contractor as provided in Article 14 of AIA Document A232–2019.

§ 7.1.1.1 If the Contract is terminated for the Owner's convenience in accordance with Article 14 of AIA Document A232–2019, then the Owner shall pay the Contractor a termination fee as follows, and Construction Manager's fee through the date final completion of the Project.:
(Insert the amount of, or method for determining, the fee, if any, payable to the Contractor following a termination for the Owner's convenience.)

§ 7.1.2 The Work may be suspended by the Owner as provided in Article 14 of AIA Document A232–2019.

§ 7.2.1.3 Termination by the Owner for Convenience

If the Owner terminates the Contract for convenience in accordance with Article 14 of AIA Document A232–2019, then the Owner shall pay the Contractor a termination fee as follows:
(Insert the amount of or method for determining the fee, if any, payable to the Contractor following a termination for the Owner's convenience.)

§ 7.3 Suspension

The Work may be suspended by the Owner as provided in Article 14 of AIA Document A232–2019; in such case, the Contract Sum and Contract Time shall be increased as provided in Article 14 of AIA Document A232–2019, except that the term "profit" shall be understood to mean the Contractor's Fee as described in Section 4.3.2 or 4.4.2, as applicable, of this Agreement.

ARTICLE 8 MISCELLANEOUS PROVISIONS

§ 8.1 Where reference is made in this Agreement to a provision of AIA Document A232–2019 or another Contract Document, the reference refers to that provision as amended or supplemented by other provisions of the Contract Documents.

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

Proctor Lureman
President and CEO

Mike Wilwol
Assistant Vice President

Broadlawns Medical Center
1801 Hickman Road
Des Moines, IA 50314

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

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

§ 8.5 Insurance and Bonds

§ 8.5.1 The Owner and the Contractor shall purchase and maintain insurance as set forth in AIA Document A132™–2019, Standard Form of Agreement Between Owner and Contractor, Construction Manager as Adviser Edition, Exhibit A, Insurance and Bonds, and elsewhere in the Contract Documents.

§ 8.5.2 The Contractor shall provide bonds as set forth in AIA Document A132™–2019, Exhibit A, and elsewhere in the Contract Documents.

§ 8.6 Notice in electronic format, pursuant to Article 1 of AIA Document A232–2019, may be given in accordance with AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, if completed, or as otherwise set forth below:

(If other than in accordance with AIA Document E203–2013, insert requirements for delivering notice in electronic format such as name, title, and email address of the recipient and whether and how the system will be required to generate a read receipt for the transmission.)

§ 8.7 Relationship of the Parties

Where the Contract is based on the Cost of the Work plus the Contractor's Fee, with or without a Guaranteed Maximum Price, the Contractor accepts the relationship of trust and confidence established by this Agreement and covenants with the Owner to cooperate with the Architect and exercise the Contractor's skill and judgment in furthering the interests of the Owner; to furnish efficient business administration and supervision; to furnish at all times an adequate supply of workers and materials; and to perform the Work in an expeditious and economical manner consistent with the Owner's interests. The Owner agrees to furnish and approve, in a timely manner, information required by the Contractor and to make payments to the Contractor in accordance with the requirements of the Contract Documents.

§ 8.8 Other provisions:

ARTICLE 9 ENUMERATION OF CONTRACT DOCUMENTS

§ 9.1 This Agreement is comprised of the following documents:

- **.1** AIA Document A132™–2019, Standard Form of Agreement Between Owner and Contractor, Construction Manager as Adviser Edition
- **.2** AIA Document A132™–2019, Exhibit A, Insurance and Bonds Exhibit
- **.3** AIA Document A232™–2019, General Conditions of the Contract for Construction, Construction Manager as Adviser Edition
- **.4** AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, dated as indicated below:

(Insert the date of the E203-2013 incorporated into this Agreement.)

- **.5** Drawings

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Number	Title	Date
TBD		

.6 Specifications

Section	Title	Date	Pages
TBD			

.7 Addenda, if any:

Number	Date	Pages
TBD		

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

.8 Other Exhibits:

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

[ ] AIA Document A132™–2019, Exhibit B, Determination of the Cost of the Work

[ ] AIA Document E235™–2019, Sustainable Projects Exhibit, Construction Manager as Adviser Edition, dated as indicated below:

(Insert the date of the E235-2019 incorporated into this Agreement.)

[ ] The Sustainability Plan:

Title	Date	Pages

[ ] Supplementary and other Conditions of the Contract:

Document	Title	Date	Pages

.9 Other documents, if any, listed below:

(List here any additional documents that are intended to form part of the Contract Documents. AIA Document A232–2019 provides that the advertisement or invitation to bid, Instructions to Bidders, sample forms, the Contractor's bid or proposal, portions of Addenda relating to bidding or proposal requirements, and other information furnished by the Owner in anticipation of receiving bids or proposals, are not part of the Contract Documents unless enumerated in this Agreement. Any such documents should be listed here only if intended to be part of the Contract Documents.)

Exhibit X - Signed Bid Package
Exhibit X - Bid Schedule

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

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OWNER *(Signature)*

(Printed name and title)

CONTRACTOR *(Signature)*

(Printed name and title)



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AIA® Document A132® – 2019 Exhibit A

Insurance and Bonds

This Insurance and Bonds Exhibit is part of the Agreement, between the Owner and the Contractor, dated the Twenty-fourth day of September in the year Two Thousand Twenty-Six
(In words, indicate day, month, and year.)

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

Broadlawns Medical Center Brain & Memory Clinic
3714 Ingersoll Ave
Des Moines, IA 50312

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

Broadlawns Medical Center
1801 Hickman Rd
Des Moines, IA 50314

THE CONTRACTOR:
(Name, legal status, and address)

To be determined by Public bid.

TABLE OF ARTICLES

A.1 GENERAL

A.2 OWNER'S INSURANCE

A.3 CONTRACTOR'S INSURANCE AND BONDS

A.4 SPECIAL TERMS AND CONDITIONS

ARTICLE A.1 GENERAL

The Owner and Contractor shall purchase and maintain insurance, and provide bonds, as set forth in this Exhibit. As used in this Exhibit, the term General Conditions refers to AIA Document A232™–2019, General Conditions of the Contract for Construction.

ARTICLE A.2 OWNER'S INSURANCE

§ A.2.1 General

Prior to commencement of the Work, the Owner shall secure the insurance, and provide evidence of the coverage, required under this Article A.2 and, upon the Contractor's request, provide a copy of the property insurance policy or policies required by Section A.2.3. The copy of the policy or policies provided shall contain all applicable conditions, definitions, exclusions, and endorsements.

ADDITIONS AND DELETIONS: The author of this document may have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added to or deleted from the original AIA text.

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

This document is intended to be used in conjunction with AIA Document A232™–2019, General Conditions of the Contract for Construction. Article 11 of A232™–2019 contains additional insurance provisions





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§ A.2.2 Liability Insurance

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

§ A.2.3 Required Property Insurance

§ A.2.3.1 Unless this obligation is placed on the Contractor pursuant to Section A.3.3.2.1, the Owner shall purchase and maintain, from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located, property insurance written on a builder's risk "all-risks" completed value or equivalent policy form and sufficient to cover the total value of the entire Project on a replacement cost basis. The Owner's property insurance coverage shall be no less than the amount of the initial Contract Sum, plus the value of subsequent Modifications and labor performed and materials or equipment supplied by others. The property insurance shall be maintained until Substantial Completion and thereafter as provided in Section A.2.3.1.3, unless otherwise provided in the Contract Documents or otherwise agreed in writing by the parties to this Agreement. This insurance shall include the interests of the Owner, Contractor, Subcontractors, and Sub-subcontractors in the Project as insureds. This insurance shall include the interests of mortgagees as loss payees.

§ A.2.3.1.1 Causes of Loss. The insurance required by this Section A.2.3.1 shall provide coverage for direct physical loss or damage, and shall not exclude the risks of fire, explosion, theft, vandalism, malicious mischief, collapse, earthquake, flood, or windstorm. The insurance shall also provide coverage for ensuing loss or resulting damage from error, omission, or deficiency in construction methods, design, specifications, workmanship, or materials. Sub-limits, if any, are as follows:

(Indicate below the cause of loss and any applicable sub-limit.)

Causes of Loss	Sub-Limit

§ A.2.3.1.2 Specific Required Coverages. The insurance required by this Section A.2.3.1 shall provide coverage for loss or damage to false work and other temporary structures, and to building systems from testing and startup. The insurance shall also cover debris removal, including demolition occasioned by enforcement of any applicable legal requirements, and reasonable compensation for the Architect's, Construction Manager's, and Contractor's services and expenses required as a result of such insured loss, including claim preparation expenses. Sub-limits, if any, are as follows:

(Indicate below type of coverage and any applicable sub-limit for specific required coverages.)

Coverage	Sub-Limit

§ A.2.3.1.3 Unless the parties agree otherwise, upon Substantial Completion, the Owner shall continue the insurance required by Section A.2.3.1 or, if necessary, replace the insurance policy required under Section A.2.3.1 with property insurance written for the total value of the Project that shall remain in effect until expiration of the period for correction of the Work set forth in Section 12.2.2 of the General Conditions.

§ A.2.3.1.4 Deductibles and Self-Insured Retentions. If the insurance required by this Section A.2.3 is subject to deductibles or self-insured retentions, the Owner shall be responsible for all loss not covered because of such deductibles or retentions.

§ A.2.3.2 Occupancy or Use Prior to Substantial Completion. The Owner's occupancy or use of any completed or partially completed portion of the Work prior to Substantial Completion shall not commence until the insurance company or companies providing the insurance under Section A.2.3.1 have consented in writing to the continuance of coverage. The Owner and the Contractor shall take no action with respect to partial occupancy or use that would cause cancellation, lapse, or reduction of insurance, unless they agree otherwise in writing.

§ A.2.3.3 Insurance for Existing Structures

If the Work involves remodeling an existing structure or constructing an addition to an existing structure, the Owner shall purchase and maintain, until the expiration of the period for correction of Work as set forth in Section 12.2.2 of the General Conditions, "all-risks" property insurance, on a replacement cost basis, protecting the existing structure against

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direct physical loss or damage from the causes of loss identified in Section A.2.3.1, notwithstanding the undertaking of the Work. The Owner shall be responsible for all co-insurance penalties.

§ A.2.4 Optional Extended Property Insurance.

The Owner shall purchase and maintain the insurance selected and described below.

(Select the types of insurance the Owner is required to purchase and maintain by placing an X in the box(es) next to the description(s) of selected insurance. For each type of insurance selected, indicate applicable limits of coverage or other conditions in the fill point below the selected item.)

[ ] **§ A.2.4.1 Loss of Use, Business Interruption, and Delay in Completion Insurance**, to reimburse the Owner for loss of use of the Owner's property, or the inability to conduct normal operations due to a covered cause of loss.

[ ] **§ A.2.4.2 Ordinance or Law Insurance**, for the reasonable and necessary costs to satisfy the minimum requirements of the enforcement of any law or ordinance regulating the demolition, construction, repair, replacement or use of the Project.

[ ] **§ A.2.4.3 Expediting Cost Insurance**, for the reasonable and necessary costs for the temporary repair of damage to insured property, and to expedite the permanent repair or replacement of the damaged property.

[ ] **§ A.2.4.4 Extra Expense Insurance**, to provide reimbursement of the reasonable and necessary excess costs incurred during the period of restoration or repair of the damaged property that are over and above the total costs that would normally have been incurred during the same period of time had no loss or damage occurred.

[ ] **§ A.2.4.5 Civil Authority Insurance**, for losses or costs arising from an order of a civil authority prohibiting access to the Project, provided such order is the direct result of physical damage covered under the required property insurance.

[ ] **§ A.2.4.6 Ingress/Egress Insurance**, for loss due to the necessary interruption of the insured's business due to physical prevention of ingress to, or egress from, the Project as a direct result of physical damage.

[ ] **§ A.2.4.7 Soft Costs Insurance**, to reimburse the Owner for costs due to the delay of completion of the Work, arising out of physical loss or damage covered by the required property insurance: including construction loan fees; leasing and marketing expenses; additional fees, including those of architects, engineers, consultants, attorneys and accountants, needed for the completion of the construction, repairs, or reconstruction; and carrying costs such as property taxes, building permits, additional interest on loans, realty taxes, and insurance premiums over and above normal expenses.

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§ A.2.5 Other Optional Insurance.
The Owner shall purchase and maintain the insurance selected below.
(Select the types of insurance the Owner is required to purchase and maintain by placing an X in the box(es) next to the description(s) of selected insurance.)

[ ] **§ A.2.5.1 Cyber Security Insurance** for loss to the Owner due to data security and privacy breach, including costs of investigating a potential or actual breach of confidential or private information.
(Indicate applicable limits of coverage or other conditions in the fill point below.)

[ ] **§ A.2.5.2 Other Insurance**
(List below any other insurance coverage to be provided by the Owner and any applicable limits.)

Coverage	**Limits**

ARTICLE A.3 CONTRACTOR'S INSURANCE AND BONDS
§ A.3.1 General
§ A.3.1.1 Certificates of Insurance. The Contractor shall provide certificates of insurance acceptable to the Owner evidencing compliance with the requirements in this Article A.3 at the following times: (1) prior to commencement of the Work; (2) upon renewal or replacement of each required policy of insurance; and (3) upon the Owner's written request. An additional certificate evidencing continuation of commercial liability coverage, including coverage for completed operations, shall be submitted with the final Application for Payment and thereafter upon renewal or replacement of such coverage until the expiration of the periods required by Section A.3.2.1 and Section A.3.3.1. The certificates will show the Owner as an additional insured on the Contractor's Commercial General Liability and excess or umbrella liability policy or policies.

§ A.3.1.2 Deductibles and Self-Insured Retentions. The Contractor shall disclose to the Owner any deductible or self-insured retentions applicable to any insurance required to be provided by the Contractor.

§ A.3.1.3 Additional Insured Obligations. To the fullest extent permitted by law, the Contractor shall cause the commercial general liability coverage to include (1) the Owner, the Architect and the Architect's consultants, and the Construction Manager and the Construction Manager's consultants, as additional insureds for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's operations; and (2) the Owner as an additional insured for claims caused in whole or in part by the Contractor's negligent acts or omissions for which loss occurs during completed operations. The additional insured coverage shall be primary and non-contributory to any of the Owner's general liability insurance policies and shall apply to both ongoing and completed operations. To the extent commercially available, the additional insured coverage shall be no less than that provided by Insurance Services Office, Inc. (ISO) forms CG 20 10 07 04, CG 20 37 07 04, and, with respect to the Architect and the Architect's consultants, and the Construction Manager and the Construction Manager's consultants, CG 20 32 07 04.

§ A.3.2 Contractor's Required Insurance Coverage
§ A.3.2.1 The Contractor shall purchase and maintain the following types and limits of insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Contractor shall maintain the required insurance until the expiration of the period for correction of Work as set forth in Section 12.2.2 of the General Conditions, unless a different duration is stated below:
(If the Contractor is required to maintain insurance for a duration other than the expiration of the period for correction of Work, state the duration.)

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§ A.3.2.2 Commercial General Liability

§ A.3.2.2.1 Commercial General Liability insurance for the Project written on an occurrence form with policy limits of not less than One Million Dollars and Zero Cents ($ 1,000,000.00) each occurrence, Two Million Dollars and Zero Cents ($ 2,000,000.00) general aggregate, and Two Million Dollars and Zero Cents ($ 2,000,000.00) aggregate for products-completed operations hazard, providing coverage for claims including

.1 damages because of bodily injury, sickness or disease, including occupational sickness or disease, and death of any person;

.2 personal injury and advertising injury;

.3 damages because of physical damage to or destruction of tangible property, including the loss of use of such property;

.4 bodily injury or property damage arising out of completed operations; and

.5 the Contractor's indemnity obligations under Section 3.18 of the General Conditions.

§ A.3.2.2.2 The Contractor's Commercial General Liability policy under this Section A.3.2.2 shall not contain an exclusion or restriction of coverage for the following:

.1 Claims by one insured against another insured, if the exclusion or restriction is based solely on the fact that the claimant is an insured, and there would otherwise be coverage for the claim.

.2 Claims for property damage to the Contractor's Work arising out of the products-completed operations hazard where the damaged Work or the Work out of which the damage arises was performed by a Subcontractor.

.3 Claims for bodily injury other than to employees of the insured.

.4 Claims for indemnity under Section 3.18 of the General Conditions arising out of injury to employees of the insured.

.5 Claims or loss excluded under a prior work endorsement or other similar exclusionary language.

.6 Claims or loss due to physical damage under a prior injury endorsement or similar exclusionary language.

.7 Claims related to residential, multi-family, or other habitational projects, if the Work is to be performed on such a project.

.8 Claims related to roofing, if the Work involves roofing.

.9 Claims related to exterior insulation finish systems (EIFS), synthetic stucco or similar exterior coatings or surfaces, if the Work involves such coatings or surfaces.

.10 Claims related to earth subsidence or movement, where the Work involves such hazards.

.11 Claims related to explosion, collapse and underground hazards, where the Work involves such hazards.

§ A.3.2.3 Automobile Liability covering vehicles owned, and non-owned vehicles used, by the Contractor, with policy limits of not less than One Million Dollars and Zero Cents ($ 1,000,000.00) per accident, for bodily injury, death of any person, and property damage arising out of the ownership, maintenance and use of those motor vehicles along with any other statutorily required automobile coverage.

§ A.3.2.4 The Contractor may achieve the required limits and coverage for Commercial General Liability and Automobile Liability through a combination of primary and excess or umbrella liability insurance, provided such primary and excess or umbrella insurance policies result in the same or greater coverage as the coverages required under Section A.3.2.2 and A.3.2.3, and in no event shall any excess or umbrella liability insurance provide narrower coverage than the primary policy. The excess policy shall not require the exhaustion of the underlying limits only through the actual payment by the underlying insurers.

§ A.3.2.5 Workers' Compensation at statutory limits.

§ A.3.2.6 Employers' Liability with policy limits not less than One Million Dollars and Zero Cents ($ 1,000,000.00) each accident, One Million Dollars and Zero Cents ($ 1,000,000.00) each employee, and One Million Dollars and Zero Cents ($ 1,000,000.00) policy limit.

§ A.3.2.7 Jones Act, and the Longshore & Harbor Workers' Compensation Act, as required, if the Work involves hazards arising from work on or near navigable waterways, including vessels and docks

§ A.3.2.8 If the Contractor is required to furnish professional services as part of the Work, the Contractor shall procure

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Professional Liability insurance covering performance of the professional services, with policy limits of not less than Three Million Dollars and Zero Cents ($ 3,000,000.00) per claim and Three Million Dollars and Zero Cents ($ 3,000,000.00) in the aggregate.

§ A.3.2.9 If the Work involves the transport, dissemination, use, or release of pollutants, the Contractor shall procure Pollution Liability insurance, with policy limits of not less than Three Million Dollars and Zero Cents ($ 3,000,000.00) per claim and Three Million Dollars and Zero Cents ($ 3,000,000.00) in the aggregate.

§ A.3.2.10 Coverage under Sections A.3.2.8 and A.3.2.9 may be procured through a Combined Professional Liability and Pollution Liability insurance policy, with combined policy limits of not less than Three Million Dollars and Zero Cents ($ 3,000,000.00) per claim and Three Million Dollars and Zero Cents ($ 3,000,000.00) in the aggregate.

§ A.3.2.11 Insurance for maritime liability risks associated with the operation of a vessel, if the Work requires such activities, with policy limits of not less than Zero Dollars and Zero Cents ($ 0.00) per claim and Zero Dollars and Zero Cents ($ 0.00) in the aggregate.

§ A.3.2.12 Insurance for the use or operation of manned or unmanned aircraft, if the Work requires such activities, with policy limits of not less than Zero Dollars and Zero Cents ($ 0.00) per claim and Zero Dollars and Zero Cents ($ 0.00) in the aggregate.

§ A.3.3 Contractor's Other Insurance Coverage

§ A.3.3.1 Insurance selected and described in this Section A.3.3 shall be purchased from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Contractor shall maintain the required insurance until the expiration of the period for correction of Work as set forth in Section 12.2.2 of the General Conditions, unless a different duration is stated below:

(If the Contractor is required to maintain any of the types of insurance selected below for a duration other than the expiration of the period for correction of Work, state the duration.)

§ A.3.3.2 The Contractor shall purchase and maintain the following types and limits of insurance in accordance with Section A.3.3.1.

(Select the types of insurance the Contractor is required to purchase and maintain by placing an X in the box(es) next to the description(s) of selected insurance. Where policy limits are provided, include the policy limit in the appropriate fill point.)

[ ] **§ A.3.3.2.1** If there is only one Contractor performing the Work on the Project, property insurance of the same type and scope satisfying the requirements identified in Section A.2.3, which, if selected in this section A.3.3.2.1, relieves the Owner of the responsibility to purchase and maintain such insurance except insurance required by Section A.2.3.1.3 and Section A.2.3.3. The Contractor shall comply with all obligations of the Owner under Section A.2.3 except to the extent provided below. The Contractor shall disclose to the Owner the amount of any deductible, and the Owner shall be responsible for losses within the deductible. Upon request, the Contractor shall provide the Owner with a copy of the property insurance policy or policies required. The Owner shall adjust and settle the loss with the insurer and be the trustee of the proceeds of the property insurance in accordance with Article 11 of the General Conditions unless otherwise set forth below:

(Where the Contractor's obligation to provide property insurance differs from the Owner's obligations as described under Section A.2.3, indicate such differences in the space below. Additionally, if a party other than the Owner will be responsible for adjusting and settling a loss with the insurer and acting as the trustee of the proceeds of property insurance in accordance with Article 11 of the General Conditions, indicate the responsible party below.)

[ ] **§ A.3.3.2.2 Railroad Protective Liability Insurance**, with policy limits of not less than ($)

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per claim and ($) in the aggregate, for Work within fifty (50) feet of railroad property.

[ ] **§ A.3.3.2.3 Asbestos Abatement Liability Insurance**, with policy limits of not less than ($) per claim and ($) in the aggregate, for liability arising from the encapsulation, removal, handling, storage, transportation, and disposal of asbestos-containing materials.

[ ] **§ A.3.3.2.4** Insurance for physical damage to property while it is in storage and in transit to the construction site on an "all-risks" completed value form.

[ ] **§ A.3.3.2.5** Property insurance on an "all-risks" completed value form, covering property owned by the Contractor and used on the Project, including scaffolding and other equipment.

[ ] **§ A.3.3.2.6 Other Insurance**

(List below any other insurance coverage to be provided by the Contractor and any applicable limits.)

Coverage	**Limits**

§ A.3.4 Performance Bond and Payment Bond

The Contractor shall provide surety bonds, from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located, as follows:
(Specify type and penal sum of bonds.)

Type	**Penal Sum ($0.00)**
Payment Bond	Written in the amount of the contract sum
Performance Bond	Written in the amount of the contract sum

Payment and Performance Bonds shall be AIA Document A312™, Payment Bond and Performance Bond, or contain provisions identical to AIA Document A312™, current as of the date of this Agreement.

ARTICLE A.4 SPECIAL TERMS AND CONDITIONS

Special terms and conditions that modify this Insurance and Bonds Exhibit, if any, are as follows:

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SECTION 00 60 00
GENERAL CONDITIONS

ARTICLE 1 – GENERAL CONDITIONS

1 AIA Document A232/CMa General Conditions of the Contract for Construction, 2009 Construction Manager as Adviser Edition, is the General Conditions between the Owner and the Contractor, is bound within this project manual as part of the Contract Documents.

Modified AIA A232/CMa General Conditions Attached

END OF SECTION 00 60 00

SECTION 00 70 00
INSURANCE REQUIREMENTS

ARTICLE 1 – SAMPLE INSURANCE CERTIFICATE

1. The Owner has determined the minimum insurance requirements during the execution of this agreement. See the sample insurance certificate for limits, waiver of subrogation, & additional insured requirements.

2. Attached sample insurance certificate will be Exhibit E in the AIA Document A132 Agreement.

END OF SECTION 00 70 00

CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY)

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER	CONTACT NAME:	
SAMPLE CERTIFICATE	PHONE (A/C, No, Ext):	FAX (A/C, No):
	E-MAIL ADDRESS:	

INSURER(S) AFFORDING COVERAGE	NAIC #
INSURER A :	
INSURER B :	
INSURER C :	
INSURER D :	
INSURER E :	
INSURER F :	

INSURED

COVERAGES **CERTIFICATE NUMBER:** **REVISION NUMBER:**

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	ADDL INSR	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS	
	GENERAL LIABILITY							
	[X] COMMERCIAL GENERAL LIABILITY	Y	Y				EACH OCCURRENCE	$ 1,000,000
	[ ] CLAIMS-MADE [X] OCCUR						DAMAGE TO RENTED PREMISES (Ea occurrence)	$ 300,000
							MED EXP (Any one person)	$ 10,000
	[X] Contractual Liability						PERSONAL & ADV INJURY	$ 1,000,000
	GEN'L AGGREGATE LIMIT APPLIES PER:						GENERAL AGGREGATE	$ 2,000,000
	[ ] POLICY [X] PRO-JECT [X] LOC						PRODUCTS - COMP/OP AGG	$ 2,000,000
								$
	AUTOMOBILE LIABILITY	N	N				COMBINED SINGLE LIMIT (Ea accident)	$ 1,000,000
	[X] ANY AUTO						BODILY INJURY (Per person)	$
	[ ] ALL OWNED AUTOS [ ] SCHEDULED AUTOS						BODILY INJURY (Per accident)	$
	[X] HIRED AUTOS [X] NON-OWNED AUTOS						PROPERTY DAMAGE (Per accident)	$
								$
	[ ] **UMBRELLA LIAB** [X] OCCUR	N	N				EACH OCCURRENCE	$ 5,000,000
	[X] **EXCESS LIAB** [ ] CLAIMS-MADE						AGGREGATE	$ 5,000,000
	[ ] DED [X] RETENTION $ 10,000							$
	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY Y / N						[ ] WC STATU-TORY LIMITS [ ] OTH-ER	
	ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICE/MEMBER EXCLUDED? N	N / A	N				E.L. EACH ACCIDENT	$ 1,000,000
	(Mandatory in NH) If yes, describe under DESCRIPTION OF OPERATIONS below						E.L. DISEASE - EA EMPLOYEE	$ 1,000,000
							E.L. DISEASE - POLICY LIMIT	$ 1,000,000
		[ ]	[ ]					

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (Attach ACORD 101, Additional Remarks Schedule, if more space is required)

Re: Broadlawns Medical Center - Brain and Memory Center
Additional Insured as required by written contract on a Primary and Non-Contributory basis with respect to
General Liability: Graham Construction Company, Simonson & Associates Architects, and Owner or Owner's agents.
Waiver of Subrogation: Graham Construction Company, Simonson & Associates Architects, and Owner or Owner's agents.

CERTIFICATE HOLDER

Broadlawns Medical Center
Attn: Proctor Lureman
1801 Hickman Road
Des Moines, IA 50314

CANCELLATION

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.

AUTHORIZED REPRESENTATIVE

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Clear All

SECTION 00 80 00

GENERAL REQUIREMENTS

The following general provisions ***shall apply to all bid packages.***

1. Plans by Simonson Associates & Architects dated September 29th, 2026.
2. Specifications from the Project Manual by Simonson Associates & Architects dated September 29th, 2026.
3. Furnish complete all necessary labor, materials, office and field supervision, insurance, tools, equipment, layout, hoisting, rigging, shoring, shop drawings, submittals, permits, licenses and fees necessary to complete the work outlined below. Include all shift pay, overtime, weekend and holiday pay to complete the work in the scheduled durations shown in the project schedule in Specification Section 01 52 00. It is the responsibility of each bid package to monitor schedule and notify the construction manager immediately. Include all cost associated with shifting schedule activities as required to stay on schedule.
4. Work that is not specifically shown, listed or detailed in the Contract Documents, but necessary for a complete system and could be reasonably inferred by the nature of the scope of work shall be included in this bid. In the event there is a contradiction in the plans or specification, request clarification or assume the more costly option.
5. All work in this Bid Package shall be provided in accordance with OSHA regulations and applicable state and local codes. Prior to mobilization to the jobsite, provide proof of all training and certificates required and provide written safety manual and fall protection programs. Sloped excavations and trenches shall meet OSHA requirements. Excavations and trenches are to be fenced off at the end of each working shift.
6. All work to follow Graham safety standards as listed in Graham's safety manual.
7. For all work with corrosive or cementitious material, or as otherwise directed by SDS, provide an eye wash station, capable of providing 15 minutes of continuous flushing.
8. The existing clinic and site will be remodeled and constructed in multiple phases. Carefully review phasing diagrams and access to the construction area. Contractors will be responsible to coordinate with the Construction Manger to complete phases as required.
9. The general construction building permit will be applied for and paid for by the Construction Manager. Each Prime Contractor shall apply for and pay for any and all permits required to complete their specific bid package scope of work.
10. Dress code: Each Prime Contractor, Subcontractor, Sub-Subcontractor, delivery drivers, equipment drivers/ operators, etc. shall ensure that each worker has the following and is worn at all times. The Construction Manager has the right to ease the requirements at their discretion.
    a. Hard hat, safety glasses, work boots/shoes meeting OSHA requirements.
    b. High visibility vests (or equivalent shirts/coats).
    c. Proper PPE for task at hand.
    d. Pants (no shorts).
    e. Sleeved shirt.
11. Jobsite hours will consist of 7 A.M- 4:30 P.M Monday-Friday (exception will be holidays). Any other work occurring outside of those times must be coordinated with the Construction Manager.
12. Each Prime Contractor, Subcontractor, Sub-Subcontractor, etc. shall ensure that each worker follows the rules including, but not limited to:
    a. No tobacco products shall be used within the construction area or on hospital property. This includes the use of e-cigarettes, etc.
    b. No weapons are permitted onsite, in vehicles, or on the property of Broadlawns.

13. Take adequate safety precautions to protect patients, visitors, hospital staff and other construction workers as needed or required by OSHA requirements. Coordinate with the Construction Manager and Owner when closing an occupied area for exploratory and/or construction activities.
14. This project will be a WORKSAFE project and will require a consultation meeting with all prime contractors. Monthly safety audits will occur and all corrective action items must be addressed by appropriate contractor within 48 hours.
15. The cost of testing and inspections shall be paid for by the Owner as indicated in the Contract Documents. All testing and inspections shall be called for by each Prime Contractor and shall be coordinated with the Construction Manager. The cost for any re-inspections or return trips due to incomplete work, failed tests or inspections, or lack of scheduling will be the responsibility of that Contractor.
16. Construction employee/company vehicle parking will only be allowed in areas designated by the Construction Manager.
17. Each contractor shall provide their own power/utilities to storage containers or office trailer. Each trade partner required to provide their own potable and non-potable water.
18. Each Prime Contractor is responsible to transport/haul their debris to a dumpster provided by bid package 01. Each Prime Contractor is responsible for providing means (dumpster cart, garbage container, etc.) of transporting their scrap construction material to the dumpster. Any salvaged materials will need to be taken to a location determined by the Construction Manager / Owner.
19. Where work occurs in existing areas/rooms that have finishes to remain, install poly and/or other means to protect existing cabinetry, equipment and room finishes.
20. All work above ceilings where those ceilings are not shown to be removed and replaced in the Contract Documents will need to be removed and replaced. This note applies to phasing and scheduling as well. For any work that occurs above ceilings before or after those ceilings get replaced because of phasing, each contractor will need to remove and replace ceilings as needed to do the work and will be responsible for any damages incurred.
21. The construction site is limited for materials and equipment. Coordinate material and equipment locations with the Construction Manager. Anything that needs to move out of the construction area will need to be kept in a staging area directed by the Construction Manager. The cost to move materials needs to be included. Each Prime Contractor is responsible for their own stored materials and equipment.
22. Each Prime Contractor shall provide ***daily*** jobsite clean-up for debris and dust generated by the installation of their scope of work. Each Prime Contractor is responsible to transport/haul their construction debris to dumpsters provided by their own bid package. ***Daily*** jobsite clean-up shall consist of all prime contractor's employees cleaning the work area for at least 30 minutes before leaving INCLUDING sweeping with compound, mopping, etc. Each contractor is responsible for providing their own sweeping compound.
23. Locate and protect all existing underground and overhead utilities to remain. Confirm locations and depths of existing underground utilities as required. This includes both public and private locates.
24. Provide and maintain all barricades required to protect the public and workers. Barricades will remain in place until work by all bid packages is complete. Remove barricades after work is complete. Barricades shall clearly mark and block the hazards present and keep the public and other workers safe from harm.
25. The cost to move materials shall be included. Include receiving all deliveries, unloading, and moving of materials as it relates to each bid package. This includes any equipment needed to accept deliveries, move materials, etc. All deliveries must be coordinated and scheduled with the Construction Manager.

26. Clean streets and roadways to keep them free of dirt, mud and debris generated by this scope of work. Clean daily or more often as site conditions require. Fill any wheel tracks, etc. from deliveries or equipment daily or more frequently if needed.
27. Each Prime Contractor shall provide, maintain, and empty a concrete wash-out container for use of any concrete, grout, mortar, etc. generated by construction activity. The concrete wash-out spoils shall be disposed off-site in a legal manner. Concrete wash out shall be installed and maintained per SWPPP requirements. Coordinate all aspects of the concrete wash-out with Construction Manager. NOTE: Any other means of concrete wash out shall be approved by the Construction Manager 10 days prior to commencement of concrete or other cementitious work.
28. Each Prime Contractor is responsible for protecting their work until acceptance by the owner. Each Prime Contractor is responsible for respecting the work completed by all other Prime Contractors and shall be responsible for replacing anything damaged.
29. All extension cords shall be rolled up and checked for cuts or defects at the end of each workday.
30. Each Prime Contractor is responsible for providing fresh, clean, potable water for their workers and workers of their subcontractors and sub-subcontractors per OSHA requirements.
31. Each Prime Contractor shall provide all layout and surveying as required to complete their scope of work.
32. Include all necessary dewatering as required for the complete installation of work included in your Bid Package.
33. Each bid package is responsible for replacing anything they damage such as spray fireproofing, building components, etc. that are damaged or compromised by their work. This includes patching any fireproofing removed for hangers, all thread, steel connections, or any other purpose. Patching to repaired immediately after damage occurs. Patching must meet all UL requirements.
34. The Owner has salvage rights to any materials being removed / demolished for the construction of this project. Any materials the Owner does not want to retain will be removed as noted by the Contract Documents or as needed for construction.
35. Each Prime Contractor is responsible for cutting/drilling, protecting, covering, and patching penetrations in the roof, slab on deck, slab on grade and walls to install their work. Make the Construction Manager aware of all penetrations, holes, etc. prior to cutting or uncovering. Follow all OSHA guidelines for covering, securing, and marking holes.
36. Each Prime Contractor is responsible to have a minimum of one English speaking supervisor on-site during the duration of the contractor's work.
37. Each Prime Contractor is responsible to supervise any and all subcontractors and suppliers under their contract. If the Construction Manager has to supervise or coordinate a Prime Contractors workers or subcontractors, the Construction Manager will charge $130 per hour.
38. Provide all work per the contract schedule. Durations are not always intended to be cumulative and must be interpreted to the context shown in the schedule. The Subcontractor understands that there will be concurrent work activities taking place that may require additional supervision, manpower, and equipment or material deliveries to accommodate the schedule needs. Provide sufficient labor, material, and equipment to maintain progress in accordance with project schedule. Durations for each activity are to be maintained. Start dates are subject to move due to weather or design delays.
39. Provide construction equipment pad as needed based on construction schedule for any equipment needing special pad or bearing requirements.
40. Each Prime Contractor is responsible for replacing anything damaged or disturbed by their work. Each Prime Contractor shall restore all public and private land disturbed by their bid package to the original condition.
41. The use of internal combustion type equipment inside the building shall be approved by the Construction Manager prior to commencement of the work. For any internal combustion

equipment used, provide carbon monoxide/carbon dioxide scrubbers on the equipment. Contractor is to provide carbon monoxide monitors to ensure work area is safe for others.

42. Coordinate shop drawings and installation sequencing with other trade contractors. All work shall be installed to provide the maximum benefit to the Owner and allow for full access to equipment requiring maintenance.
43. Prime Contractors are responsible for providing a fire watch on a continuous basis if they need to shut the Fire Protection system down any longer 4 hours until the system is active. Hot work permits will be required
44. This project will utilize Last Planner Construction Schedule tools to plan the work, update the schedule, and monitor progress. It is a requirement to provide all paperwork and attend all meetings as requested by the Contractor/Construction Manager. Some of the items included are, but not limited to:
    a. A minimum of one scheduled coordination meeting per phase will be held with the Subcontractor/Prime project managers and foremen. These meetings may last a full day and are mandatory. In this meeting, you will be required to list all activities, assign accurate durations, and work with other contractors to sequence the activities as a group.
    b. Weekly foremen's meetings will be held where weekly work plans (WWP's) will be turned in to the Contractor/Construction Manager for review and the 6-week project schedule will be discussed. Weekly work plans are required to be turned in prior to the weekly meeting so all activities can be compiled into one WWP and distributed at the meeting.
    c. Daily stand-up meetings are a daily progress check and planning session for the following day. These meetings will be held on the project site, foremen for all trades on site are required to be there, and they should take no longer than fifteen minutes per day.
45. Progress meetings will be held twice a month and are mandatory for trades having work starting within the next 6 weeks. The representative at each meeting must have authority to make decisions on schedule, manpower and costs.
46. Procore will be used for maintaining project information. Each contractor shall check Procore at a minimum of twice a week. The cost of Procore is by the Construction Manager. Each prime contractor is responsible to field verify all dimensions prior to fabrication of products.
47. Each Prime Contractor will be responsible for completing two punch lists per phase. One for the Construction Manager and one for the Architect / Owner. Corrections to the Construction Manager punch list must be complete before the Architect / Owner punch list starts.
48. For work occurring outside temporary barricades shown on the phasing plan, each contractor is responsible to provide the construction shown for their scope of work along with temporary construction barriers, negative air machine placement and monitoring, access to their work (remove and replace ceilings, sections of walls etc.) demolition and clean-up. The area in and around the construction should be returned to existing or better condition after the construction is completed.
49. All submittals and shop drawings will be required within 30 days from Notice to Proceed (NTP). *Note: Long lead time items that impact the early portions of the project schedule will be required earlier than the minimum date for all submittals. Efforts must be made to procure materials in order to maintain the project schedule.
50. Controlled access zones are to be flagged off during the process of work around crane counterweights and concrete pump boom radius.
51. All contractor carried allowances must be approved prior to use and must be accompanied by T&M tickets signed by Construction Manager. T&M tickets must be submitted for approval to the Construction Manager within 72 hours, anything after 72 hours will be rejected. All allowances shall be broken out on the AIA pay applications.
52. Each prime contractor is responsible to field verify all dimensions prior to fabrication of products.

53. Safety related observations are to be corrected with 48 hours. All other site observation reports must be corrected within 5 working days or not to alter the schedule, whichever is duration is shorter.
54. Contractor will be responsible to research any existing conditions.
55. All individuals working on site will be required to check-in and review site specific requirements with the Construction Manager.
56. Closeouts are the responsibility of this agreement. Provide all closeouts in a timely manner. All closeouts will be due by dates designated in Procore or 3 months prior to substantial completion, whichever date is earlier. Your payment applications shall include a line item for closeout completion at a value of no less than 3% of the agreement value and you may bill for this upon full completion of your closeouts. This schedule of values line item is not part of any retainage. Owner training and as-builts are exempt from the schedule of values line items, but these are required prior to substantial completion of the project and/or phasing.
57. Contractor to be adequately qualified to perform work in a healthcare environment as outlined below:
    a. Contractor has completed (3) similar projects in size, type, and scope in the past (7) years.
        I. Contractor to provide reference list with bid including customer contract information.
    b. Contractor will have sufficient manpower to staff the project to meet the project schedule outlined in Specifications.
    c. Contractor must have a competent person on site during all times while any direct subcontractors are on site.
    d. Field and office management/supervisors must have a minimum of three years of healthcare experience.
    e. All supervision and project management must have completed infection control and risk assessment training.
    f. Contractor will have an established apprenticeship program. Union labor is not required for public bid hospitals. Apprenticeship is recommended to ensure proper training of employees, however, is not to be considered a decision maker if contractor does not have program in place.
    g. All supervision must have a minimum of 10 hours OSHA training.
    h. All supervision must have CPR / First Aid Training.
58. Any Prime Contractor that causes a schedule delay will be responsible to make up for any amount of days lost to maintain contract schedule. This may include additional costs incurred by prime contractor that caused the delay, as well as added costs by other prime contractors including but not limited to expedited shipping costs and over time work. Cost may also include additional construction manager general conditions costs as well has any costs incurred by the owner.

END OF SECTION 00 80 00

SECTION 00 80 01
BID PACKAGE 01

Bid package 01: General Trades

Furnish complete all necessary labor, materials, office and field supervision, insurance, tools, equipment, layout, hoisting, rigging, shoring, shop drawings, submittals, permits, licenses and fees necessary to complete the work outlined below. Include all shift pay, overtime, weekend and holiday pay to complete the work in the scheduled durations shown in the project schedule in Specification Section 01 52 00.

This bid package includes, but is not limited to the following scope of work:

A. Bid Package #00 - General Requirements

B. Construction documents by Simonson Associates & Architects dated September 29th, 2026.

C. Specifications from the Project Manual by Simonson Associates & Architects dated September 29th, 2026, including, but not limited to the following sections:

a.	All Division 00 and 01 specifications	
b.	02 41 00	Selective Demolition
c.	03 05 16	Underslab Vapor Barrier
d.	04 26 13	Masonry Veneer
e.	04 72 00	Cast Stone Masonry
f.	05 12 23	Structural Steel Framing
g.	05 50 00	Metal Fabrications
h.	05 52 13	Exterior Railings
i.	06 10 00	Rough Carpentry
j.	06 10 53	Miscellaneous Rough Carpentry
k.	06 20 00	Finish Carpentry
l.	06 41 00	Architectural Wood Casework
m.	06 83 16	Fiberglass Reinforced Paneling
n.	07 01 50.19	Preparation for Re-Roofing
o.	07 13 00	Sheet Waterproofing
p.	07 21 00	Thermal Insulation
q.	07 26 00	Vapor Retarders
r.	07 27 00	Air Barriers
s.	07 31 13	Asphalt Shingles
t.	07 42 13	Metal Wall and Soffit Panels
u.	07 46 46	Fiber-Cement Siding
v.	07 62 00	Sheet Metal Flashing and Trim
w.	07 92 00	Joint Sealants
x.	08 14 13	Stile and Rail Wood Doors
y.	08 31 00	Access Doors and Panels
z.	08 43 13	Aluminum-Frames Storefronts
aa.	08 52 00	Clad Wood Windows
bb.	08 71 00	Door Hardware
cc.	08 80 00	Glazing
dd.	09 05 61	Common Work Results for Flooring Preparation
ee.	09 21 16	Gypsum Board Assemblies
ff.	09 30 00	Tiling
gg.	09 51 00	Acoustical Ceilings
hh.	09 65 00	Resilient Flooring and Base

ii.	09 68 13	Tile Carpeting
jj.	09 72 00	Wall Coverings
kk.	09 91 13	Exterior Painting
ll.	09 91 23	Interior Painting
mm.	10 21 23	Cubicle Curtains and Track
nn.	10 28 00	Toilet Accessories
oo.	10 31 00	Manufactured Fireplaces
pp.	10 44 00	Fire Protection Specialties
qq.	12 24 00	Window Shades
rr.	12 36 00	Countertops
ss.	31 20 00	Earthwork
tt.	31 23 33	Trenching and Backfilling
uu.	31 35 00	Erosion Control
vv.	32 11 23	Aggregate Base Course
ww.	32 13 13	Concrete Paving
xx.	32 13 73	Pavement Joint Sealants
yy.	32 17 23	Pavement Markings
zz.	32 93 00	Trees, Shrubs, Groundcover
aaa.	33 49 00	Storm Sewer and Drainage

The below items are further clarifications and/or additional requirements to the above specification sections.

D. **DIVISION 01 - GENERAL REQUIREMENTS**

1. All work to be completed in accordance with the schedule and phasing included in specification section 01 15 20 and as noted in the Contract Documents. The contractor must include additional mobilizations as needed to meet the schedule and phasing as noted.
2. Furnish and install complete systems per Specification Sections listed above and as indicated on the Contract Documents.
3. All work in this Bid package shall be provided in accordance with OSHA regulations and applicable state and local codes. Provide proof of all training and certificates required and provide written safety and fall protection programs. All work to follow Graham safety standards as listed in Graham's safety manual.
4. This project will utilize Last Planner Construction Schedule tools to plan the work, update the schedule, and monitor progress. It is a requirement to provide all paperwork and attend all meetings as requested by the Contractor/Construction Manager. Some of the items included are, but not limited to:
    a. A minimum of one scheduled coordination meeting per phase will be held with the Subcontractor/Prime project managers and foremen. These meetings may last a full day and are mandatory. In this meeting, you will be required to list all activities, assign accurate durations, and work with other contractors to sequence the activities as a group.
    b. Weekly foremen's meetings will be held where weekly work plans (WWP's) will be turned in to the Contractor/Construction Manager for review and the 6-week project schedule will be discussed. Weekly work plans are required to be turned in prior to the weekly meeting so all activities can be compiled into one WWP and distributed at the meeting.
    c. Daily stand-up meetings are a daily progress check and planning session for the following day. These meetings will be held on the project site, foremen for all trades on site are required to be there, and they should take no longer than fifteen minutes per day.
5. Contractor to be adequately qualified to perform work in a healthcare environment as outlined below:
    a. Contractors have completed similar healthcare projects in the past three years.

b. Contractor will have sufficient manpower to staff the project to meet the project schedule outlined in the Specifications.

c. Field and office management/supervisors must have a minimum of three years of healthcare experience.

6. Coordinate with the AHJ, city, state, etc. on work related to the disturbance of any public streets or right of ways. This includes but is not limited to any fine grading, deliveries, or work near street access. Obtain all necessary approvals and permits before commencing work.
7. Provide, set-up and maintain any barricades, signage, traffic control, etc. for work involving closing of streets, drives, sidewalks, etc.. Include cost for required permits by the City of Des Moines. Contractor must file for permits in a timely manner as to not impede schedule.
8. Submittal and closeout due dated must be uploaded to Procore prior to the due date. Contractor will be responsible for uploading all RFI's to Procore for review by the Construction Manager.
9. Include taking any deliveries related to this bid package, and moving materials and clean-up as required. Delivery routes for materials and trucking to be coordinated with Construction Manager prior to commencing work.
10. The construction site is limited for materials and equipment. Coordinate material and equipment locations with the Construction Manager. Anything that needs to move out of the construction area will need to be kept in a staging area directed by the Construction Manager. The cost to move materials needs to be included. Each Prime Contractor is responsible for their own stored materials and equipment.
11. Provide all layout as required to complete this scope of work.
12. Contractor is responsible for all required field measurements for items in this bid package. Field measurements must be taken in advance to prevent any material/schedule delays.
13. Contractor responsible to provide mockups as noted in specifications prior to work beginning for those specific items. Work can remain part of the project if approved by the architect.
14. This package is required to provide all final cleaning at the completion of each phase. This will require two construction cleans prior to the start of the punch list process and two final cleans prior to the turn-over of the space.
15. Clean streets and roadways to keep them free of dirt, mud and debris generated by this scope of work. Cleaning to be done as needed or as directed by the Construction Manager, but no less often than once daily. Fill any wheel tracks, etc. from deliveries or equipment.
16. Provide all snow removal from the construction entrances, roadways, and temporary stone laydown areas. This includes sidewalks, entrances, roof, etc. Snow removal to be completed within 24 hours of any snow event greater than 1" (one inch). Provide de-icing materials as required to prevent slipping at exterior sidewalks and entrances.
17. Per the schedule in the contract documents there will be a Construction Manager punch list as well as an Owner/Architect punch list. Contractor to include mobilizations as needed for punch list corrections. The Construction Manager punch list must be completed before the Owner/Architect punch list.
18. Project foreman's meetings will be held weekly at the site and progress coordination meetings will take place bi-weekly with the construction manager. Contractors shall have a representative at each meeting while the contractor is on site or within 4 weeks of starting a task. This representative shall have knowledge of the project and be empowered to make decisions while at the meeting. Absences to be discussed with the construction manager prior to the meeting.
19. Include all extended warranties to be provided in this bid package.
20. Each Bid package is responsible for replacing anything they damage such as building components, etc. that are damaged or compromised by their work.

21. Each Prime Contractor is responsible to have at minimum on one English speaking supervisor on site during the duration of the Contractor's work.
22. Each Prime Contractor is responsible to supervise any and all subcontractors under that specific Bid package. Graham will give 24 hours' notice before starting to charge $150/hr. for supervision, preparation, and coordination of the contractor's subs.
23. Lean scheduling (pull planning) will be utilized on this project. This trade contractor and any subcontractors are required to attend all pull planning meetings to establish schedule, expedite schedule, and/or to sequence the schedule.

D. DIVISION 02 – EXISTING CONDITIONS

1. Locate and protect all existing underground and overhead utilities to remain, both public and private. Pothole existing underground utilities to confirm locations and depths as required. Dig permit to be filled out and signed by Construction Manager prior to work starting.
2. The Owner has salvage rights to any materials being removed / demolished for the construction of this project. Any materials the Owner does not want to retain will be removed as noted by the Contract Documents or as needed for construction.
3. Contractor and subcontractors shall be responsible to research any existing conditions. This includes any locating/potholing of any private or public utilities prior to starting work. Confirm all utilities have been located. Confirm all utilities requiring deactivation have been deactivated prior to commencing work. This Subcontractor has visited the site, reviewed and understands the Geo-Technical Data and existing site conditions.
4. Provide labor and equipment for demolition of all interior and exterior building items noted, shown, or that could be reasonably inferred on drawings that would be associated with this project. Look through all demolition drawings associated with this project in order to get a complete overview.
5. This Bid package is responsible for all interior and exterior demo as called out in the plans. This includes demo of existing building to make structural connections to the existing, wood retaining wall. Include demo of the exterior façade as needed for new finishes.
6. Include removal and disposal of all site items and utilities as noted or as needed for other work shown on the construction documents. Protect all items shown to remain. Remove and dispose of all debris to an offsite location per applicable codes and regulations.
7. This Bid package is responsible for the saw cutting, removal and disposal of existing exterior concrete as indicated on the construction documents.
8. Contractor shall perform clean saw cuts in a manner to minimize overcutting beyond the limits of removal show in the construction documents. In the event a saw cut extends beyond the limits into an adjacent panel, pavement slab or utility structure, the contractor shall remedy and/or replace to the nearest joint or as directed by the AHJ at no cost to the Owner.
9. In the event that concrete removal or other operations within this scope of work damage existing concrete, this contractor shall replace the damaged concrete to the next joint or as directed by Engineer at no cost to the Owner. Contractor shall notify Construction Manager of any damage to existing concrete immediately.
10. Include full depth saw-cutting and grading at existing pavement to join new paving to existing paving as indicated in the contract documents. Contractor shall include a second cut before new paving is placed to remove chipped edges from first cut. Refer to Table 1 of OSHA 1926.1153©(1) for required respiratory protection.
11. Where demolition of existing is only partial, demolition shall be done to a point needed to be able to build the new construction as noted.
12. The intent is to leave the existing vestibule storefront for as long as possible, while the new vestibule construction takes place. Coordinate with Construction Manager for schedule and sequencing.

E. DIVISION 03 – CONCRETE

1. Furnish and install all reinforcement including welded wire fabric and any macro/micro fibers, dosage rate to be confirmed with Engineer and Manufacturer. All reinforcement must be
2. Furnish, install, and maintain OSHA approved rebar caps at all exposed rebar until integrated into the final construction.
3. Furnish and install all concrete stairs as noted in the construction documents. Include steel handrail as needed for the concrete stairs. All reinforcement shall be epoxy coated.
4. Furnish and install all equipment pads as indicated in the contract documents. Coordinate with Mechanical contractor.
5. Clean-up concrete debris, splatter, etc. at all building components. Upon completion all floors shall be scraped and broom cleaned.
6. Provide all saw-cutting as required per the contract documents.
7. Provide proper elevations per the contract documents. Third party testing will be required 24 hours after slabs poured.
8. Remove spoils generated by the work of this Bid package off-site. Spoils cannot be stockpiled on site.
9. Furnish and install compacted granular sub-base as specified in the Contract Documents under all footings, stairs, etc.
10. All structural concrete footings to be provided by this package. Review civil drawings for additional details of this work. Footings can be trenched formed if soils allow, no change orders will be issued for having to form footings.
11. Furnish and install block outs for expansion joint covers in floor slabs and poured concrete walls as indicated in the Contract Documents. Coordinate this work with other trades.
12. Receive, inventory and install anchor bolts, anchor rods, embeds, base plates, etc. Subcontractor shall report all damaged items or shortages upon finalization of receipt and inventory. Shortages or replacement of items due to loss or damage that can be attributed to Subcontractor lack of care or management will be the responsibility of the Subcontractor.
13. Sleeves for mechanical and equipment penetrations to be provided by BP 02 and BP 03 and installed by BP 01. Coordinate with other contractors for sizing and install.
14. At the completion of the anchor bolt and embed installation and prior to structural steel erection the Contractor of this Bid package shall submit a certification from a third party that all anchor bolts and embeds have been properly installed or located as indicated on the Contract Documents. Improperly installed or located anchor bolts and embeds will be replaced correctly at no additional cost to the project. This contractor shall coordinate and schedule third party testing. Notify Construction Manager of scheduled testing dates and have testing agency provide reports to Construction Manager and Owner.
15. All anchor bolts shall be protected and spray painted in orange to make them visible. Anchor bolts shall be covered with rebar caps to prevent impalement.
16. Provide all surveying, staking and layout as required to complete this scope of work.
17. Contractor shall coordinate with all other trades and Construction Manager prior to installing work to verify that all sleeves, underground and site utilities and other work is completed. Subcontractor will not be compensated for re-work due to failure to coordinate and verify with Construction Manager.
18. Contractor is responsible for concrete fill of bollards as indicated on the construction documents.
19. Patch any existing waterproofing where connecting to part of an existing building structure. Relocate and repair any drain tile where connecting to existing building.

20. For any combustion equipment used, provide scrubbers on the equipment. All combustion equipment must be equipped with a fire extinguisher that is regularly inspected and documented.
21. Provide any excavation (including but not limited to footings/foundations and backfill) as indicated in the contract documents associated with this bid package. A Dig Permit is required for any excavation onsite.
22. Provide all misc. concrete patching noted in the Contract Documents. To include but not limited to locations where Mechanical and Electrical equipment has been removed.
23. Provide all interior concrete pour back in slab. This contractor must fill trenches in and compact prior to pouring. Coordinate with other contractors.
24. Monitor concrete placement and adjust/maintain positioning of reinforcing during pours.
25. Dry pack or non-shrink grout placement: all steel base or bearing plates, leveling plates, block outs or pockets as indicated in the construction documents.
26. Rub, fill, grind, and patch as necessary to prepare surfaces for specified finishes or as necessary to achieve specified tolerances. Patch all exposed form tie holes immediately following stripping operations.
27. This Bid package is required to drill any holes in existing foundations or concrete for the embedment of new bars. Coordinate with the Construction Manager when this work is to be performed. This work may need to be performed off hours to reduce noise disruptions.
28. Slope subgrade and slab on grade to drains as outlined on the drawings. The required thickness for the slab on grade must be maintained. Testing will be performed on sloped floors to verify positive drainage. If sloping is not maintained removal and replacement will be required at no additional costs.
29. A concrete wash-out pit will be provided, maintained, and removed by this bid package. All concrete washout material is to be deposited in this location by this bid package. Any other means of concrete wash out to be approved by the Construction Manager. Concrete wash out to be maintained per SWPPP requirements, coordinate with the Construction Manager.
30. Shoring, cutting and patching of any existing structural components needed to complete the work in this package should be completed by this contractor.
31. Include all water stop systems as specified and detailed on the documents.
32. Provide all winter conditions as required to complete the concrete scope of work as to not delay the project schedule including, but not limited to, concrete admixtures, hot water, concrete blankets, temporary heat, ground thaw, enclosures, supports, etc.
33. This Contractor shall be responsible for scheduling all inspections and testings for each pour. Notify the Construction Manager of pour dates. In the event that any test fail, additional testing shall be performed at no cost to the Owner. Notify Construction Manager of scheduled testing dates and have testing agency provide reports to Construction Manager and Owner.
34. This Contractor shall be responsible to coordinate testing and provide a letter of confirmed design strength for footings prior to steel erection in order to meet project schedule. Notify Construction Manager of scheduled testing dates and have testing agency provide reports to Construction Manager and Owner.

F. DIVISION 04 – MASONRY

1.

G. DIVISION 05 – METALS

1. Furnish and install all structural steel and miscellaneous steel as indicated in the construction documents. This includes but is not limited to steel tubing, baseplates, slotted channel frames, anchor rods, bolts, nuts, washers, angles, embeds, etc. as indicated in the construction documents.

2. Anchor rods assemblies and baseplates to be hot-dipped galvanized. This Bid package shall be responsible for providing hot-dip galvanized steel that meets the requirements as indicated in the construction documents.
3. Furnish and install steel bollard sleeves for median, crowned steel plate caps and covers as indicated in construction documents. Cover to be thermoplastic ¼" thick HDPE with horizontal reflective stripes.
4. Furnish and install steel railings, fittings, joints, anchors, non-shrink grout, etc. as indicated in the construction documents for a complete system.
5. Furnish and install aluminum guardrails, post, base plate, baluster, decorative top rail, bottom rail, superior performance coating, etc. as indicated in the construction drawings for a complete system.
6. Include field touch up of High-Performance Coating Primer at field welds and anywhere the primer is removed during installation.
7. Furnish and install grout at all column base plates as shown in the construction documents.
8. This Bid package is responsible for receiving and unloading all structural steel and miscellaneous steel. Material staging area shall be coordinated with the Construction Manager. Steel shall be cleaned of all debris prior to erection.
9. Fabricator is responsible for supplying or correcting any incorrectly fabricated items so that the schedule is not delayed.
10. Due to schedule, steel shop drawings to be submitted within 2 weeks of receiving notice to proceed.
11. Fabricator is to send a minimum of 1 full size paper set and 1 electronic file set of field and file drawings for use by the Construction Manager.
12. Protect all existing materials from welding sparks, etc. Hot work permit required for any work that involves open flames or produces heat and/or sparks, potentially creating a fire hazard. This scope to provide fire watch for their scope during hot work and 1-hour after hot work is completed. Provide adequate fire extinguishers/protection as needed to mitigate potential for fire.

H. DIVISION 06 - WOODS, PLASTICS, AND COMPOSITES

1. Furnish and install all interior and exterior wood blocking/backing per construction documents. Blocking shall consist of the following locations, but is not limited to:
   a. Blocking for exterior trim.
   b. Blocking for handrails and guardrails.
   c. Blocking for interior trim where shown on the drawings.
   d. Blocking associated with roof conditions.
   e. Blocking for cabinets (upper and lower), countertop support, toilet partitions, grab bars, all toilet accessories, window treatment, access panels, and other surface mounted items requiring blocking.
   f. Blocking for doors, windows, louvers, vents, access hatches.
   g. Blocking for eaves, roofing systems, soffits, and fascias.
   h. Blocking and framing required for mechanical, electrical, and other trades' openings.
   i. Blocking for mechanical trades curbs.
   j. Blocking for all Division 10 and 11 specification items.
   k. Blocking for specialized and Owner provided equipment.
2. Coordinate backing elevations and locations with the drawings and with Owner requirements. Coordinate backing installation with other trades.

3. All blocking shall be fire retardant unless otherwise noted.
4. Even if not indicated on drawing, fire retardant plywood backboards will be required at electrical and telecommunication rooms. Backboards to be installed from finish floor to finish ceiling.
5. Include labor and materials to furr out ceiling where indicated on the construction documents.
6. Millwork to be delivered to the jobsite and allowed to acclimate to the building conditions at least 72 hours prior to installation.
7. Furnish and install all architectural wood casework per the contract documents. This includes, but is not limited to, all base cabinets, wall cabinets, soffits, cabinet hardware and locks, accessories, support brackets, braces, filler panels, shelving, drawers, glides, blocking, support framing, hooks, grommets, etc.
8. Contractor shall coordinate plumbing and electrical rough-ins with Bid packages 02 and 03. This contractor shall be responsible to cut out any mechanical or electrical penetrations in the millwork as required. Coordinate exact size and location with appropriate trades.
9. This bid package shall clean millwork surfaces, drawers, and shelves prior to the Construction Managers punch list in each phase.
10. This bid package shall provide and install all material and labor required to cover material including but not limited to countertops, wall panels, reception desk, etc.
11. Provide final adjustment by the installer of hardware, millwork doors, drawers, etc. as directed by the construction manager prior to the punch list.
12. This bid package shall include all caulking associated with this scope of work. This includes any caulking from any painted/sealed surface to adjoining material.
13. Furnish and install all wall sheathing as indicated in the construction documents. Material shall be 15/32” OSB, structural grade 1, exposure 1. Provide fasteners and anchors as required.
14. Furnish and install all materials, coatings, fasteners and accessories as required in the construction documents for wall trim, wall base, door frames, shelving, Nurse Station base bid re-face, etc.
15. Furnish and install fiberglass reinforced panels, trim, adhesive and sealant as shown in the construction documents. Allow panels to acclimate to the building conditions at least 48 hours prior to installation.

I. DIVISION 07 – THERMAL AND MOISTURE PROTECTION

1. This bid package is responsible for the complete roofing system on the existing building and canopy. This includes all vapor barriers, sheathing, insulation, underlayment, asphalt shingles, blocking, fascia, soffits, metal flashing, flexible flashing, metal coping, ventilation roof vents, sealants, accessories, etc..
2. Provide all material and labor required for the removal of existing roofing system, flashing and counterflashing. Contractor shall repair and broom clean existing wood deck surface to provide smooth surface for new roof system.
3. Provide, install, maintain, and remove protection of existing roof system while not being worked on, and exposed deck surfaces.
4. Furnish and install wall panel system, metal plank soffit, soffit panels, trim, anchors, coatings and accessories as indicated in construction documents.
5. Furnish and install all roof snow guards/spikes above all entry and exist points to the building.
6. Furnish and install all gutters and downspouts as indicated on the construction documents. Gutters and downspouts shall be prefinished sheet metal, with rectangular profiles. Provide concrete splash block at each downspout location.
7. Furnish and install all caulking as needed for roof flashing or any materials supplied by this bid package. Include all caulking from flashings to other dissimilar materials.

8. Roof in all curbs for mechanical and conduits for electrical as noted in the Contract Documents.
9. This bid package is responsible for all hoisting of material related to this package.
10. This bid package will include safe egress to and from the roof.
11. Furnish, install, maintain and remove all warning lines, temporary guardrails and fall protection with toe kicks at the leading edge of the roof, roof opening and any other openings such as the roof hatch etc. as required per OSHA regulations. This includes existing and new openings. Remove when directed by the Construction Manager. All Work within 15' of leading edge to utilize 100% tie-off.
12. Provide all cutting and removal of existing roofing where new equipment is installed at the existing roof or for any other roof modifications as noted. Patch existing roof back after new equipment is installed.
13. This bid package shall be responsible for cleaning the roof of all roofing material and dispose of properly off-site daily.
14. This contractor shall have 24-hour repair service for a period of one (1) year after substantial completion.
15. Furnish and install all fiber cement siding, air barriers, trim, fasteners, sealants and accessories for a complete system as indicated in the construction documents. Contractor shall examine, clean and repair substrate as required before installation.
16. This bid package shall furnish and install all insulation noted in construction documents for the listed specification sections. Insulation shall be trimmed neatly to fit spaces. Where foamed-in-place insulation is required, apply by spray method in uniform monolithic density. Protect adjacent surfaces from over spray or dusting.
17. Furnish and install sheet waterproofing as indicated in construction documents. Prepare substrate surface by cleaning of dust and debris and repairing as needed. Include labor and material for install of drainage mat, geotextile fabric, 4" (4-inch) perforated drain tile, aggregate, all excavation, trenching and backfilling as required for a complete and functional system.

J. DIVISION 08 – OPENINGS

1. Furnish and install all stile and rail wood doors, hollow metal frames, aluminum doors and frames, storefront, door hardware, and auto operators. Raceway, wiring, final terminations and card readers to be by bid package 03 for a functioning door system. Coordinate with other contractors.
2. Contractor is responsible for anchoring to hollow metal door frames and verifying they are plumb and level during drywall installation.
3. This bid package (including subcontractors/suppliers) shall attend all meetings to review door hardware and keying requirements with the Owner, Architect, and Construction Manager.
4. This prime contractor shall check and test each door that has a locking mechanism to ensure that it operates correctly prior to the Construction Manager's punch list.
5. Provide final adjustment of doors, hardware, etc. as directed by the construction manager prior to the punch list.
6. Furnish and install all required caulking and sealant at door frames at floor and wall.
7. Contractor is responsible for supplying or correcting any doors or frames that arrive damaged, defective or incorrectly fabricated as to not delay schedule. All doors are to be inspected immediately once delivered; inform Construction Manager of any damages or defects found.
8. Furnish, install, remove and replace all interior, exterior glass/glazing including but not limited to glass and glazing for windows, doors, store front system and curtain wall. Include all glazing, mounting hardware, clips, layout, trim pieces, muntins, grilles, sills, sealants, fasteners, etc.

9. Furnish and install required caulking and sealant for glazing systems, where glazing systems meet adjacent material on exterior side, and any other items installed under this Bid package. caulking and sealant type as specified in Specifications.
10. Contractor is responsible to furnish and install plastic film where indicated on the construction documents.
11. Contractor is responsible for final cleaning of all Glass and Glazing. Final cleaning to be at end of project close out to be directed by Construction Manager.
12. Include testing as required per the specifications.
13. Furnish and install all access doors and panels noted on the construction documents.
14. Furnish and install acoustic sealants at existing penetrations, walls, and any new penetrations created by this bid package.

K. DIVISION 09 - FINISHES

1. Furnish and install all gypsum board wall assemblies, painting, tiling, wall protection, corner guards, and door protection; including but not limit to: interior gypsum sheathing, exterior gypsum sheathing, interior metal stud framing, exterior metal stud framing, insulation, spray foam insulation, all weather barrier, firestopping, acoustic caulking, joint sealants, primer, paint, wall tile, and stone tile.
2. This bid package is responsible for cleaning out the bottom track immediately before drywall is installed.
3. Furnish and install all gypsum ceilings assemblies and acoustical ceilings as indicated in the construction documents. Include all grid, supports, attachments, anchors, trim pieces, finish pieces, vapor barriers, etc. for a complete system. Coordinate and cut all holes/penetrations for other trades in the ceiling systems.
4. This bid package shall verify with Construction Manager that all above ceiling work is completed above drywall ceilings before drywall is installed.
5. Coordinate and adjust ceiling grid layout as needed to accommodate half sized border tile at a minimum.
6. Contractor shall be responsible to replace ceiling tile as needed until the project is turned over to the Owner.
7. Furnish and install all wall coverings as indicated in construction documents. Wall coverings to be delivered to site to acclimate to space condition not less than 24 hours before installation.
8. Furnish, install, and maintain all resilient flooring, tile carpeting, walk off carpet, tile, floor base, and sealed concrete as specified in the contract documents. Include all required trim, grout, adhesives, sealants, etc., for a complete system.
9. Furnish all floor preparation as needed to fill cracks, voids, saw-cut control joints, including fill to match transitions to accept finish materials. Skim and sand floors as needed to cover trowel marks left by concrete work and divots left by construction activity. Patch and repair concrete floors at wall partition removal locations.
10. Furnish and install all floor leveling or skimming as required to meet the requirements of the contract documents, local/state/federal codes, and/or requirements for the flooring material whichever is the strictest.
11. Furnish and install floor fill materials at and around floor drains. Concrete floors to slope to floor drains by concrete contractor. Flooring contractor to provide final coating and adjustment through the use of floor fill and floor skimming compounds for a smooth and neat installation. Multiple skim coats may be required to achieve satisfactory results as determined by the Construction Manager.
12. Furnish and install floor fill where new doors are cut into existing walls to allow for new floor installation as needed.

13. Furnish and install floor fill as needed to meet the required flooring manufacturer specifications.
14. Furnish pH and moisture test for all areas receiving flooring under this Bid package. Submit documentation to Construction Manager.
15. Furnish and install all caulking and sealants for any items within this scope of work. Caulking to include, but is not limited to, flooring material to door frames, sheet vinyl cove cap to wall, etc.
16. At completion of floor installation contractor is responsible for providing a clean finished product. This includes but not limited to removing all residue from tile installation.
17. Furnish a seaming plan submittal for approval. Plan must be submitted and approved at least 10 business days prior to commencement of flooring installation. Allow 20 business days for approval.
18. Protect completed work as necessary. Cover completed flooring with a plastic layer and then a hardboard product with all seams taped continuously as required for construction activities to continue after installation of the flooring. Coordinate floor protection products with the manufacturer's recommendations. Remove protection and haul away when directed by the Construction Manager.
19. Furnish and install all interior paint, exterior paint, epoxy paint, and high-performance coatings.
20. This bid package shall include multiple mobilizations to meet the schedule. Final paint shall be completed before the Graham Punch.
21. The final coat of paint is to be applied once all interior finishes, electrical trim plates, casework, floor base, thermostats, nurse call devices, etc. has been installed and just prior to Graham Punch. Include the time and material needed to tape off and cover all finished products including the flooring. Do not proceed with installing the final coat of paint until written permission from the construction manager has been provided.

L. DIVISION 10 - SPECIALTIES

1. Furnish and install all toilets, shower, and bath accessories. Refer to the specifications on which items with be contractor-furnished/contract-installed, owner-furnished/contractor-installed, and owner-furnished/owner-installed. Items included but not limited to toilet paper dispensers, paper towel dispensers, waste receptacles, soap dispensers, antibacterial gel dispensers, mirrors, shelves, grab bars, coat hooks, robe hooks, shower curtain rods, and shower curtains. Provide backing as required for the installation of these accessories.
2. Furnish and install all fire extinguishers, fire extinguisher cabinets, knox boxes, signage, and accessories as shown in the contract documents. Coordinate wall partition thickness with each fire extinguisher cabinet location. Do not install the permanent fire extinguishers until directed by the construction manager.
3. Coordinate final locations of all specialties with Owner and Construction Manager prior to install.
4. Furnish and install curtain track as indicated in construction documents.
5. Electrical fireplace to be furnished and installed by BP 03. Electrical contractor to provide submittals with dimensions to BP 01 to frame wall.
6. Provide color match caulk required for FRP/wall protection or any other specialty product.

M. DIVISION 12 - FURNISHING

1. Furnish and install all solid surface countertops, countertop supports, solid surface window sills, integral sink bowls, and quartz countertops.
2. This bid package is responsible for cutting all grommets as required by the owner. Grommet material shall be furnished and installed by this Bid package.
3. This bid package shall include all caulking associated with this scope of work. This includes any caulking from any painted/sealed surface to adjoining material.
4. Furnish and install all interior window shades per the construction documents.

5. Furnish, install, and maintain temporary door, wall and window enclosures to make the building weather tight for temporary winter heating.
    a. Construct temporary enclosures from 2”x4” (minimum) wood members and reinforced 10 mil poly on both sides filled full with insulation.
    b. At temporary walls exposed to the exterior elements, clad the exterior side of the wall with peel and stick weather barrier and coordinated top and bottom of the wall metal flashings. Maintain the integrity of this barrier until the new adjacent building is watertight. Provide this barrier at any temporary opening to the exterior elements. This includes locations that might not be identified.
    c. Maintain all temporary enclosures until permanent enclosures are installed. Remove and dismantle/dispose of temporary enclosures as permanent enclosures are installed.
6. Install all Owner Furnished Contractor Installed items (OFCI) or Contractor Furnished Contractor Installed items (CFCI) as noted on the Contract Documents. Include taking delivery or moving from the existing room, any assembly needed, and installation of items. Coordinate installation and delivery times with Construction Manager. Some existing items may not be able to move until allowed by the Owner. Coordinate all backing requirements.

N. DIVISION 31 – EARTHWORK

1. Furnish, install, and maintain the erosion control measures for the entire project duration or until the applicable permit(s) can be closed out. Coordinate all work with the Construction Manager, including final removal and completion.
2. This Bid package to apply and maintain all applicable permits.
3. Demolition of existing parking lot and sidewalk as shown in the construction documents to include column and column footings at entry.
4. Include all earthwork, imported fill, export, grading, trenching, backfill, bedding materials, shoring and proof rolling as required.
5. Include excavation, shoring and protection to expose any adjacent existing building structure to install utilities as needed.
6. All paved areas, including sidewalks, shall be compacted and graded to within +/- one inch (+/- 1”) not more than three weeks prior to paving or sidewalk placement. Any prepared subgrade that becomes frozen shall be scarified and re-compacted prior to pavement and sidewalk installation. The paving work shall be provided under a separate Bid package and will be installed as per the Construction Schedule noted in the contract documents.
7. Include cost to close-up and barricade all excavations associated with the work of this Bid package that are left open overnight. Include all barricades to protect other workers during working hours.
8. Provide all barricading required to separate work from public sidewalks, paving, etc. and to protect the public. This barricading will remain in place until work by all Bid packages is complete. Remove barricades after work is complete.
9. All excavations to be OSHA compliant via trench boxes, benching, or other means. If space constraints are too tight, trench boxes must be used and included in this scope of work.
10. Provide daily jobsite clean-up. Haul and place all debris (no concrete, plant materials, or soils) in dumpster provided by Construction Manager.
11. Include all necessary dewatering as required for the complete installation of work included in this Bid package including rerouting any existing drain tile as needed. This includes pumping, removal of mud, muck, etc. out of excavations and replacement of removed material for work of this package.
12. Restore all public and private land disturbed by the work of this Bid package to original condition.

13. Repair erosion control, temporary roads, etc. disturbed by the installation of the work in this Bid package.
14. Pick-up and dispose of off-site all rocks and large clumps of earth over 1.5” diameter.
15. If conditions require cutting or excavation to a depth lower than existing footings, this bid package is responsible for shoring and supporting of existing footings during this scope of work.
16. Bid package shall comply with Construction Manager’s spotter policy for site equipment. All personnel must be certified/trained per the Construction Manager’s safety policy. This includes but not limited to operators, flaggers, spotters, traffic control, etc.

O. DIVISION 32 – EXTERIOR IMPROVEMENTS

1. Include all cutting, removal, pour back of any concrete/paving/curbs, and final grading required for the installation. Include any City coordination and costs associated with street closures for work of this bid package. Include cutting and pour back of concrete at driveway connection to existing roadway.
2. Include full depth saw-cutting and grading at existing pavement to join new paving to existing paving as indicated in the Contract Documents. Shall include a second cut before new paving is placed to remove chipped edges from first cut. Refer to Table 1 of OSHA 1926.1153(c)(1) for required respiratory protection.
3. All testing and inspections shall be coordinated with the Construction Manager and Testing Consultant. The cost of initial testing and inspections will be paid for by the Owner. All re-testing for failed tests due to deficient work shall be paid for by the Contractor.
4. A concrete wash-out container for use by this Bid package to be provided by this Bid package. Concrete wash out to be off-site or on-site concrete wash out container to be emptied off site. Any other means of concrete wash out to be approved by Construction Manager.
5. Concrete waste created by this Bid package shall be removed from the site by this Bid package. Concrete waste cannot be placed in the dumpster provided by the Construction Manager.
6. Include barricades, signage, traffic control, etc. for work involving closing of streets, drives, sidewalks, etc..
7. Handle all spoils generated by this bid package scope of work. Spoils cannot be stockpiled and are to be hauled off site.
8. Repair erosion control, temporary roads, etc. disturbed by the installation of the work in this Bid Package.
9. Include all earthwork, imported fill, export, grading and proof rolling as required.
10. Provide all sub drainage components at perimeter foundation including tile, fabric, drainage mat and fill as shown on the documents.
11. Furnish and install all landscaping, including all plants, trees, sod, and seeding as noted in the Contract Documents. This includes soil treatment, fertilizer, mulch, rock, etc.
12. Protect plantings, shrubbery and tree root systems during transportation and storage as necessary to ensure root systems are maintained and in a healthy condition. During storage, heel-in plants with moist mulch or soil; maintain, water and protect from excessive sun, wind and inclement weather conditions.
13. Provide tree planting process and meet with landscaping architect for approval.
14. Landscape edging to be straight and verify correct elevation, proper backfill and bed depth for sod/mulch/rock.
15. Provide watering of plants, trees, sod, and seeding starting at installation date and extending until October 1st, 2027.

16. Contractor shall retain full liability for the health of all plantings, shrubbery, trees, sod, and seeding until final acceptance. Material determined to be damaged or unhealthy by the Construction Manager before final acceptance shall be replaced at the Contractor's full expense.
17. Contractor to include 1 additional mobilization to remove stakes installed for trees and shrubbery. Stakes remain in place for no longer than 1 year from installation.

P. UTILITIES

1. Furnish and install all storm drainage piping and cleanouts as indicated on the contract documents.
2. Trade Partner must designate one competent person for all trenching and excavation activities and must notify Construction Manager who their competent person is.
3. Provide surveying of all installed site utilities installed by this Bid Package and provide documentation of those surveys with exact utility locations and depths on as-built drawings. Provide locations of buried utilities at 20' increments. Notify the Construction Manager when existing utilities are found for documentation by others.
4. Include cost to close-up and barricade all excavations associated with the work of this Bid Package that are left open overnight. Include all barricades to protect other workers during working hours.
5. Furnish and install all roof drains as indicated on the contract documents. This contractor shall connect new and existing downspouts to collection line as indicated on the contract documents.
6. Furnish and install free-draining granular backfill and rigid drain tile with sock as specified in the Contract Documents.
7. Install temporary drain piping (flexible) to roof drains as needed to avoid storm water from dumping inside the building after the roof membrane has been installed and before the permanent roof drain piping has been installed.

Q. ALLOWANCES

1. Provide an allowance of 40 hours of general clean-up for the duration of the project. This general clean-up is over and above clean-up for work occurring. This general clean-up is to sweep / vacuum and clean construction area for general construction dust and debris, or other clean-up as directed by the Construction Manager. This allowance will be monitored by the Construction Manager. Contractor to provide work tickets weekly for Construction Manager to sign off on. Provide a cost per hour included below which will be used to add or deduct from this allowance. The worker must be available within 1 business day after request by the Construction Manager. All unused costs will be returned to the owner.
2. Provide an allowance of 20 hours of a skilled carpenter. Carpenter will be used as directed by Construction Manager. This allowance will be monitored by the Construction Manager. Contractor to provide work tickets weekly for Construction Manager to sign off on. Provide a cost per hour included below which will be used to add or deduct from this allowance. The worker must be available within 1 business day after request by the Construction Manager. All unused costs will be returned to the owner.
3. Carry an allowance of $10,000 to be used as needed for City review changes. Use of this allowance shall be coordinated and approved by the Owner and Construction Manager. Any unused amount of this allowance to be credited back to the Owner.

R. UNIT PRICES

1. The Contractor agrees to the following unit/alternate prices, which include all delivery, hoisting, supervision, fringes, equipment, travel time, insurance, taxes, bonds, overhead and profit for the Work if ordered in writing by the Contractor. Provide Unit Prices per Bid Breakdown including all mark-ups:

a. Provide a list of hourly labor rates for change order work including subcontractors working under the prime contractor. Include overtime rates.
b. Provide a list of billable tool/equipment rates for change order work including subcontractors.
c. Project Manager: $_____/hr
d. Superintendent: $_____/hr
e. Foreman: $_____/hr
f. Journeyman: $_____/hr
g. Apprentice: $_____/hr
h. Laborer: $_____/hr
i. Carpenter: $_____/hr
j. Finisher: $_____/hr
k. Painter: $_____/hr
l. Floor Installer: $_____/hr

U. ALTERNATES

1. Provide pricing on Bid Form for all applicable alternates as defined in Specifications.

V. COMPANY INFORMATION:

_____ _____
Bidder's Company Name Telephone Number

_____ _____
Date of Proposal Fax Number

_____ _____
Signature Printed Name

END OF BID PACKAGE 01

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SECTION 00 80 02

BID PACKAGE 02

Bid Package 02: HVAC and PLUMBING

Furnish complete all necessary labor, materials, office and field supervision, insurance, tools, equipment, layout, hoisting, rigging, shoring, shop drawings, submittals, permits, licenses and fees necessary to complete the work outlined below. Include all shift pay, overtime, weekend and holiday pay to complete the work in the scheduled durations shown in the project schedule in Specification Section 01 52 00.

This bid package includes, but is not limited to the following scope of work:

A. Bid Package #00 - General Requirements

B. Construction documents by Simonson Associates & Architects dated September 29th, 2026.

C. Specifications from the Project Manual by Simonson Associates & Architects dated September 29th, 2026, including, but not limited to the following sections:

1. All Division 00 and 01 specifications
2. 02 41 00 Demolition
3. 07 92 00 Joint Sealants
4. All Division 22 – Plumbing
5. All Division 23 – Heating, Ventilating, and Air Conditioning (HVAC)

The below items are further clarifications and/or additional requirements to the above specification sections

D. DIVISION 01 – GENERAL REQUIREMENTS

1. Furnish and install complete, plumbing, mechanical, and HVAC, systems per plans and specification sections listed above and as indicated in the Contract Documents. Contractor is responsible to review Architectural, Structural, Electrical, Medical Equipment, and Civil drawing sheets for coordination and any plumbing and mechanical items not identified on the MEP drawing sheets.
2. All work in this Bid Package shall be provided in accordance with OSHA regulations and applicable state and local codes. Provide proof of all training and certificates required and provide written safety and fall protection programs. All work to follow Graham safety standards as listed in Graham's safety manual.
3. Provide all layout as required to complete this scope of work.
4. Contractor is responsible for all required field measurements for items in this bid package. Field measurements must be taken in advance to prevent any material/schedule delays.
5. Obtain and pay for the plumbing/mechanical building permit for specification sections noted above. Construction Manager to obtain general building permit.
6. This project will utilize Last Planner Construction Schedule tools to plan the work, update the schedule, and monitor progress. It is a requirement to provide all paperwork and attend all meetings as requested by the Contractor/Construction Manager. Some of the items included are, but not limited to:
    a. A minimum of one scheduled coordination meeting per phase will be held with the Subcontractor/Prime project managers and foremen. These meetings may last a full day and

are mandatory. In this meeting, you will be required to list all activities, assign accurate durations, and work with other contractors to sequence the activities as a group.

b. Weekly foremen's meetings will be held where weekly work plans (WWP's) will be turned in to the Contractor/Construction Manager for review and the 6-week project schedule will be discussed. Weekly work plans are required to be turned in prior to the weekly meeting so all activities can be compiled into one WWP and distributed at the meeting.

c. Daily stand-up meetings are a daily progress check and planning session for the following day. These meetings will be held on the project site, foremen for all trades on site are required to be there, and they should take no longer than fifteen minutes per day.

7. Contractor to be adequately qualified to do work in a Healthcare Environment as outlined below:
   a. Contractor has completed similar healthcare projects in the past three years.
   b. Contractor will have an after-hours/ 24-hour emergency service under the entire contract and warranty period.
   c. Field and office management/supervisors must have a minimum of three years of healthcare experience.
8. Contractor will have sufficient manpower to staff the project to meet the project schedule outlined in Contract Documents
9. Submittal and closeout due dated must be uploaded to Procore prior to the due date. Contractor will be responsible for uploading all RFI's to Procore for review by the Construction Manager.
10. Include taking any deliveries related to this bid package, and moving materials and clean-up as required. Delivery routes for materials and trucking to be coordinated with Construction Manager.
11. The construction site is limited for materials and equipment. Coordinate material and equipment locations with the Construction Manager. Anything that needs to move out of the construction area will need to be kept in a staging area directed by the Construction Manager. The cost to move materials needs to be included. Each Prime Contractor is responsible for their own stored materials and equipment.
12. Protect all ductwork and piping from water, oil, dust and other contaminates after delivery to the jobsite. Store off the floor. Cover ends of pipe and ductwork delivered and stored at the jobsite. Installed ductwork ends shall remain covered until the adjacent piece is installed. Clean ductwork as it is being installed if necessary.
13. Coordinate all rough-ins and installation locations with electrical contractor. Coordinate with the other trade contractors on all plumbing and HVAC rough-ins and final connections.
14. Coordinate shop drawings and installation of the work in this bid package with other trade contractors to maximize the free space above the ceiling. All work shall be installed to provide the maximum benefit to the Owner and allow for full access to equipment, valves, dampers, etc. requiring maintenance or access.
15. Project foreman's meetings will be held weekly at the site and progress coordination meetings will take place bi-weekly with the construction manager. Contractors shall have a representative at each meeting while the contractor is on site or within 4 weeks of starting a task. This representative shall have knowledge of the project and be empowered to make decisions while at the meeting. Absences to be discussed with the construction manager prior to the meeting.
16. Concrete housekeeping pads for mechanical and plumbing equipment as noted on civil, arch, structural, and MEP drawings will be provided and installed by Bid Package 01. Coordinate with bid package for dimensions.
17. BP01 is to furnish and install all CFCI equipment. Bid Package 02 and Bid Package 03 to provide final connections and terminations for CFCI equipment.
18. BP01 is to receive and install all OFCI equipment. Bid Package 02 and Bid Package 03 to provide final connections and terminations for any Owner supplied equipment.

19. Per the schedule in the contract documents there will be a Construction Manager punch list as well as an Owner/Architect punch list. Contractor to include mobilizations as needed for punch list corrections. The Construction Manager punch list must be completed before the Owner/Architect punch list.
20. Include all extended warranties to be provided in this bid package.
21. Provide all temporary heating and sheltering as required to complete the scope of work of this bid package per typical weather conditions assuming baseline schedule.
22. Each Bid package is responsible for replacing anything they damage such as building components, etc. that are damaged or compromised by their work.
23. Each Prime Contractor is responsible to have at minimum on one English speaking supervisor on site during the duration of the Contractor's work.
24. Each Prime Contractor is responsible to supervise any and all subcontractors under that specific Bid package. Graham will give 24 hours' notice before starting to charge $150/hr. for supervision, preparation, and coordination of the contractor's subs.

E. DIVISION 02 – EXISTING CONDITIONS

1. Contractor and major subcontractors will sit in pre-demolition conferences to review what services will be affected during and after demolition process occurs. Contingency plans will be developed with the Construction Manager for potential issues that could occur during and after demolition and phasing.
2. Interior Demolition Areas:
    a. Provide demolition of existing plumbing and mechanical as shown on the Contract Documents. This shall include removal of plumbing and mechanical whether shown or not on the Contract Documents, that need to be removed for other demolition shown on the plans such as removing a wall, removing a piece of equipment, etc. This includes any and all shutdowns that will be required to take place off hours.
    b. Remove any disconnected/demolition items (piping, ductwork, control wiring, etc.) completely from the areas of the building scheduled to remain.
    c. Interior concrete removal and replacement, not shown on the contract documents but needed to install work for this bid package, shall be included by this bid package.
    d. Concrete demo and patching for the demolition of plumbing and mechanical work is by this bid package. Include all excavation and backfill for underground work.
3. This bid package shall be responsible for all interior concrete slab demo, including saw cutting and x-raying all areas where slabs are to be removed to locate possible objects in the slabs.
4. The owner shall have first salvage rights to all items removed. If owner refuses salvage, contractor is responsible for disposal.
5. Locate and protect all existing underground and overhead utilities to remain, both public and private. Pothole existing underground utilities to confirm locations and depths as required. Dig permit to be filled out and signed by Construction Manager prior to work starting.
6. Contractor and subcontractors shall be responsible to research any existing conditions. This includes any locating/potholing of any private or public utilities prior to starting work. Confirm all utilities have been located. Confirm all utilities requiring deactivation have been deactivated prior to commencing work. This Subcontractor has visited the site, reviewed and understands the Geo-Technical Data and existing site conditions.
7. Provide labor and equipment for demolition of all interior and exterior building items noted, shown, or that could be reasonably inferred on drawings that would be associated with this project. Look through all demolition drawings associated with this project in order to get a complete overview.
8. Bid Package 01 is responsible for interior concrete slab pour back, coordinate with contractor.

F. DIVISION 07 – THERMAL AND MOISTURE PROTECTION

1. Furnish and install acoustic sealants at any new penetrations created by this bid package.
2. Any penetrations at the existing and new foundations made by this Bid Package need to be sealed watertight and/or fire stopped as required.

G. DIVISION 22 – PLUMBING

1. Furnish and install all plumbing work including but not limited to all hot and cold domestic water piping, recirculation piping, vent piping, storm water piping, sanitary piping, drains, roof drains, hangers, identification, insulation, access panels, valves, water heaters, drinking fountains, stainless steel sinks, mop basins, water closets, plumbing fixtures, fixture trim, caulking of plumbing fixtures, meters, gauges, etc. for a complete and functional plumbing system.
2. Contractor to include all excavation and backfill as required to complete their scope of work. Compaction shall meet testing specifications. Include all necessary dewatering as required for the complete installation of work included in this bid package including rerouting any existing drain tile as needed. This includes pumping, removal of mud, muck, etc. out of excavations and replacement of removed material for work of this package. This includes any pot holing necessary to locate and identify any obstructions or utilities.
3. Furnish, install, and maintain temporary heating and dehumidification equipment and connections as required to maintain the following requirements:
    a. Maintain a minimum temperature of 60 degrees. The temperature is not to exceed 75 degrees. This minimum temperature shall be maintained until permanent units are installed and completed start-up.
    b. Dehumidification to occur from May 1st until project completion. Minimum humidity shall be 30%. Maximum humidity shall not exceed 55%. Temporary cooling shall occur from May 1st to project completion.
    c. Temporary equipment is to use existing power of the facility. Coordinate with BP 04 for connections as needed.
4. All equipment & material must be properly barricaded per OSHA regulations
5. Support all ductwork, piping and equipment from building structure members. Hold piping tight to bottom of structural members or run through joist webs if possible. Do not support piping from other piping, ductwork and/ or electrical conduits.
6. This bid package is to include, but not limited to, all core drilling, concrete cutting, etc. through walls, floors, and roof as required to complete their scope of work. Contractor to remove material/debris from jobsite per applicable codes and regulations. Coordinate all penetrations with the construction manager and other affected bid packages. Areas that may require core drilling include but not limited to, exterior walls and interior concrete.
7. Contractor to provide cap where items are removed from roof to allow for roofing material to be installed over top.
8. Provide a minimum clearance as specified from the Mechanical Engineer for the outside air intake to any exhaust fan or plumbing vent.
9. Provide electronic coordination drawings, shop drawings and as-built drawings as required for this project. Drawings to be sent to the Construction Manager and electrical contractors for coordination. Coordinate all above ceiling plumbing and mechanical systems with the electrical contractor's main conduit runs, cable tray, etc.
10. Provide miscellaneous sleeves required through concrete and walls. Coordinate with BP 01 for install.
11. Coordinate all plumbing fixtures, drinking fountains, and sink installations provided by this package with Bid Package 01.

12. Coordinate all floor drain and floor sink locations and elevations. Contractor shall be on site to ensure the floor drains, floor sinks, cleanouts, etc. remain true, plumb and at the proper elevation during the concrete pour.

H. DIVISION 23 - HVAC

1. Furnish and install all mechanical work including but not limited to all mechanical piping, gas piping, hydronic piping, steam piping, condensate piping, refrigerant piping, ductwork, variable frequency drives, power ventilators, air curtains, air terminal units, test and balancing, controls work, commissioning, insulation, hangers, identification, access panels, valves, pumps, registers, diffusers, filters, heat exchangers, energy recovery units, energy recovery ventilation units, air handling units, blower coils, vibration isolation, terminal heating units, humidifiers, cleaning, dampers, meters, gauges, thermostats, etc. for a complete and functional mechanical system.
2. Provide mechanical connections for any equipment noted on the equipment and furniture drawings in the Contract Documents. Include taking delivery or moving from existing rooms, assembly if necessary, and installing ice machines.
3. All return air grills shall be capped with sheet metal and sealed with tape while units are being used during construction. Only outside air shall be used to operate the units until the building has been final cleaned. Any associated controls work to temporarily use the unit shall be included and final commissioning to be complete prior to building turnover. The specified warranty for equipment will not start until substantial completion. Provide extended warranties as necessary to maintain the required warranty duration. Continue to maintain negative air within construction areas.
4. Furnish and install all roof curbs and support for pipe and duct penetrations and mechanical equipment as indicated in the contract documents. Coordinate installation with Roofing Contractor and Construction Manager.
5. Furnish and install all controls work including but not limited to pathways, raceways, wiring, thermostats, pressure sensors, system upgrades, software upgrades, etc. for a complete and functional controls system. The new controls system and full graphics will be required to be operational along with Owner training prior to substantial completion.
6. Provide all Test and Balancing for the work of this bid package. Test and Balance reports will be required to be submitted prior to substantial completion. Intermediate testing and balancing may be required to maintain proper operation of systems serving occupied areas of the facility throughout the duration of construction. Any retest and balance to be completed due to being out of spec to be completed by this contractor at no additional cost to the Owner.
7. This contractor to include cleaning of ductwork (internal and external) if required for equipment startup to meet project schedule requirements.
8. Perform all commissioning requirements per the contract documents.
9. Any potential ceiling height conflicts with ductwork, mechanical piping, plumbing piping and fire suppression piping is to be brought to the attention of the Construction Manager and architect immediately. No ceiling heights will be altered without approval from the construction manager and the design team.
10. Coordinate all ceiling device locations within the ceiling grid with the electrical contractor, construction manager and design team prior to installation.
11. Furnish and install one complete set of filters to be used during construction for each unit. Remove construction filters at substantial completion or as directed by the construction manager. Furnish and install one complete set of new filters for each air handling unit at substantial completion. Furnish and turn over to the owner, one set of filters for each unit as attic stock. In total three complete sets of filters for each unit is required to be supplied by this bid package.
12. Any material prefabricated off site must be field verified and altered as required for site conditions at no cost to the owner.

13. For any combustion equipment used for temporary heating, provide scrubbers on the equipment.

I. UNIT PRICES

1. The Contractor agrees to the following unit/alternate prices, which include all delivery, hoisting, supervision, fringes, equipment, travel time, insurance, taxes, bonds, overhead and profit for the Work if ordered in writing by the Contractor. Provide Unit Prices per Bid Breakdown including all mark-ups:
   a. Provide a list of hourly labor rates for change order work including subcontractors working under the prime contractor. Include overtime rates.

   b. Provide a list of billable tool/equipment rates for change order work including subcontractors.

   c. Project Manager: $_____/hr

   d. Superintendent: $_____/hr

   e. Journeyman: $_____/hr

   f. Laborer: $_____/hr

J. ALTERNATES:

1. Provide pricing on Bid Form for all applicable alternates as defined in Specifications.

K. COMPANY INFORMATION:

_____ _____
Bidder's Company Name Telephone Number

_____ _____
Date of Proposal Fax Number

_____ _____
Signature Printed Name

END OF BID PACKAGE 02

SECTION 00 80 03

BID PACKAGE 03

Bid Package 03: Electrical, Telecommunication, Fire Alarm, Security

Furnish complete all necessary labor, materials, office and field supervision, insurance, tools, equipment, layout, hoisting, rigging, shoring, shop drawings, submittals, permits, licenses and fees necessary to complete the work outlined below. Include all shift pay, overtime, weekend and holiday pay to complete the work in the scheduled durations shown in the project schedule in Specification Section 01 52 00.

This bid package includes, but is not limited to the following scope of work:

A. Construction documents by Simonson Associates & Architects dated September 29th, 2026.

B. Specifications from the Project Manual by Simonson Associates & Architects dated September 29th, 2026, including, but not limited to the following sections:

   a. All Division 00 and 01 specifications
   b. 02 41 00 Demolition
   c. 07 92 00 Joint Sealants
   d. 31 23 00 Foundation Excavating and Backfilling
   e. All Division 26 – Electrical
   f. All Division 27 – Telecommunications
   g. All Division 28 – Electronic Safety and Security

The below items are further clarifications and/or additional requirements to the above specification sections.

C. DIVISION 1 – GENERAL REQUIREMENTS

1. Furnish and install a complete electrical, telecommunications, and electronic safety and security systems per specification sections listed above and as indicated in the Contract Documents for a complete and fully functional system. Contractor is responsible to review Architectural, Structural, Mechanical, medical Equipment, and Civil drawing sheets for coordination and any electrical items not identified on the MEP drawing sheets.
2. Provide all layout as required to complete this scope of work.
3. Contractor is responsible for all required field measurements for items in this bid package. Field measurement must be taken in advance to prevent any material/schedule delays.
4. Obtain and pay for all permits associated with the electrical, telecommunications, electronic safety, fire alarm, and security systems. General Building permit will be obtained by the Construction Manager.
5. Contractor to be adequately qualified to do work in a Healthcare Environment as outlined below:
   a. Contractor has completed similar healthcare projects in the past three years.
   b. Contractor will have an afterhours/ 24-hour emergency service under the entire contract and warranty period.
   c. Contractor will have sufficient manpower to staff the project to meet the project schedule outlined in Contract Documents
   d. Field and office management/supervisors must have a minimum of three years of healthcare experience.
6. Project foreman's meetings will be held weekly at the site and progress coordination meetings will take place bi-weekly with the construction manager. Contractors shall have a representative at

each meeting while the contractor is on site or within 4 weeks of starting a task. This representative shall have knowledge of the project and be empowered to make decisions while at the meeting. Absences to be discussed with the construction manager prior to the meeting.

7. All building systems shut downs need to be coordinated with the Construction Manager. Provide, at a minimum, 48-hour notice to the construction manager for any shutdown. Shut downs may require off hours work depending on affected systems.
8. Provide electronic coordination drawings, shop drawings and as-built drawings as required for this project. Drawings to be sent to the Construction Manager and fire suppression, plumbing and mechanical contractors for coordination.
9. Coordinate shop drawings and installation of the work in this bid package with other trade contractors to maximize the free space above the ceiling. All work shall be installed to provide the maximum benefit to the Owner and allow for full access to equipment and dampers requiring maintenance.
10. This bid package to provide multiple mobilizations to meet the project schedule for all programming.
11. Lean scheduling (pull planning) will be utilized on this project. This trade contractor and any subcontractors are required to attend all pull planning meeting to establish schedule, expedite the schedule, and/or to sequence the schedule.
12. BP01 is to furnish and install all CFCI equipment. Bid Package 02 and Bid Package 03 to provide final connections and terminations for CFCI equipment.
13. BP01 is to receive and install all OFCI equipment. Bid Package 02 and Bid Package 03 to provide final connections and terminations for any Owner supplied equipment.
14. Per the schedule in the contract documents there will be a Construction Manager punch list as well as an Owner/Architect punch list. Contractor to include mobilizations as needed for punch list corrections. The Construction Manager punch list must be completed before the Owner/Architect punch list.
15. Include all extended warranties to be provided in this bid package.
16. Each Bid package is responsible for replacing anything they damage such as building components, etc. that are damaged or compromised by their work.
17. Each Prime Contractor is responsible to have at minimum on one English speaking supervisor on site during the duration of the Contractor's work.
18. Each Prime Contractor is responsible to supervise any and all subcontractors under that specific Bid package. Graham will give 24 hours' notice before starting to charge $150/hr. for supervision, preparation, and coordination of the contractor's subs.

D. DIVISION 2 – EXISTING CONDITIONS

1. Interior Demolition Areas:
   a. Provide demolition of existing electrical and low voltage as shown on the Contract Documents. This shall include removal of electrical and low voltage whether shown or not on the Contract Documents, that need to be removed for other demolition shown on the plans such as removing a wall, removing a piece of equipment, etc.
   b. Interior concrete removal and replacement, not shown on the contract documents but needed to install work for this bid package, shall be included by this bid package.
   c. Remove any disconnected/demolition items (wire, conduit, cable, etc.) completely from the areas of the building scheduled to remain.
   d. Reroute any essential services required to keep the occupied areas operational.

e. Provide complete demolition of all electrical systems per plans and specifications. Any items not specifically shown or listed in the contract documents but are required to be removed for this contractor's or other trade's work or as required by code shall be included.

f. Provide all electrical demolition, disconnection of power, phone, and data as required for project demolition and construction. Coordinate work with other trades demolition contractors and Construction Manager. Label phone and data lines that are staying to identify where they go.

2. Contractor and major subcontractors will sit in pre-demolition conferences to review what services will be affected during and after demolition process occurs. Contingency plans will be developed with the Construction Manager for potential issues that could occur during and after demolition and phasing.
3. The owner shall have first salvage rights to all items removed. If owner refuses salvage, contractor is responsible for disposal.
4. All work above ceilings by this bid package where those ceilings are not shown to be removed and replaced in the Contract Documents will need to be removed and replaced by this bid package. This note applies to phasing as well. For any work that occurs above ceilings before or after those ceilings get replaced because of phasing, this bid package will need to remove and replace ceilings as needed to do the work. Any damaged ceiling grid or tiles due to work by contractors within this package will be back charged to this package.
5. Where existing electrical conduits serving circuits to be demolished and not reused, remove conductors. Existing back boxes and conduits remaining may be reused depending on location. If back boxes and conduit are not reused remove and patch surface to match existing. At locations where new electrical is to be installed in existing walls, this package to provide patching and finishing to match existing.

E. DIVISION 07 – THERMAL AND MOISTURE PROTECTION

1. Furnish and install acoustic sealants at any new penetrations created by this bid package.
2. Any penetrations at the existing and new foundations made by this Bid Package need to be sealed watertight and/or fire stopped as required.

F. DIVISION 08 - OPENINGS

1. This Contractor to provide all wiring included but not limited to door operators, door activating devices, etc. for a complete functioning system. This includes the mounting of the power supply boxes.
2. Bid Package 01 to furnish and install all hollow metal doors, hollow metal door frames, wood doors, door hardware, and auto operators. This Bid Package to coordinate, provide and install all electrical and low voltage pathways, wiring, final terminations and card readers for a functioning door system.

G. DIVISION 26 - ELECTRICAL

1. Furnish, install, maintain and remove temporary lighting inside the building during construction. Temporary lighting must comply with OSHA standards and Specification Section 01 50 00. Temporary lighting will need to be modified as construction progresses or as directed by Construction Manager. All temporary lighting must be on a dedicated circuit and labeled. Temporary lighting must be sleeved by nonconductive material through walls in order to prevent a cut hazard. This bid package to provide and install all necessary sleeves to comply with OSHA.
2. Coordinate the outlets and switches with the painter to be compliant with OSHA. Power needs turned off to these outlets when the switch plates and outlet plates are removed for painting. If the power cannot be turned off (e.g. breaker run adjacent hospital room that cannot be shutoff) provide alternate plates to allow finish paint to be finished beyond the edge of the cover plate outlines.

3. Lighting control system manufacturer shall provide 1-day additional on-site system training to site personnel at the conclusion of each construction phase.
4. This bid package shall include a final cleaning of all light fixtures prior to punch list.
5. This bid package is to include, but not limited to, all core drilling, concrete cutting, etc. through walls, floors, and roof as required to complete their scope of work. Contractor to remove material/debris from jobsite per applicable codes and regulations. Coordinate all penetrations with the construction manager and other affected bid packages. Areas that may require core drilling include but not limited to, exterior walls and interior concrete.
6. Furnish and install all site electrical, such as lighting, power for signs, etc. as indicated in the Contract Documents. Include furnish and install of illuminated bollards shown on the contract documents. Include excavation, backfill, and site patching to match existing for all site work required by this bid package.
7. Provide miscellaneous sleeves required through concrete and walls. Coordinate with BP 01 for install.
8. Furnish and install cable tray as shown on the contract documents. Coordinate with other contractors work. Notify Construction Manager of any conflicts with new or existing work.
9. Provide all required electrical systems and connections for medical equipment and/or commercial kitchen equipment as shown on the contract documents.
10. Furnish and install manufactured fireplace assembly with all accessories and remote control. This contractor shall provide submittals with dimensions to BP 01 for the framing of the wall. Coordinate with other contractors.
11. Provide adequate power as required to operate temporary heating, cooling, and dehumidification equipment. Coordinate the power requirements of the equipment being provided by BP 02. Each piece of equipment must be on a dedicated circuit.

H. DIVISION 27 – COMMUNICATIONS

1. This bid package shall furnish and install all voice and data communications, public address and paging systems, nurse call and music sound system per contract documents.
2. This bid package shall furnish and install all pathways, J-hooks, wiring, and power sources as indicated on the contract documents for a full and complete system.

I. DIVISION 28 – ELECTRONIC SAFETY AND SECURITY

1. Fire alarm shop drawings shall be submitted to the jurisdiction having authority at the same time the shop drawings are submitted to the Electrical Engineer.
2. Keep the fire alarm and life safety system active in all remodeled areas throughout construction. Coordinate with the Hospital and Construction Manager to deactivate system during the day for work occurring. All systems need to be reactivated at the end of every day. Provide dust covers for all fire alarm devices in the affected area. Dust covers will be required to be installed, maintained, and removed daily.
3. Relocate lighted exit signs and emergency lighting as needed for project phasing and temporary partition locations. Coordinate with the Construction Manager.
4. Coordinate with Direct to Owner Vendor for card access and security devices and install.

J. UNIT PRICES

1. The Contractor agrees to the following unit/alternate prices, which include all delivery, hoisting, supervision, fringes, equipment, travel time, insurance, taxes, bonds, overhead and profit for the Work if ordered in writing by the Contractor. Provide Unit Prices per Bid Breakdown including all mark-ups:

a. Provide a list of hourly labor rates for change order work including subcontractors working under the prime contractor. Include overtime rates.

b. Provide a list of billable tool/equipment rates for change order work including subcontractors.

c. Project Manager: $_____/hr

d. Superintendent: $_____/hr

e. Foreman: $_____/hr

f. Journeyman: $_____/hr

g. Apprentice: $_____/hr

M. ALTERNATES

1. Provide pricing on Bid Form for all applicable alternates as defined in Specifications.

N. COMPANY INFORMATION:

_____	_____
Bidder's Company Name	Telephone Number
_____	_____
Date of Proposal	Fax Number
_____	_____
Signature	Printed Name

END OF BID PACKAGE 03

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SECTION 01 10 00
SUMMARY

PART 1 GENERAL

1.01 PROJECT

A. Project Name: 14138B Brain and Memory Center.

B. Owner's Name: Broadlawns Medical Center.

C. Architect: Simonson & Associates Architects.

D. Construction Manager: Graham Construction Company.

E. Structural Engineer: Raker Rhodes Engineering.

F. MEP Engineer: KEDbluestone Engineering.

G. The project consists of the renovation of a 4,700 square foot building, the construction of a detached canopy and associated site and concrete improvements. The work includes, but is not limited to, HVAC, Electrical, Plumbing, Finish Upgrades and Roofing.

1.02 CONTRACT DESCRIPTION

A. Contract Type: Multiple prime contracts, each based on a Stipulated Price, Publicly Bid as described in Document 00 01 11.

B. Estimated Construction Budget: $2,750,000.

C. Construction Commencement: November 3rd, 2026.

D. Substantial Completion: May 28th, 2027.

E. Final Completion: May 28th, 2027.

1.03 DESCRIPTION OF ALTERATIONS WORK

A. Scope of demolition and removal work is indicated on drawings and specified in Section 02 41 00.

B. Scope of alterations work is indicated on drawings.

1.04 WORK BY OWNER

A. Owner will award a contract for supply and installation of pole mounted cameras which will commence on a date to be determined later.

1. Cut sheets for planned equipment will be available to the contractors during construction.

2. Final utility connections shall be performed under this Contract.

B. Items noted NIC (Not in Contract) will be supplied and installed by Owner (OFOI) after Substantial Completion. Some items include:

1. Pole mounted cameras.

2. Exterior Signage.

1.05 OWNER-FURNISHED ITEMS

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

B. The Work includes providing support systems to receive Owner's equipment, and mechanical and electrical connections.

C. The Owner will arrange and pay for delivery of Owner-furnished items in accordance with the Contractor's Construction Schedule, and will inspect deliveries for damage.

D. If Owner-furnished items are damaged, defective or missing, the Owner will arrange for replacement. The Owner will also arrange for manufacturer's field services, and the delivery of manufacturer's warranties and bonds to the Contractor.

E. The Contractor is responsible for designating the delivery dates of Owner furnished items in the Contractor's Construction Schedule and for receiving, unloading and handling Owner- furnished items at the site.

F. The Contractor is responsible for protecting Owner-furnished items from damage, including damage from exposure to the elements, and to repair or replace items damaged as a result of his operations.

1.06 OWNER OCCUPANCY

A. Owner intends to continue to occupy adjacent portions of the existing building during the entire construction period.

B. Owner intends to occupy the Project upon Substantial Completion.

C. Cooperate with Owner to minimize conflict and to facilitate Owner's operations.

D. Schedule the Work to accommodate Owner occupancy.

1.07 CONTRACTOR USE OF SITE AND PREMISES

A. Construction Operations: Limited to areas noted on Drawings.

1. Locate and conduct construction activities in ways that will limit disturbance to site.

B. Arrange use of site and premises to allow:

1. Owner occupancy.

2. Work by Others.

3. Work by Owner.

4. Use of site and premises by the public.

C. Provide access to and from site as required by law and by Owner:

1. Emergency Building Exits During Construction: Keep all exits required by code open during construction period; provide temporary exit signs if exit routes are temporarily altered.

2. Do not obstruct roadways, sidewalks, or other public ways without permit.

D. Time Restrictions:

1. Limit conduct of especially noisy work to hours as coordinated with the Owner.

E. Utility Outages and Shutdown:

1. Limit disruption of utility services to hours the building is unoccupied.

2. Do not disrupt or shut down life safety systems, including but not limited to fire sprinklers and fire alarm system, without 7 days notice to Owner and authorities having jurisdiction.

3. Prevent accidental disruption of utility services to other facilities.

1.08 WORK SEQUENCE

A. Coordinate construction schedule and operations with Design Professional.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 01 10 00

SECTION 01 15 20
PROJECT BID SCHEDULE

A. The following is the project bid schedule. Each Contractor shall review the schedule carefully and include in their bid any shift premiums or overtime required to complete their work in the duration shown. Work that is not completed on schedule may be completed by the Owner or Owner's Agents by whatever means necessary and the cost for such work will be subtracted from the Contractors contract sum.

B. The project bid schedule is intended to show general flow of work. It is not intended to show all activities or durations as that detail will be developed with contractor input upon award.

C. Each prime contractor should note the project is expected to be staffed at a minimum of Monday through Friday 7:00 a.m. to 4:00 p.m. of each week while performing the scope of work relevant to their contract. A minimum of one representative from each company must be on site during that time. Contractor acknowledges working in the hospital environment will likely require off hour work to minimize the impact to the hospital and has included those costs in their bid.

D. Deliveries will be coordinated off hours to minimize the impact to hospital operations. These deliveries will be outside the typical work hours noted above.

E. Any schedule delays will need to be documented within 10 business days of the delay. The Owner may elect to allow additional time. If allowed, this will be at no additional cost to the Owner.

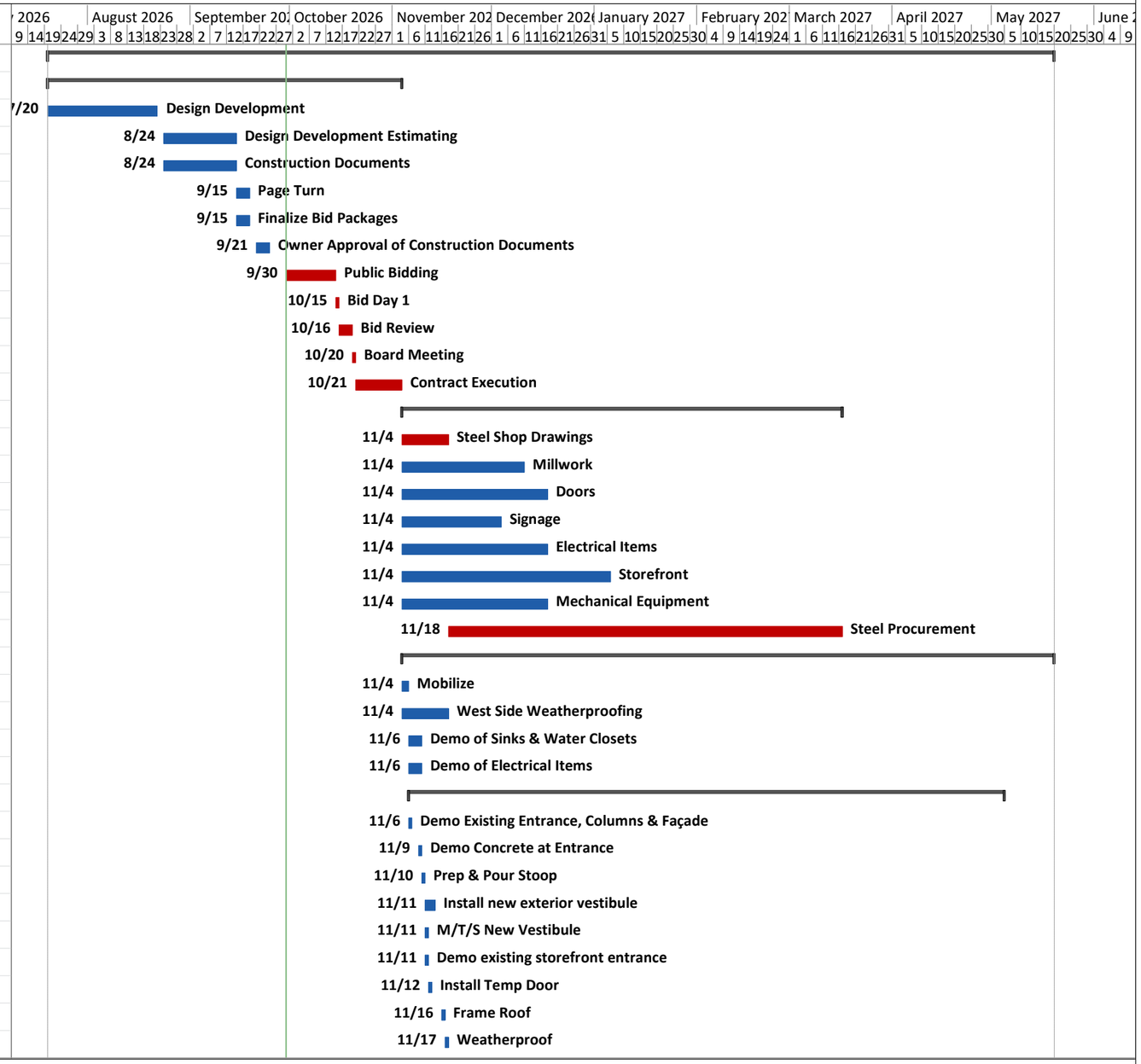
END OF SECTION 01 15 20

SEE ATTAHCMENT:
SECTION 01 15 20.01 – PROJECT BID SCHEDULE

Brain & Memory

Preliminary Schedule
Issued Wed 9/30/26
UPDATED

ID	Task Name	Duration	Start	Finish	Predecessors
1	**BMC Brain & Memory**	**212 days**	**Mon 7/20/26**	**Wed 5/19/27**	
2	**Drawings/Permitting**	**76 days**	**Mon 7/20/26**	**Tue 11/3/26**	
3	Design Development	25 days	Mon 7/20/26	Fri 8/21/26	
4	Design Development Estimating	15 days	Mon 8/24/26	Mon 9/14/26	3
5	Construction Documents	15 days	Mon 8/24/26	Mon 9/14/26	3
6	Page Turn	4 days	Tue 9/15/26	Fri 9/18/26	5,4
7	Finalize Bid Packages	4 days	Tue 9/15/26	Fri 9/18/26	5,6SS
8	Owner Approval of Construction Documents	4 days	Mon 9/21/26	Thu 9/24/26	6
9	Public Bidding	11 days	Wed 9/30/26	Wed 10/14/26	
10	Bid Day 1	1 day	Thu 10/15/26	Thu 10/15/26	9
11	Bid Review	2 days	Fri 10/16/26	Mon 10/19/26	10
12	Board Meeting	1 day	Tue 10/20/26	Tue 10/20/26	11
13	Contract Execution	10 days	Wed 10/21/26	Tue 11/3/26	12
14	**Material Procurement/Submittals**	**90 days**	**Wed 11/4/26**	**Tue 3/16/27**	
15	Steel Shop Drawings	10 days	Wed 11/4/26	Tue 11/17/26	13
16	Millwork	25 days	Wed 11/4/26	Thu 12/10/26	13
17	Doors	30 days	Wed 11/4/26	Thu 12/17/26	13
18	Signage	20 days	Wed 11/4/26	Thu 12/3/26	13
19	Electrical Items	30 days	Wed 11/4/26	Thu 12/17/26	13
20	Storefront	8 wks	Wed 11/4/26	Tue 1/5/27	13
21	Mechanical Equipment	30 days	Wed 11/4/26	Thu 12/17/26	13
22	Steel Procurement	16 wks	Wed 11/18/26	Tue 3/16/27	15
23	**Construction**	**136 days**	**Wed 11/4/26**	**Wed 5/19/27**	
24	Mobilize	2 days	Wed 11/4/26	Thu 11/5/26	13
25	West Side Weatherproofing	10 days	Wed 11/4/26	Tue 11/17/26	24SS
26	Demo of Sinks & Water Closets	2 days	Fri 11/6/26	Mon 11/9/26	24
27	Demo of Electrical Items	2 days	Fri 11/6/26	Mon 11/9/26	24
28	**Vestibule**	**123 days**	**Fri 11/6/26**	**Tue 5/4/27**	
29	Demo Existing Entrance, Columns & Façade	1 day	Fri 11/6/26	Fri 11/6/26	24
30	Demo Concrete at Entrance	1 day	Mon 11/9/26	Mon 11/9/26	29
31	Prep & Pour Stoop	1 day	Tue 11/10/26	Tue 11/10/26	30
32	Install new exterior vestibule	3 days	Wed 11/11/26	Fri 11/13/26	31
33	M/T/S New Vestibule	1 day	Wed 11/11/26	Wed 11/11/26	32SS
34	Demo existing storefront entrance	1 day	Wed 11/11/26	Wed 11/11/26	33SS
35	Install Temp Door	1 day	Thu 11/12/26	Thu 11/12/26	34
36	Frame Roof	1 day	Mon 11/16/26	Mon 11/16/26	32,35
37	Weatherproof	1 day	Tue 11/17/26	Tue 11/17/26	36



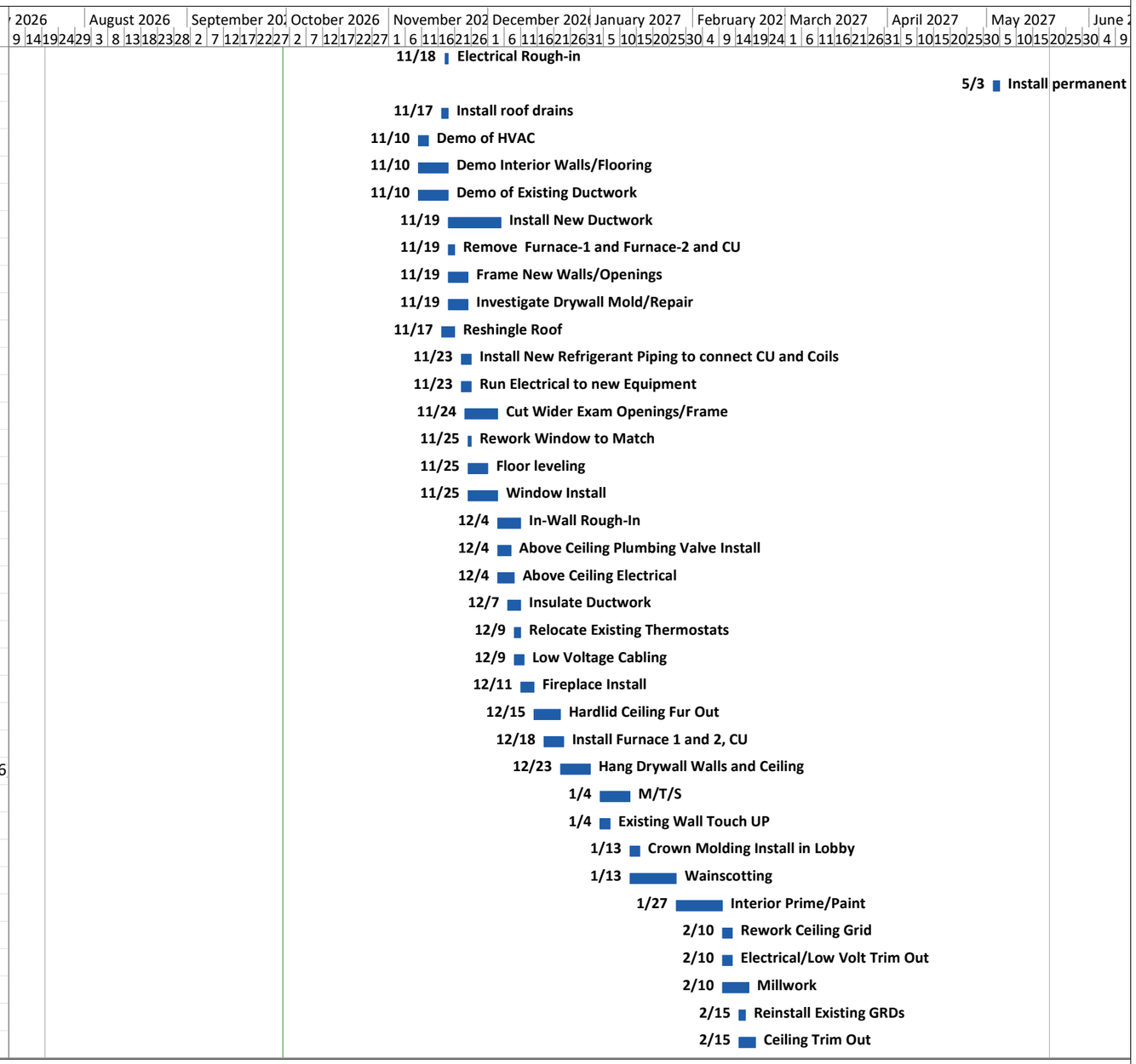
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Brain & Memory

Preliminary Schedule
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ID	Task Name	Duration	Start	Finish	Predecessors
38	Electrical Rough-in	1 day	Wed 11/18/26	Wed 11/18/26	37
39	Install permanent Door	2 days	Mon 5/3/27	Tue 5/4/27	20
40	Install roof drains	2 days	Tue 11/17/26	Wed 11/18/26	37SS
41	Demo of HVAC	3 days	Tue 11/10/26	Thu 11/12/26	27
42	Demo Interior Walls/Flooring	7 days	Tue 11/10/26	Wed 11/18/26	26
43	Demo of Existing Ductwork	7 days	Tue 11/10/26	Wed 11/18/26	41SS
44	Install New Ductwork	10 days	Thu 11/19/26	Fri 12/4/26	43
45	Remove Furnace-1 and Furnace-2 and CU	2 days	Thu 11/19/26	Fri 11/20/26	43
54	Frame New Walls/Openings	4 days	Thu 11/19/26	Tue 11/24/26	42
55	Investigate Drywall Mold/Repair	4 days	Thu 11/19/26	Tue 11/24/26	42
56	Reshingle Roof	4 days	Tue 11/17/26	Fri 11/20/26	36
47	Install New Refrigerant Piping to connect CU and Coils	3 days	Mon 11/23/26	Wed 11/25/26	45
48	Run Electrical to new Equipment	3 days	Mon 11/23/26	Wed 11/25/26	47SS
57	Cut Wider Exam Openings/Frame	6 days	Tue 11/24/26	Thu 12/3/26	54FS-1 day
58	Rework Window to Match	1 day	Wed 11/25/26	Wed 11/25/26	54
59	Floor leveling	2 days	Wed 11/25/26	Mon 11/30/26	54
72	Window Install	5 days	Wed 11/25/26	Thu 12/3/26	54
60	In-Wall Rough-In	5 days	Fri 12/4/26	Thu 12/10/26	54,57
61	Above Ceiling Plumbing Valve Install	2 days	Fri 12/4/26	Mon 12/7/26	60SS
63	Above Ceiling Electrical	3 days	Fri 12/4/26	Tue 12/8/26	60SS
49	Insulate Ductwork	4 days	Mon 12/7/26	Thu 12/10/26	44
50	Relocate Existing Thermostats	2 days	Wed 12/9/26	Thu 12/10/26	60FF
65	Low Voltage Cabling	3 days	Wed 12/9/26	Fri 12/11/26	63
62	Fireplace Install	2 days	Fri 12/11/26	Mon 12/14/26	60
66	Hardlid Ceiling Fur Out	6 days	Tue 12/15/26	Tue 12/22/26	49,63,62,44
46	Install Furnace 1 and 2, CU	4 days	Fri 12/18/26	Wed 12/23/26	45,21,47,48
64	Hang Drywall Walls and Ceiling	5 days	Wed 12/23/26	Thu 12/31/26	60,55SS,62,66
67	M/T/S	7 days	Mon 1/4/27	Tue 1/12/27	64
68	Existing Wall Touch UP	3 days	Mon 1/4/27	Wed 1/6/27	67SS
70	Crown Molding Install in Lobby	3 days	Wed 1/13/27	Fri 1/15/27	67
73	Wainscotting	10 days	Wed 1/13/27	Tue 1/26/27	67
69	Interior Prime/Paint	10 days	Wed 1/27/27	Tue 2/9/27	68,73
71	Rework Ceiling Grid	3 days	Wed 2/10/27	Fri 2/12/27	69
74	Electrical/Low Volt Trim Out	3 days	Wed 2/10/27	Fri 2/12/27	69,70
75	Millwork	6 days	Wed 2/10/27	Wed 2/17/27	69
51	Reinstall Existing GRDs	2 days	Mon 2/15/27	Tue 2/16/27	49,76SS
76	Ceiling Trim Out	5 days	Mon 2/15/27	Fri 2/19/27	71



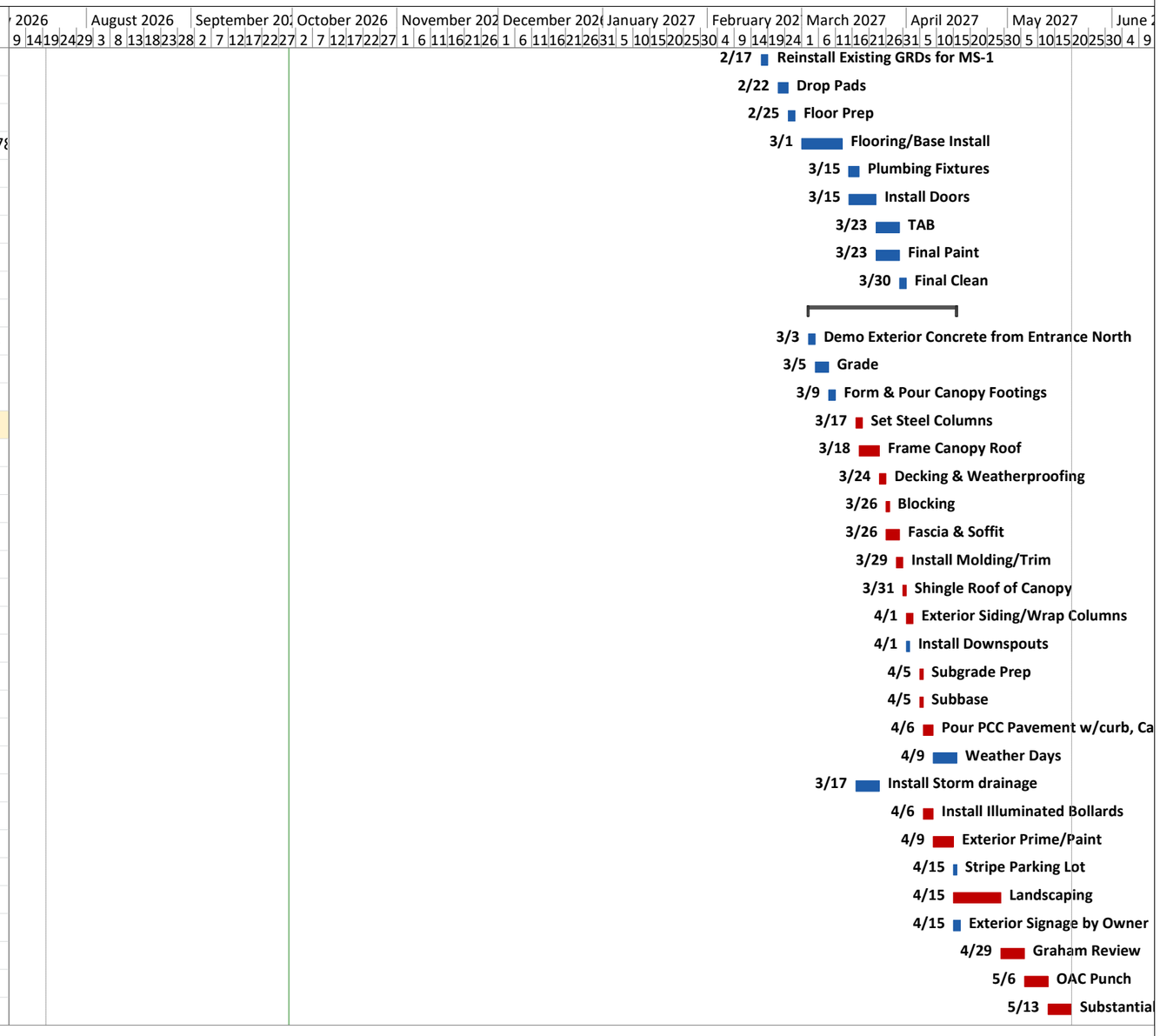
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Brain & Memory

Preliminary Schedule
Issued Wed 9/30/26
UPDATED

ID	Task Name	Duration	Start	Finish	Predecessors
52	Reinstall Existing GRDs for MS-1	2 days	Wed 2/17/27	Thu 2/18/27	51,76SS
78	Drop Pads	3 days	Mon 2/22/27	Wed 2/24/27	76
79	Floor Prep	2 days	Thu 2/25/27	Fri 2/26/27	78
80	Flooring/Base Install	10 days	Mon 3/1/27	Fri 3/12/27	76,59,74,73,78
77	Plumbing Fixtures	3 days	Mon 3/15/27	Wed 3/17/27	75,80
81	Install Doors	6 days	Mon 3/15/27	Mon 3/22/27	80
53	TAB	5 days	Tue 3/23/27	Mon 3/29/27	81
82	Final Paint	5 days	Tue 3/23/27	Mon 3/29/27	81
83	Final Clean	2 days	Tue 3/30/27	Wed 3/31/27	82
84	**Canopy/Exterior Pavement**	**32 days**	**Wed 3/3/27**	**Thu 4/15/27**	
85	Demo Exterior Concrete from Entrance North	2 days	Wed 3/3/27	Thu 3/4/27	22FS-10 days
86	Grade	2 days	Fri 3/5/27	Mon 3/8/27	85
87	Form & Pour Canopy Footings	2 days	Tue 3/9/27	Wed 3/10/27	86
88	Set Steel Columns	2 days	Wed 3/17/27	Thu 3/18/27	22,87
89	Frame Canopy Roof	4 days	Thu 3/18/27	Tue 3/23/27	88FS-1 day
90	Decking & Weatherproofing	2 days	Wed 3/24/27	Thu 3/25/27	89
91	Blocking	1 day	Fri 3/26/27	Fri 3/26/27	90
92	Fascia & Soffit	2 days	Fri 3/26/27	Mon 3/29/27	91FS-1 day
93	Install Molding/Trim	2 days	Mon 3/29/27	Tue 3/30/27	92FS-1 day
94	Shingle Roof of Canopy	1 day	Wed 3/31/27	Wed 3/31/27	93
95	Exterior Siding/Wrap Columns	2 days	Thu 4/1/27	Fri 4/2/27	94
96	Install Downspouts	1 day	Thu 4/1/27	Thu 4/1/27	95FF-1 day
97	Subgrade Prep	1 day	Mon 4/5/27	Mon 4/5/27	95
98	Subbase	1 day	Mon 4/5/27	Mon 4/5/27	97SS
99	Pour PCC Pavement w/curb, Canopy Island	3 days	Tue 4/6/27	Thu 4/8/27	98
100	Weather Days	5 days	Fri 4/9/27	Thu 4/15/27	99
101	Install Storm drainage	5 days	Wed 3/17/27	Tue 3/23/27	88SS
102	Install Illuminated Bollards	3 days	Tue 4/6/27	Thu 4/8/27	97
103	Exterior Prime/Paint	4 days	Fri 4/9/27	Wed 4/14/27	99,102
104	Stripe Parking Lot	1 day	Thu 4/15/27	Thu 4/15/27	103
105	Landscaping	10 days	Thu 4/15/27	Wed 4/28/27	103
106	Exterior Signage by Owner	2 days	Thu 4/15/27	Fri 4/16/27	103
107	Graham Review	5 days	Thu 4/29/27	Wed 5/5/27	106,105
108	OAC Punch	5 days	Thu 5/6/27	Wed 5/12/27	107
109	Substantial Completion	5 days	Thu 5/13/27	Wed 5/19/27	108



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SECTION 01 35 20
SPECIAL PROJECT PROCEDURES

PART1 – GENERAL

1.01 SECTION INCLUDES

SPECIAL NOTE: This specification section will be used for any work that must be performed after the owner takes occupancy of the building, and all work performed within or near the existing hospital.

A. Procedures for Work in an Operational Hospital.

1.02 GENERAL

A. The existing hospital is a fully functioning facility. During construction of the new work and all renovation, no interruption of services offered by the Hospitals is permitted. Consult and carefully schedule with the Owner to comply with this requirement. The Owner will cooperate within reason, but the need to provide full, uninterrupted medical care will supersede any construction aspect.

B. Owner may direct Contractor to cease work where Contractor's operations interrupt hospital functions.

C. Contractors Requests to Owner: All Contractor request to be given to Construction Manager in writing with advance notice not less than the following:

1. Power Shut-down or Life Support: 15 working days; see ELECTRIC SHUT-DOWN/LIFE below.
2. All others: 72 hours

1.03 PROCEDURE IN OPERATIONAL HOSPITAL

A. The Hospital must remain in operation at all times. Where the Hospital vacates to allow work in an area, services and utilities may be cut as long as the continuity of the service does not affect other areas. Access must be maintained to all other areas in a safe and sanitary manner. Compliance with good safety practice is to be exercised at all times. Work shall be done in a manner so as to protect patients, visitors, employees and equipment. Safe equipment only shall be used, and used in a safe manner. Unsafe conditions such as obstacles in corridors, improperly made connections, unstable piling of materials, loose material overhead tripping and hazards shall be avoided.

B. Conduct: Contractor and workmen under his control to be quiet and non-offensive.

1. Radios are prohibited.
2. Contractor's employees must stay in assigned area at job site and not visit other areas unless authorized to do so by an Owner's Representative. Eating areas will be designated for contractor's use.
3. Soliciting, selling of any merchandise or distribution of any literature for any cause is strictly forbidden.
4. Gambling, intoxicating liquor, or drugs in any form are forbidden at all times.
5. Use of Owner's telephone is strictly forbidden.
6. Contractor is to designate a hospital where personnel are to be treated in the event of an injury.
7. Contractor parking to be in approved staging areas or off site. No parking in Hospital parking lots allowed with out permission of Construction Manager.

C. Dress Code:

1. Required Apparel: Shirt, long pants, shoes with laces: all suitably clean. **All workers on-site must be wearing a company shirt displaying their company name / logo at all times. Contractors must provide and pay for the shirts for their workers.**
2. Not permitted: Offensive graphics or messages on clothing, short pants, tank tops, sandals, open toed shoes, bare torso, and bare feet.

3. Safety glasses and hard hats are to be worn as needed. The Contractor shall also provide personal protective equipment when necessary.

D. No utilities or services may interrupt without full consent of and prior scheduling with the Contractor. All functions of existing building must be maintained at all times unless specific written permission is obtained from the Owner. Critical functions include, but are not limited to:
   1. Exits.
   2. Utilities.
   3. Service functions including access for refilling existing oxygen tank.
   4. Public access to building during normal business hours.
   5. Fire department access.
   6. Fire protection/detection systems.

E. Noxious Fumes/Odors: Provide special filtering or direct exhaust to exterior for processes involving strong odors, fumes, or VOC's which may be either offensive or detrimental to patients.
   1. Advise Owner in advance of work for determination of filter/exhaust requirements.
   2. Cautions:
      a. Exterior work near fresh air intakes subject to special filtering requirements.
      b. Interior exhaust must not be recycled into fresh air intakes without special filtering requirements.

1.04 EXISTING FACILITIES

A. Existing elevators, telephone, vending machines, cafeteria, or other facilities are not permitted to be used by Contractor or his employees and Subcontractors without Owner permission.

B. Existing toilets: Contractors and Subcontractors cannot use hospital bathrooms without Owner permission, See Section 01 5000 – Construction Facilities and Controls.

C. Construction materials, toolboxes, etc., shall not enter elevators occupied by patients.

D. Every effort shall be made to prevent dust, dirt, mud, etc. from being tracked down corridors and stairways, etc.

E. Due caution shall be taken when pushing carts through corridors, to prevent injury to patients, visitors, or employees.

1.08 NOISE AND SAFETY

A. Construction noise limited to Normal Working Hours. Construction Manager & Owner can have any contractor stop work that is disrupting the patients or staff of the hospital until this is resolved. No additional payments will be allowed due to contractor's compliance with above restrictions.

B. In no instance may a corridor be blocked nor its clear width reduced either to less than 4'-0" or to less than the minimum exit required in accordance with the Uniform Building Code, whichever is greater.

C. No live electrical wiring may be left exposed, including temporary lighting in areas of public or staff access.

1.09 NO SMOKING POLICY

A. Smoking on Hospital property is prohibited.

1.07 WORKING HOURS

A. Normal hours: Perform work between the following hours, Monday through Friday: 7:00am to 4:30pm

B. Non-Normal hours: Should the Contractor be unable to schedule his work within normal working hours as it would negatively impact the ongoing operation of the hospital, they may request the Construction Manager in writing, to permit work to be performed during non-normal hours. Submit schedule of hours, days, and location of request work.

1.08 ELECTRICAL SHUT-DOWN/LIFE SUPPORT

A. Advanced Notice Required: Contractor to request, minimum 15 working days in advance. Owner's permission to shut down any electric power, medical gasses or other life-support systems to occupied portions of the building. Request to be in writing and indicate area(s) affected, time and date shut-down requested to commence, and anticipated duration of shut-down. Approved time and date may be during non-normal working hours.

B. No additional payments will be allowed due to contractor's compliance with above restrictions.

1.09 JOINT COMMISSION REQUIRMENTS

A. The Joint Commission on Accreditation of Healthcare Organizations (JCAHO) requires the Owner to comply with the "Interim Life Safety Measures", Appendix "E" of 1996 Accreditation Manual for Hospitals listed below. Each Contractor is also required to comply with this requirement and cooperate with the Owner so as not to place the Owner in violation of these requirements.

B. Interim Life Safety Measures (ILSM) are a series of 11 administrative actions required to be taken to temporarily compensate for the hazards posed by existing Life Safety Code (LSC) deficiencies or construction activities.

C. Implementation of (ILSM) is required in or adjacent to all construction areas and applies to all personnel, including construction workers.

D. Interim Life Safety Measures (ILSM):

1. Ensure exits provide free and unobstructed egress. Personnel shall receive training if alternative exists must be designated.
2. Ensure free and unobstructed access to emergency departments/services and for emergency forces.
3. Ensure fire alarm, detection, and suppression systems are not impaired. A temporary, but equivalent, system shall be provided when any fire system is impaired. Temporary systems must be inspected and tested monthly.
4. Ensure temporary construction partitions are smoke tight and built of noncombustible materials.
5. Provide additional fire fighting equipment and use training for personnel.
6. Prohibit smoking in and /or adjacent to all construction areas.
7. Develop and enforce storage, housekeeping, and debris removal policies and procedures that reduce the flammable and combustible fire load to the lowest level necessary for daily operations.
8. Conduct a minimum of two fire drills per shift per quarter.
9. Increase hazard surveillance of buildings, grounds, and equipment with special attention to excavations, construction areas, construction storage, and field offices.
10. Training personnel when structural or compartmentation features of fire safety are compromised.
11. Conduct organization-wide safety education programs to ensure awareness of any LSC deficiencies, construction hazards, and these ISLM.

E. Questions concerning the implementation and use of ISLM should be directed through the Owner and to the Department of Plant and Technology Management at the Joint Commission.

1.10 JCAHO SAFETY CHECKLIST

A. Each Contractor/Sub-Contractor to complete the Joint Commission Safety Checklist (attached to end of this Section) form weekly and return it to Construction Manager for their record. Contractor to stay in compliance with this Check List at all times; however, where the Construction Documents, codes, or other applicable ordinances conflict, the more stringent requirement shall apply.

B. No additional payments will be allowed due to contractor's compliance with above restrictions

1.11 PROJECT CATEGORY MATRIX

A. Each Contractor/Sub-Contractor to follow the recommended Infection Control Precautions (attached to end of this Section).

B. Each item will be evaluated with the Owner's Infection Control personnel to determine effective and practical applications based on this project.

C. No additional payments will be allowed due to contractor's compliance with above restrictions

1.12 CLEAN-UP AND MATERIAL MOVING

A. Keep working area as clean as possible at all times. Do not allow refuse and debris to accumulate. Pile materials neatly and safely, at a safe distance from hot piping, and off roadways and walkways. Do not leave tools or materials on steps, walkways, platforms, or elevated equipment or pipes. Remove lumber with protruding nails to safe area and remove or bend nails over. All refuse and debris must be removed from work area by contractor each day and disposed of in a legal duping site, approved by Owner.

B. Each Trade Contractor and their subcontractors shall do their own clean-up and haul debris away, dumpster to be paid for by each contractor, move materials that are in the way of construction, and repair and replace damage they do.

C. If the above work is not accomplished in a reasonable length of time, the Construction Manger will do the required work. Cost of the work will be charged to the Trade Contractor. After all Trade Contractors have debris removed during construction in compliance with the above, remaining clean up shall be performed by each contractor.

D. Each Contractor shall do all cleaning of finish surfaces relative to their work prior to acceptance of their work. Each Contractor shall comply with all special cleaning instructions contained in the Section 01780.

END OF SECTION 01 35 20

SEE ATTACHMENTS:

"A" JOINT COMMISION SAFETY CHECKLIST
"B" PROJECT CATEGORY MATRIX
"C" RECOMMENDED INFECTION CONTROL PRECAUTIONS

JOINT COMMISSION SAFETY CHECKLIST
ATTACHMENT A

		IN COMPLIANCE YES	*NO
1.	Ensure required with the project limits. Provide free and unobstructed egress.	_____	_____
2.	Contractor shall ensure his work does not obstruct access to emergency department/services and/or access for emergency forces.	_____	_____
3.	Contractor shall ensure his work does not impair fire alarm detection and/or fire suppression systems without a temporary, but equivalent, system provided. Temporary systems shall be inspected on a regular basis by Contractor if the system is implemented because of worked involved in this project.	_____	_____
4.	Contractor shall ensure temporary construction partitions are smoke tight and constructed of non-combustible material.	_____	_____
5.	Contractor shall enforce the Hospital's (Owner's) smoking procedures with his employees and subcontractors. Smoking shall be prohibited in or adjacent to all construction areas.	_____	_____
6.	Contractor shall develop and enforce policies and procedures for storage of materials and removal of debris that shall reduce the flammable and combustible fore load to the lowest level necessary for daily operations. The policy shall be submitted to the Hospital (owner) in written form for his review and approval.	_____	_____
7.	Contractor shall participate in fire drills.	_____	_____
8.	Contractor has notified Owner before structural or compartmentalization features of fire safety are compromised.	_____	_____

*If any of the above are answered "NO", indicated why; also state what corrective action will be taken to be in compliance and when it will be in compliance.

_____

_____

I, _____, representing _____
(Print Name)

hereby certifies that my response to the above statements are true and accurate to the best of my knowledge.

_____ _____
(Sign) (Date)

PROJECT CATEGORY MATRIX
ATTACHMENT B

	Low Risk Areas Offices, Support areas, Lobbies,	**Medium Risk Areas** Non-invasive patient care, Cardiology, PT/OT, Radiology, Nuclear Medicine, Endoscopy, Food Service areas	**High Risk Areas:** Special Care Areas, ER. LDR, Nurseries, Peds, Pharmacy, Recovery rooms, Outpatient Surgery, Laboratory	**Extreme Risk Areas** Areas with Immuno-compromised Patients, Transplant Area, Cardiac Cath Lab, OR's ICU's Isolation Rooms, Sterile Supply areas, Burn Unit, Negative Pressure Isolation Room, Oncology, Medical Units (if occupied during construction)
Inspection and noninvasive activities: Inspections above ceiling, minor repair, painting or wall covering (no patching), Minor electrical or plumbing work or similar work with little or no drilling, cutting, or other dust-raising activity. Normal maintenance activity.	**Category 1 precautions**	**Category 2 precautions**	**Category 2 precautions**	**Category 3 precautions**
Small Scale Projects of short duration that create minimal dust: Installation of electrical and computer cabling, Opening into chases and concealed spaces, cutting plaster and drywall, sanding and other dust making/ activity within a room or other controlled area.	**Category 1 precautions**	**Category 2 precautions**	**Category 3 precautions**	**Category 3 Precautions**
Larger Scale Projects that produce a moderate to high amount of dust or requires demolition or removal of any fixed building components or assemblies: Removing floor coverings, sanding walls, wall demolition and construction, minor duct work or electrical work above ceilings, major cabling work.	**Category 1 precautions**	**Category 2 precautions**	**Category 3 precautions**	**Category 4 precautions**
Major Renovation and Construction: Major demolition of areas, particularly those open to patient care, work on HVAC Systems, new construction	**Category 2 precautions**	**Category 3 precautions**	**Category 4 precautions**	**Category 5 precautions**

RECOMMENDED INFECTION CONTROL PRECAUTIONS BY CATEGORY
ATTACHMENT C

CATEGORY 1:

	Protect patient care areas from activity, or enclose work area (close doors). Replace ceiling tiles promptly.
	Minimize dust and dirt, clean or have area cleaned when done, and when dust or dirt builds up. Vacuum with HEPA post-filter type vacuum, and/or damp mop areas when work complete.

CATEGORY 2:

	Protect patient care areas from activity by closing doors, or enclosing area with plastic or equivalent. Replace ceiling tiles prior to removal of enclosures.
	Use water spray mist to minimize dust when opening ceilings, and conducting activities that will cause dust or dirt to be airborne.
	HVAC System: - filter return air - Close off HVAC system openings (exhaust and supply) with plastic or equivalent. - utilize a "clean air machine." or powered HEPA filters in exhaust path, or exhaust directly to outside
	Use dust mats at entrances. Wet mops areas during and after construction to remove and control dust and dirt with suitable cleaning agents. Use HEPA filters on vacuums used in area for cleanup. Wipe down all horizontal surfaces (except floor and ceiling) with suitable disinfectant at conclusion of job.
	Control of Debris: use covered container to remove debris through internal hospital paths.

At Job Completion:

	Replace all ceiling tile, or re-close ceiling.
	Wipe down all horizontal surfaces (except floor and ceiling). Wet mop or extract floor with disinfectant approved by Infection Control. If appropriate, vacuum all areas with HEPA Post-filters on vacuum.
	Clean HVAC system as closure being removed, and operate system for 24 hrs prior to final cleaning of job.
	Maintain all enclosures practical until post-job cleaning complete. Use vacuum with post-HEPA filters during removal of barriers, as practical.

CATEGORY 3

	Isolate the HVAC systems in area where work is being performed to prevent contamination of the duct system. Maintain negative air pressure within the construction site if possible. Utilize HEPA-equipped air filtration units as necessary.
	Provide necessary construction separations. Enclose work areas prior to any demolition work or opening any walls or ceilings as practical.
	Debris must be removed in covered containers. The debris removal containers should be vacuumed or wet-wiped prior to removal from the site.

At Job Completion:

	Maintain barriers in place as much as practical until final cleaning is complete. Removal of barrier materials should be accompanied by vacuuming using a vacuum with HEPA-filtered post-filters.
	Clean HVAC system as closure being removed, and operate system for 24 hrs prior to final cleaning of job and removal of barriers (to the extent practical based on the system.
	Site must be thoroughly cleaned, by damp-wiping all horizontal surfaces with disinfectants approved by Infection Control.

CATEGORY 4

	Use all CATEGORY 3 precautions, plus:
	Isolate HVAC System and seal with at least plastic and tape. Where pressure may exist, use sheet metal or similar rigid materials in addition of plastic and tape, to minimize accidental movement of air in ductwork. Isolate the ductwork as close to the construction barrier as practical.
	Seal all holes, penetrations, and openings in the construction barriers and walls which are part of the construction separation with appropriate materials. Hole in fire rated separations must be equivalent in fire rating. Other holes must be sealed with tape and plastic, or similar materials which are strong enough to withstand the pressure

	differential without leakage.
	If practical, create a construction ante-room where all clothing, tools, equipment, and other materials being removed are vacuumed or wet-wiped prior to being taken off site through the hospital patient care areas. Cart wheels should also be cleaned. Any person who has dust, dirt, or materials on their clothing must vacuum it prior to leaving the ante-room areas. The ante-room will be wet mopped frequently (several times a day in usual construction activity), or similar methods will be used to satisfy the Infection Control staff.
	If practical, personnel working in the area must either change clothing prior to leaving the job site, or use shoe covers, and cover clothing prior to leaving the area.

At Job Completion

	Maintain barriers in place until final cleaning is complete. Removal of barrier materials must be accompanied by vacuuming using a vacuum with HEPA-filtered post-filters. Air pressure should be maintained negative to patient care areas during final cleanup.
	Clean HVAC system as closure being removed, and operate system for 24 hrs prior to final cleaning of job and removal of barriers. If necessary allow the HVAC to blow into the site with the clean air machine catching the output of the supply, and the machine feeding the air to the returns.
	Site must be thoroughly cleaned, by damp-wiping all horizontal surfaces with disinfectants approved by Infection Control.

CATEGORY 5

	Use all CATEGORY 4 precautions, plus:
	As practical, use a “Clean-Air” machine, both to recirculate air in the job site to reduce airborne dust, and to exhaust air from the job site, to maintain a pressure negative to the air outside the job site, so leakage will be into the job site. The same machine may be used for both purposes, if it has suitable capacity.
	As practical, use a two chamber “air-lock” or similar method to assure no open path exists from the job site into patient care areas at any time. Wet-wipe down all materials and containers being removed from the site with appropriate disinfectant, in the air-lock, to assure no dust leaves the site. The clean lock must be mopped frequently and not allowed to become dirty. It should be as clean as a patient care area. Enclosed carts may be loaded from the dirty to the clean side of the airlock (if outside doors are closed, and other precautions followed to assure airborne dust cannot escape the worksite.
	As practical, all materials removed from the site during work activity must be either wet-wiped, or placed in containers which can be wet-wiped prior to removal. This includes debris removed through the hospital routing, and other materials removed from the site.

At Job Completion

	Maintain barriers in place as much as practical until final cleaning is complete, and site inspected by Infection Control. Removal of barrier materials should be accompanied by vacuuming using a vacuum with HEPA-filtered post-filters.
	Clean HVAC system as closure being removed, and operate system for 24 hrs prior to final cleaning of job and removal of barriers. If necessary allow the HVAC to blow into the site with the clean air machine catching the output of the supply, and the machine feeding the air to the returns. The Clean Air Machine HEPA should be replaced or examined to assure it is working appropriately, and pre-filter replaced prior to the final air system cleaning, so dust from the system can be visually evaluated.
	Site must be thoroughly cleaned, by damp-wiping all horizontal surfaces with disinfectants approved by Infection Control.

SECTION 01 40 00
QUALITY REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Submittals.

B. References and standards.

C. Control of installation.

D. Mock-ups.

E. Tolerances.

F. Manufacturers' field services.

G. Defect Assessment.

1.02 RELATED REQUIREMENTS

A. Document 00 72 00 - General Conditions: Inspections and approvals required by public authorities.

B. Section 01 30 00 - Administrative Requirements: Submittal procedures.

C. Section 01 60 00 - Product Requirements: Requirements for material and product quality.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Design Data: Submit for Design Professional's knowledge as contract administrator for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents, or for Owner's information.

C. Test Reports: After each test/inspection, promptly submit two copies of report to Design Professional and to Contractor.

1. Include:
    a. Date issued.
    b. Project title and number.
    c. Name of inspector.
    d. Date and time of sampling or inspection.
    e. Identification of product and specifications section.
    f. Location in the Project.
    g. Type of test/inspection.
    h. Date of test/inspection.
    i. Results of test/inspection.
    j. Compliance with Contract Documents.
    k. When requested by Design Professional, provide interpretation of results.
    l. Test report submittals are for Design Professional's knowledge as contract administrator for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents, or for Owner's information.

D. Certificates: When specified in individual specification sections, submit certification by the manufacturer and Contractor or installation/application subcontractor to Design Professional, in quantities specified for Product Data.

1. Indicate material or product complies with or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
2. Certificates may be recent or previous test results on material or product, but must be

acceptable to Design Professional

1.04 REFERENCES AND STANDARDS

A. For products and workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

B. Comply with reference standard of date of issue current on date of Contract Documents, except where a specific date is established by applicable code.

C. Obtain copies of standards where required by product specification sections.

D. Maintain copy at project site during submittals, planning, and progress of the specific work, until Substantial Completion.

E. Should specified reference standards conflict with Contract Documents, request clarification from Design Professional before proceeding.

F. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of Design Professional shall be altered from Contract Documents by mention or inference otherwise in any reference document.

1.05 TESTING AND INSPECTION AGENCIES AND SERVICES

A. Owner will employ and pay for services of an independent testing agency to perform specified testing and inspection.

B. Employment of agency in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 CONTROL OF INSTALLATION

A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce work of specified quality.

B. Comply with manufacturers' instructions, including each step in sequence.

C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Design Professional before proceeding.

D. Comply with specified standards as minimum quality for the work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

E. Have work performed by persons qualified to produce required and specified quality.

F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.

G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

3.02 MOCK-UPS

A. Before installing portions of the Work where mock-ups are required, construct mock-ups in location and size indicated for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work. The purpose of mock-up is to demonstrate the proposed range of aesthetic effects and workmanship.

B. Accepted mock-ups establish the standard of quality the Design Professional will use to judge the Work.

C. Notify Design Professional fifteen (15) working days in advance of dates and times when mock-ups will be constructed.

D. Tests shall be performed under provisions identified in this section and identified in the respective product specification sections.

E. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.

F. Obtain Design Professional's approval of mock-ups before starting work, fabrication, or construction.

G. Design Professional will use accepted mock-ups as a comparison standard for the remaining Work.

H. Where mock-up has been accepted by Design Professional and is specified in product specification sections to be removed, protect mock-up throughout construction, remove mock- up and clear area when directed to do so by Design Professional.

I. Where possible salvage and recycle the demolished mock-up materials.

3.03 TOLERANCES

A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.

B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Design Professional before proceeding.

C. Adjust products to appropriate dimensions; position before securing products in place.

3.04 TESTING AND INSPECTION

A. See individual specification sections for testing and inspection required.

B. Testing Agency Duties:

1. Provide qualified personnel at site. Cooperate with Design Professional and Contractor in performance of services.
2. Perform specified sampling and testing of products in accordance with specified standards.
3. Ascertain compliance of materials and mixes with requirements of Contract Documents.
4. Promptly notify Design Professional and Contractor of observed irregularities or non-compliance of Work or products.
5. Perform additional tests and inspections required by Design Professional.
6. Submit reports of all tests/inspections specified.

C. Limits on Testing/Inspection Agency Authority:

1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
2. Agency may not approve or accept any portion of the Work.
3. Agency may not assume any duties of Contractor.
4. Agency has no authority to stop the Work.

D. Contractor Responsibilities:

1. Deliver to agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.
2. Cooperate with laboratory personnel, and provide access to the Work and to manufacturers' facilities.
3. Provide incidental labor and facilities:
    a. To provide access to Work to be tested/inspected.
    b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
    c. To facilitate tests/inspections.
    d. To provide storage and curing of test samples.
4. Notify Design Professional and laboratory 24 hours prior to expected time for operations requiring testing/inspection services.
5. Employ services of an independent qualified testing laboratory and pay for additional samples,

tests, and inspections required by Contractor beyond specified requirements.

6. Arrange with Owner's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.

E. Re-testing required because of non-compliance with specified requirements shall be performed by the same agency on instructions by Design Professional.

F. Re-testing required because of non-compliance with specified requirements shall be paid for by Contractor.

3.05 MANUFACTURERS' FIELD SERVICES

A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust and balance of equipment as applicable, and to initiate instructions when necessary.

B. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

3.06 DEFECT ASSESSMENT

A. Replace Work or portions of the Work not complying with specified requirements.

B. If, in the opinion of Design Professional, it is not practical to remove and replace the work, Design Professional will direct an appropriate remedy or adjust payment.

3.07 MOCK-UP SCHEDULE

A. Section 12 32 00 - Manufactured Wood Casework: Upper cabinet with glove and paper towel accessories.

END OF SECTION 01 40 00

SECTION 01 50 00
CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Temporary Utilities: Electricity, lighting, heat, ventilation, telephone and FAX service, water and sanitary facilities.

B. Temporary Controls: Barriers, enclosures and fencing, protection of the Work, and water control.

C. Construction Facilities: Parking, progress cleaning, project signage, and temporary building.

1.02 GENERAL

A. Install temporary facilities and utilities in conformance with State and Local Codes and requirements.

B. Obtain and pay for required applications, permits and inspections.

C. Early Service: Any Contractor requiring temporary service before it can be provided as specified, or whose requirements with respect to a particular service differ from the service specified shall provide such service as suits his needs, at his own expense, and in a manner satisfactory to the Construction Manager.

D. Maintenance: Temporary facilities and utilities are to be maintained and kept in good operating condition. Maintenance men necessary to perform this work shall be provided in accordance with requirements. Maintenance time will include normal working hours for all trades and start up and shut down overtime as required.

E. Removals: Subject to approval of Construction Manager, contractor providing temporary facilities or services shall remove same when no longer required or when their function is replaced by authorized use of permanent facilities. Other removal time may be directed by Construction Manager.

F. Disclaimer: Specific administrative and procedural minimum actions are specified in this section, as extension of provisions in General Conditions and other contract documents. These requirements have been included for special purposes as indicated. Nothing in this section is intended to limit types and amounts of temporary work required, and no omission from this section will be recognized as an indication by Architect, Engineer or Construction Manager that such temporary activity is not required for successful completion of the work and compliance with requirements of contract documents. Provisions of this section are applicable to, but not by way of limitation, utility services, construction facilities, security/protection provisions, and support facilities.

1.03 TEMPORARY SANITARY FACILITIES

A. The Construction Manager will provide temporary sanitary facilities for use by contractors. The use of hospital facilities is prohibited.

1.04 TEMPORARY HEAT

A. General Responsibilities: Temporary heating responsibilities and equipment types relate to the extent of building enclosure and work performed as follows:

1. Prior to Enclosure of any Type: Temporary heat for the building prior to the building being partially enclosed in each Trade contractor's responsibility. Each Trade Contractor shall provide, at his own expense, all cold weather protection and temporary heat as required to carry out his work expeditiously during inclement weather and to protect all his work and materials from damage by the weather.

   a. Equipment: No restrictions are placed on heating equipment except that such equipment shall conform to applicable safety regulations and its use shall not damage or otherwise be detrimental to the appearance of the Work.

b. Cost: All Costs borne by Trade Contractor providing temporary heat.

c. Work Restrictions: No work with interior type finishes or work permitted which may be damaged by direct contact with water.

2. Partial Enclosure: Temporary heat for partially enclosed portions of the building prior to the building being permanently enclosed is each Trade Contractor's responsibility. Partial enclosure is defined as permanent walls of the space in place, all openings provided with suitable temporary enclosures or permanent enclosures, not less than one floor slab or roof directly above the space in place.

   a. Equipment: Heating equipment shall be approved gas-fired forced air heaters. Operation of electric resistance heaters or air-conditioning units is optional but all associated fuel costs for increased temporary electric power, if available, and separate metering to be borne by the using Trade Contractor.

   b. Cost: All costs borne by Trade Contractor providing temporary heat.

   c. Work Restrictions: No interior type finish work beyond hanging wallboard. Protect all such work from becoming wet.

3. Permanent Enclosure: Temporary heat of the building after the building is permanently enclosed and approved as such by the Architect shall be provided by Bid Package 02. Permanent enclosure is defined as permanent walls, roofs, copings, and flashings in place and weather tight, windows in place and glazed and all entrance enclosures either permanently in place or provided with suitable temporary enclosures.

   a. Equipment: Temporary construction heaters, hot water heaters.

   b. Cost: Cost of fuel and electric power consumed paid for by Trade Contractor

   c. Work Restrictions: None except as may be stated in separate Specification Sections or required by the manufacturer, such as special ventilation requirements.

B. Ventilation: The Mechanical Contractor (Bid Package 02) shall provide ventilation for the building and to prevent building up of harmful dusts and fumes and to remove excess moisture. During warm weather, provide an adequate supply of fresh air (minimum 1 to 1-1/2 air changes per hour) when necessary to properly ventilate for moisture, dust, fumes from paints, cements, or adhesives in tightly enclosed area where natural ventilation will not be sufficient. Ventilation requirements may be supplemented by the building's permanent HVAC system but primary responsibility rests with the designated trade contractor.

C. Mechanical Trade Contractor Responsibilities:

1. Maintain as to temperatures and ventilation required for work in various parts of the building as follows:

   a. Stored Materials: As recommended by manufacturer.

   b. Installed Materials: As recommended by manufacturer for the length of time following installation.

2. Maintain that portion of any floor thereof which has been constructed, or partly constructed, at a temperature and humidity that will ensure against damage due to warping, buckling, excessive shrinkage, etc., and adequate ventilation until the permanent HVAC system is operating. Trade Contractor will be responsible for damage to work under other contracts due to smoke or other damage caused by improper temporary heating.

3. Installation, connection, operation, and maintenance of temporary heating and ventilating devices to be performed by tradesmen proficient in the skills required and meet requirements of applicable regulator agencies.

4. Temperature Requirements:

   a. Provide temperatures required in various parts of the buildings as specified herein below:

   b. All Trades: provide the range of temperatures required for temporary heat, so the temperature as recommended by the manufacturer of the material concerned is maintained while such materials as mentioned above are stored in the building or being

installed, and for the length of time recommended following installation. In those portions of the building where work is in progress or completed, it must be protected from freezing if subject to damage there from.

5. During General Contract Work: Provide the following:
   a. During installation of gypsum wallboard or gypsum lath, a temperature of not less than 55 deg F during working hours, and a temperature of at least 40 deg F at all other times throughout the heating season.
   b. Wall before plaster work or joint work for gypsum wall board begins and continuous throughout setting and drying periods, a temperature range between 50 and 75 deg F shall be maintained day and night. During this period, no finish woodwork, resilient flooring or flexible wall coverings shall be installed or stored in the buildings, and no finish painting or applying of finish wall coatings shall be undertaken.
   c. For a period of 10 days previous to the placing of interior wood finish and throughout the placing of this and other interior finishing, varnishing, painting, etc., and until final acceptance of the work or until fully occupied by the Owner, provide sufficient heat to produce a temperature range between 60 deg F and 75 deg F.
   d. During and after installation of millwork, maintain temperature and humidity conditions in building spaces at same levels planned for occupancy.
6. Permanent Systems:
   a. The permanent HVAC system can be used for temporary heating, cooling and ventilation so long as the following maintenance includes the following:
      i. Proper operation and maintenance of the HVAC plant until acceptance of building by Owner.
      ii. Maintenance of temporary filters in all equipment to prevent accumulation of dust and dirt in coils, housing, and ductwork.
      iii. Prior to Final Inspection: Replacement of all (temporary and existing) filters with new filters, thorough cleaning of coils and other equipment, putting entire system into first class condition, cleaning traps and devices, adjustment and renewal of all materials and equipment not functioning correctly.
      iv. Use of permanent heating or cooling equipment for temporary heating or cooling shall not affect guarantee. Guarantee shall take effect at time of building acceptance by Owner. Mechanical contractor to provide extended warranty as needed.
      v. Cost of all fuel for operation of permanent heating system shall be paid by the Construction Manager and be reimbursed in full by the Owner.
   b. Close off return air to the permanent systems and provide only single-pass air during the course of construction. This practice shall remain in place until area is clean and system is ready for final balancing.
   c. Replace filters in all equipment to prevent accumulation of dust and dirt in coils, housings, and ductwork.
7. Prior to Final Inspection:
   a. Replace temporary filters with new filters.
   b. Thoroughly clean coils and other equipment.
   c. Clean traps and devices, adjust and renew any and all materials and equipment not functioning correctly.
   d. Vacuum clean the duct system.
   e. Restore equipment to like new condition.

1.05 TEMPORARY LIGHT AND POWER

A. Each Trade Contractor: Provide light and power for his own construction field office.

B. Electrical Trade Contractor:

1. Provide temporary light and power distribution for construction purposes for all trades including the cost of running temporary service from the utility supply. The temporary lighting and power system shall comply with all applicable OSHA regulations.
    a. Temporary power to be sufficient to operate all "light tools" and equipment (electric arc welders excluded) and permanent building equipment including the HVAC system.
    b. Additional temporary power required by other trades to be furnished, at their cost, up to the power available.

C. Electrical work shall confirm to requirements of the National Electrical Code and all federal, state and local requirements. The Electrical Contractor shall obtain and pay for applications, permits and inspection pertaining to this work.

D. Each trade shall provide and pay for its own extensions for lights or power tools beyond the receptacle outlets provided above.

E. The electrical requirements for all temporary heating and ventilating systems shall be connected directly to the project temporary power system until the primary service is installed.

F. Temporary work shall be installed in such a manner as not to interfere with the permanent construction.

1.06 TEMPORARY LIGHTING

A. The Electrical trade contractor to provide and be responsible for the following: Temporary lighting distribution to be made from the temporary panels indicated above. Each circuit shall consist of "pigtail" receptacles on 20 foot centers with 200 watt lamps installed in every other receptacle leaving the alternate receptacles for added concentration of lighting as needed. Wire fixtures with #8 AWG wire and suspend at least 10'-6" above the floor.
    1. As interior partitions are erected, revise the temporary lighting arrangements so that not less than 1 lamp is provided in each space if needed for work or required for safety. Also, install lights as directed by Construction Manager, in smaller areas where required to provide adequate light for work being carried out in the space.
    2. Receptacle Outlets: See temporary light and power.
    3. Furnish and install 200 Watt lamps for general circuit lighting and all fuses as may be required for a complete job.
    4. Replace lamps, fuses, including theft, throughout the life of the project.
    5. Install and maintain a reasonably balanced system and take current readings on the feeders at regular intervals as required. Correct any serious phase unbalance.
    6. Protect the installation against weather damage, normal operations of other trades, and other persons on the site. Be responsible for the proper use and maintenance of temporary wiring systems until they are removed.

B. Each trade shall provide and pay for its own extensions for lights or power tools beyond the receptacle outlets provided above.

1.07 BARRIERS

A. Provide barriers to prevent unauthorized entry to construction area, to allow for Owner's use of site, and to protect existing facilities and adjacent properties from damage from construction operations and demolition. Provide barricades and covered walkways as required by governing authorities for public rights-of-way and for public access to existing building.

B. Provide protection for plant life designated to remain. Replace damaged plant life.

C. Protect no-owned vehicular traffic, stored materials, site, and structures from damage.

1.08 WATER CONTROL

A. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.

B. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.

C. Provide temporary drainage trenches, drains, sumps, pumps, or other items required to afford satisfactory working conditions for the execution, completion and protection of the work. Water shall be diverted to or shall be pumped into existing sewerage systems or ditches and shall not be allowed to run onto ground surface area.

1.09 EXTERIOR ENCLOSURES

A. Weather-tight enclosures shall be included in the Framing, Drywall, etc. Bid Package (01). Temporary enclosures shall be provided insulated and weather-tight at exterior openings to accommodate acceptable working conditions and protection for products, to allow for temporary heating and maintenance of required ambient temperatures identified in individual specification Sections, and to prevent entry of unauthorized persons. Provide doors with self-closing hardware and locks.

1.10 PROTECTION OF INSTALLED WORK

A. Protect installed work and provide special protection to protect work by other contractors.

B. Provide temporary and removable protection for installed products. Control activity in immediate work area to minimize damage.

C. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.

D. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects by protecting with durable sheet materials.

E. Prohibit traffic or storage on waterproofed or roofed surfaces. When traffic or activity is necessary, obtain recommendation for protection from waterproofing or roofing material manufacturer.

F. Prohibit traffic from landscaped areas.

1.11 ROOF PROTECTION

A. Protect existing roofs from damage due to activities under this Contract. Each Prime Contractor to provide roof protection for their work. Minimum protection to include the following:

1. One layer of 1/4 inch thick fanfold board ("Amocor'PB4" by Amoco or equal) laid directly over roof.

B. One layer of nominal 1/2 inch thick exterior plywood or exterior OSB board laid over fanfold board. Provide suitable ballast to maintain position and preclude blow-off. Do not overload structure.

C. After completion of work operations on roof, remove temporary protection, restore roof to pre-construction condition, and repair damage to roof, if any; see below.

D. Damage/Warranties: Damage to existing roofing due to operations under this Contract to be repaired as required by roofing membrane manufacturer without reduction in Owner's warranty provisions and rights:

E. All costs associated with repairs and warranty reinstatements, if any, to be borne by the Prime Contractor who caused the damage.

F. Existing Warranties: Coordinate with Owner for areas of roof which carry existing warranty; repairs in these areas, if any, to be made by original installer.

1.12 WEATHER PROTECTION

A. Protect work and existing or adjacent property against weather, to maintain their work, materials, apparatus and fixtures free form injury or damage in accordance with the General conditions during the entire construction period. Work likely to be damaged shall be covered or protected at the end of each day's work. Work damaged by failure to provide weather protection all be removed and replaced with new work at the contractor's expense.

1. Provide temporary non-staining waterproof covering for tops of all exterior walls keep cavities and wall materials dry. Coverings to shed water to exterior and lap wall assemblies not less than 4 inches. Maintain in watertight condition until permanent coverings are in place. Coordinate with similar requirement specified under Division 06.

B. Remove all snow and ice as may be required for proper protection and execution of the work and protect and safety of the public.

C. Winter Weather Enclosures: Trade Contractor designated to provide for their own work and use:

Temporary Doors: Provide at all enclosed openings.

1.13 SECURITY

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

B. Coordinate with Owner's security program.

C. Require all workers on Project to govern themselves under same rules and regulations as employees of Community Memorial Hospital, who will concurrently occupy premises.

D. A property pass, properly approved by the CEO, COO, or Facilities Manager must be secured to remove any non-personal articles. Packages, lunch boxes, clothing may be inspected by Security as employee leaves.

1.14 ACCESS TO SITE

A. Construct and maintain temporary roads accessing public thoroughfares to serve construction area.

B. Extend and relocate as Work progress requires. Provide detours necessary for unimpeded traffic flow.

C. Provide and maintain access to fire hydrants, free of obstructions.

D. Fire lanes and aisles to fire fighting equipment shall be left unobstructed at all times.

E. Material is never to be piled in front of fire equipment, fire doors, or hydrants.

1.15 PARKING

A. Parking for Contractor's firm owned vehicles is limited, in number and location, to staging areas designated by the Construction Manager. No parking or obstructing egress to and from Parking Areas will be allowed.

B. Traffic and parking regulations of Owner are applicable and violators are subject to fines for infractions.

C. When site space is not adequate, provide additional off-site parking.

1.16 PROGRESS CLEANING AND WASTE REMOVAL

A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.

B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.

C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.

D. Remove waste materials, debris, and rubbish from building daily.

E. Carts, trucks, etc. used to transport materials shall be loaded in a safe manner. Materials shall not protrude beyond the sides of conveyance used.

F. Materials shall not be thrown or dropped from scaffolds or other overhead areas.

G. Gasoline or other highly flammable liquids shall not be brought inside facilities.

H. Spills of any materials creating hazards shall be cleaned up immediately.

1.17 HAUL ROUTES

A. Haul routes shall be designated by Owner and Construction Manager.

B. Confine construction traffic to designated route.

C. Provide traffic control at critical areas of haul routes to regulate traffic, to minimize interference with public traffic.

D. Contractor is responsible for keeping all public streets and owner occupied paving clean.

PART 2 PRODUCTS

2.01 TEMPORARY FIELD OFFICES

A. General:

1. Construction: Offices to be weather-tight, heated, air-conditioned, lighted, doors with locks, and furnished with private line telephone.
2. Expenses:
    a. Construction Manager: All expenses in connection with his or Architect's Field Offices, including the installation costs and use of telephones, heat, air-conditioning, light, water and janitor service shall be paid for by the Construction Manager and will be fully reimbursed by the Owner.
    b. Prime Contractors: All expenses associated with their offices including utility installation costs shall be included in their bid.
3. Toll Costs: All long-distance calls to be paid for by party placing call including Architect, Owner's representative, and contractors.
4. Field Offices shall be maintained until final acceptance and then be removed by the responsible party, no later than fifteen (15) days after acceptance of building, unless the Construction Manager orders or approves earlier removal.

B. Construction Manager shall provide temporary field office for his use and for job meetings. This office will have phone and fax for use by other Prime Contractors.

C. Each Prime Trade Contractor: To keep a complete set of drawings, and specifications kept marked up to date with revision, Addenda, as-built drawings, and all permits and approved shop drawings on file. Each Prime Contractor is also responsible to ensure their field personnel have the same information on the jobsite.

PART 3 EXECUTION

3.01 USE OF PERMANENT SYSTEMS AND FACILITIES

A. Obtain written agreement with Owner, establishing start of warranties and conditions of use:

1. Systems complete, with utility connections and safety devices.
2. Automatic controls operational.
3. Temporary filters and items required for protection of equipment and finishes are in place.
4. Replace items damaged during temporary service use.

3.02 TOOL AND EQUIPMENT USE ON HOSPITAL PROPERTY

A. Use of power-actuated tools is limited and shall not be used unless authorized by the Owner's Representative.

B. All tools and equipment must conform to OSHA Safety Code and State Codes. All contractors' equipment must be removed upon completion of the job.

C. Before any hot work is started in an area of the facilities, a fire permit must be obtained from the Owner:

1. All welding.
2. Torch cutting.
3. Soldering.
4. Melting of metals.
5. Any operation where open flames or sparks are present.

D. Necessary precaution and protection is to be exercised to prevent fires and damage from falling sparks from welding and cutting operations. This must be done before the Owner's Safety Department okay will be given for any hot work.

3.03 CLEAN-UP AND MATERIAL MOVING

A. Keep working area as clean as possible at all times. Do not allow refuse and debris to accumulate. All refuse and debris must be removed form work area by contractor each day and disposed of in a legal dumping site.

B. Each Trade Contractor and their subcontractors shall do their own clean-up, move materials that are in the way of construction, and repair and replace damage they do.

C. If the above work is not accomplished in a reasonable length of time, the Construction Manager will do the required work. Cost of the work will be charged to the Trade Contractor.

D. Each Contractor shall do all cleaning of finish surfaces relative to their work prior to acceptance of their work. Each Contractor shall comply with all special cleaning instructions contained in the Specification.

END OF SECTION 01 50 00

SECTION 01 52 00
PAY APPLICATION AND SCHEDULE OF VALUES

A. All pay requests shall be submitted on form AIA G702/CMA *Application and Certification for Payment*.

B. All Applications for Payment shall have a schedule of values submitted on form AIA G703. Include breakdown of costs for all components, systems, and types of work. Provide a labor, material and equipment breakdown for each item.

C. Submit a proposed Schedule of Values to the Construction Manger for review and approval within 15 business day from receipt of a notice of award. The Schedule of Values shall separate the cost of the work into identifiable sections for use in determining the percentage complete for each pay application. Separate lines on the Schedule of Values shall be provided for all divisions of work; labor, material, equipment, and major components.

D. In the Schedule of Values, have one item labeled closeout. This line item will be worth 3% of the bid package. This line item is not part of the 5% retainage. This will be used to track progress of turning in warranties, O&M's, extra materials, and other closeout documentation. Owner training and as-built drawings will be exempt from this line item. No partial payment is made on this line item until all items have been approved.

E. The Schedule of Values shall be broken down into the following areas as per Section 01 5201.

F. Pay Applications shall be submitted to the Construction Manger by the 22nd day of the month and shall only include work complete for the same month. False or inaccurate pay applications will be rejected.

G. Billing for stored materials is allowed, see the attached instructions.

INSTRUCTIONS FOR BILLING FOR STORED MATERIALS

If materials are stored at the construction site, they are not considered stored materials. The Owner and/or Construction Manager are not responsible to provide storage locations for project materials, tools, or equipment.

If materials are stored at a location other than the construction site, they are considered stored materials, and in order to invoice for such materials the following documentation is required:

1. A completed bill of sale signed by a company representative. A sample is attached.
2. A certificate of insurance equal to or in excess of the value of the stored materials being invoiced that clearly identifies insurance coverage includes the storage location where materials are being stored; the Owner shall be listed as an additional insured. Any and all insurance premiums and deductibles will be paid by contractor.
3. Digital photos of the stored materials, with the materials clearly marked "sold to '*Broadlawns Medical Center*".
4. Notify the Construction Manager by the 18th day of the month to allow the Construction Manager and/or Owner to inspect and take photos of the stored materials prior to the review process, if they so desire.
5. Copies of material invoices from the contractor's supplier. The contractor can bill for the invoiced cost of the stored materials. All overhead and profit shall be billed for after material is delivered to the jobsite.

Bill of Sale for Offsite Stored Materials
Broadlawns Medical Center
Des Monies, IA 50314

Contractor / Vendor Name & Address:_____
_____

Name and Address of Storage Location:_____
_____

Contractor/Vendor for and in consideration of the partial payment to be made by *"Broadlawns Medical Center"* under the existing contract agreement hereby sells to *"Broadlawns Medical Center"* the personal property described in the attached invoice and as itemized: (attach additional sheets if required)

Item Description Quantity Value
_____
_____
_____
_____
_____

Contractor / Vendor shall clearly label all stored materials sold to the Owner, and shall be clearly marked in the provided digital photos. All stored materials shall be stockpiled separate from other materials, and shall not co-mingle with stock or stored materials for other projects.

The Owner and Construction Manager shall have free access to the storage location for inspection of all stored materials. The Owner may take possession of, obtain, remove, sell, or discard of any and all stored materials at any time, at their sole discretion.

Executed on this _____ day of _____ 20__.

_____
Contractor / Vendor Signature

By:_____

Title:_____

Address:_____

_____

END OF SECTION 01 52 00

SECTION 01 53 00
CONTRACTORS COST SUMMARY WORKSHEET

A. The following is a copy of the Contractor's Cost Summary Worksheet. Each Contractor shall complete this form and submit it with proper supporting documentation for all cost changes.

B. The allowance for overhead and profit combined, included in the total cost shall be based on the amounts stated below:

1. For the Contractor; for added work performed by the Contractor's own forced, 15 percent of the cost up to $10,000 total change order cost including mark-up, 10 percent from $10,000 to $50,000, 5 percent above $50,000; for deleted work performed by the Contractor's own forces, 5 percent of the cost.

2. For the Contractor, for added or deleted work performed by the contractor's Subcontractor, 5 percent of the amount due the Subcontractor.

3. For each Subcontractor or Sub-subcontractor involved; for added work performed by that subcontractor's own forces, 15 percent of the cost up to $10,000 total change order cost including mark-up, 10 percent from $10,000 to $50,000, 5 percent above $50,000; for deleted work performed by that Subcontractor's own forces, 5 percent of the cost.

4. For each Subcontractor, for added or deleted work performed by the Subcontractor's Sub-subcontractors, 5 percent of the amount due the Subcontractor.

5. In order to facilitate the checking of quotations for extras or credit, all proposals, except those so minor that their propriety can be seen by inspection, shall be accompanied by a complete itemization of costs including labor, materials, and Subcontracts. Labor and materials shall be itemized in the manner described above. Where major cost items are Subcontract, they shall be itemized also. In no case will a change involving over $250.00 be approved without such itemization.

   Reference Cost Summary Sheet Example in Section 01 53 00.01

END OF SECTION 01 53 00

GRAHAM construction co.

Building what's important.™

Contractor's Cost Summary

Project: _____ Reference: _____

Contractor: _____ Date: _____

This form, itemized accountings and appropriate supporting data must be attached to any Claim or Change Proposal.

(Only fill in applicable line items)

1. Labor *(including benefits) $_____
2. Materials * $_____
3. (Subtotal of lines 1 & 2) $_____
4. Overhead & Profit (% of line 3) $_____
5. Premium Time on Contract Work $_____
6. Major Construction Equipment* $_____
7. Subcontractor's name & cost: (Attached summaries & breakdowns)
   - a. _____ $_____
   - b. _____ $_____
   - c. _____ $_____
   - d. _____ $_____
   - e. _____ $_____
   - f. _____ $_____
   - g. _____ $_____
   - h. _____ $_____
8. Total Sub. Cost (total of lines 7a thru 7h) $_____
9. Contractor's O & P Sub's. Work (% of line 8) $_____
10. (Subtotal of lines 3,4,5,6,8 and 9) $_____
11. Bond _____% & Insurance _____% (if required) = _____% of line 10 $_____
12. Total Cost (total of line 10 and 11) $_____
(if this is Sub's Summary, Contractor to include the amount of line 12 on line 7 of their Cost Summary)

13. Adjustment in Contract Time (calendar days): _____ (Add) (Deduct).
(Providing supportive data substantiating claim for additional days).

***Attach breakdown of itemized accounting and supporting data.**

END OF SECTION

SECTION 01 60 00
PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General product requirements.

B. Re-use of existing products.

C. Transportation, handling, storage and protection.

D. Product option requirements.

E. Substitution limitations.

F. Procedures for Owner-supplied products.

G. Maintenance materials, including extra materials, spare parts, tools, and software.

1.02 REFERENCE STANDARDS

A. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.03 SUBMITTALS

A. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.

B. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

C. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.

1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.

PART 2 PRODUCTS

2.01 EXISTING PRODUCTS

A. Do not use materials and equipment removed from existing premises unless specifically required or permitted by Contract Documents.

B. Unforeseen historic items encountered remain the property of the Owner; notify Owner promptly upon discovery; protect, remove, handle, and store as directed by Owner.

C. Existing materials and equipment indicated to be removed, but not to be re-used, relocated, reinstalled, delivered to the Owner, or otherwise indicated as to remain the property of the Owner, become the property of the Contractor; remove from site.

D. Specific Products to be Reused: The reuse of certain materials and equipment already existing on the project site is required.

1. See Section 01 10 00 for list of items required to be salvaged for reuse and relocation.

2.02 NEW PRODUCTS

A. Provide new products unless specifically required or permitted by Contract Documents.

B. Where other criteria are met, Contractor shall give preference to products that:

1. Are extracted, harvested, and/or manufactured closer to the location of the project.

2. Have longer documented life span under normal use.

3. Result in less construction waste.

2.03 PRODUCT OPTIONS

A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.

B. Products Specified by Naming One or More Manufacturers: Use a product of one of the manufacturers named and meeting specifications, no options or substitutions allowed.

C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.

D. "Similar and equivalent to" indicates an example product that meets specifications. This example is not considered a 'named' product.

E. "Basis of Design" indicates applicable characteristics of named product were used to design systems. "Similar and equal to" is implied unless otherwise indicated. When provision for substitution is stated, submit a request for any manufacturer or product not named.

F. "Approved Equal" with a provision for substitutions: Contractor may submit a request for substitution for any manufacturer not named. The example is considered a 'named' product. The allowance for substitutions does not warrant that a substitution is known or exists.

2.04 MAINTENANCE MATERIALS

A. Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification sections.

B. Deliver to Project site; obtain receipt prior to final payment.

C. Record delivery date and time in Contractor As-Built Document Set.

PART 3 EXECUTION

3.01 SUBSTITUTION PROCEDURES

A. Instructions to Bidders specify time restrictions for submitting requests for substitutions during the bidding period. Comply with requirements specified in this section.

B. Substitutions of products, materials, equipment, or methods of construction will not be considered except in the following instances:

1. The specified item cannot be provided within the Contract time (substitutions will not be considered if this is the result of the Contractor's failure to pursue the work in a timely manner).
2. The requested substitution offers the Owner a substantial savings in cost, time, or energy conservation.
3. The specified item cannot be installed due to incompatibility with other materials, failure to comply with applicable codes, etc

C. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents.

D. A request for substitution constitutes a representation that the submitter:

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

E. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals, without separate written request, or when acceptance will require revision to the Contract Documents. Substitution Submittal Procedure:

1. Submit six copies of request for substitution for consideration. Limit each request to one proposed substitution.
2. Submit shop drawings, product data, and certified test results attesting to the proposed product equivalence. Burden of proof is on proposer.
3. The Architect/Engineer will notify Trade Contractor in writing of decision to accept or reject request.
4. Identify product by Contractor Specification Section and article numbers. Provide manufacturer's name and address, trade name of product, and model or catalog number. List fabricators and suppliers as appropriate.
5. List similar projects using product, dates of installation, and names and phone numbers of Architect and Owner.
6. Give itemized comparison of proposed substitution with specified product, listing quality and performance variations, and reference to Specification Section and article number.
7. Give cost data comparing proposed substitution with specified product, and amount of net change to Contract price.
8. List nearest availability of maintenance services and replacement materials.
9. State effect of substitution on construction schedule, and changes required in other work or products.

F. Acceptance of a substitute manufacturer does not waive or alter any specified product requirement.

3.02 OWNER-SUPPLIED PRODUCTS

A. See Section 01 10 00 - Summary for identification of Owner-supplied products.

3.03 TRANSPORTATION AND HANDLING

A. Package products for shipment in manner to prevent damage; for equipment, package to avoid loss of factory calibration.

B. If special precautions are required, attach instructions prominently and legibly on outside of packaging.

C. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.

D. Transport and handle products in accordance with manufacturer's instructions.

E. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.

F. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.

G. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage, and to minimize handling.

H. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

3.04 STORAGE AND PROTECTION

A. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication.

B. Store and protect products in accordance with manufacturers' instructions.

C. Store with seals and labels intact and legible.

D. Store sensitive products in weathertight, climate-controlled enclosures in an environment favorable to product.

E. For exterior storage of fabricated products, place on sloped supports above ground.

F. Protect products from damage or deterioration due to construction operations, weather,

precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.

G. Comply with manufacturer's warranty conditions, if any.

H. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.

I. Prevent contact with material that may cause corrosion, discoloration, or staining.

J. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.

K. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

END OF SECTION 01 60 00

SECTION 01 60 01
SUBSTITUTION REQUEST FORM

We hereby submit for your consideration the following product instead of the specified item for the following project:

PROJECT TITLE _____ PROJECT NO. _____

DRAWING NO. _____ DRAWING TITLE _____

SPEC. SECTION	SPEC. TITLE	PARAGRAPH	SPECIFIED ITEM
_____	_____	_____	_____

Proposed Substitution:_____

Attach complete information on changes to Drawings and/or Specifications which proposed substitution will require for its proper installation.

Submit, with request, all necessary samples and substantiating data to prove equal quality and performance to that which is specified. Clearly mark manufacturer's literature to indicate equality in performance.

Substitutions of the materials and equipment described in the Contract Documents will be considered during the bidding period upon receipt or a written request to the Architect for approval up to three (3) days before receipt of bids. Verbal or written requests without the completed Substitution Request Form will not be considered.

CERTIFICATION OF EQUAL PERFORMANCE AND ASSUMPTION OF LIABILITY FOR EQUAL PERFORMANCE

The undersigned states that the function, appearance, and quality are equivalent or superior to the specified item.

Submitted by:

_____

Signature

_____

Firm

_____

Address

_____ _____ _____

Telephone Email Date

Signature shall be by person having authority to legally bind his firm to the above terms. Failure to provide legally binding signature will result in retraction of approval.

Fill in Blanks Below:

A. Does the substitution affect dimensions shown on Drawings? Yes No

If yes, clearly indicate changes:

_____

_____

B. Will the undersigned pay for changes to the building design, including engineering and detailing costs caused by the requested substitution? Yes No

If no, fully explain:

_____

_____

C. What effect does substitution have on other Contracts or other trades?

_____

_____

D. What effect does substitution have on construction schedule?

_____

_____

E. Manufacturer's warranties of the proposed and specified items are:
_____ Same _____ Different (Explain on Attachment)

F. Reason for Request:

_____

_____

G. Itemized comparison of specified item(s) with the proposed substitution.
List significant variations:

_____

_____

H. Accurate cost data comparing proposed substitution with product specified:

_____

_____

I. Designation of maintenance services and sources:

_____

_____

J. Does the proposed substitution meet BABAA requirements? Yes No N/A

(ATTACH ADDITIONAL SHEETS IF REQUIRED)

For Use by Design Professional:

_____ Recommended _____ Recommended as Noted
_____ Not Recommended _____ Received Too Late
Signed By _____
Date _____

For Use by Owner's Representative or Owner:

_____ Approved _____ Approved as Noted
_____ Not Approved _____ Approved Too Late
Signed By _____
Date _____

END OF SECTION

SECTION 01 70 00
EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Examination, preparation, and general installation procedures.

B. Requirements for alterations work, including selective demolition, except removal, disposal, and/or remediation of hazardous materials and toxic substances.

C. Pre-installation meetings.

D. Cutting and patching.

E. Cleaning and protection.

F. Starting of systems and equipment.

G. Demonstration and instruction of Owner personnel.

H. Closeout procedures, including Contractor's Correction Punch List, except payment procedures.

I. General requirements for maintenance service.

1.02 RELATED REQUIREMENTS

A. Section 01 10 00 - Summary: Limitations on working in existing building; continued occupancy; work sequence.

B. Section 01 40 00 - Quality Requirements: Testing and inspection procedures.

C. Section 01 50 00 – Temporary Facilities and Controls: Temporary exterior enclosures.

D. Section 01 50 00 – Temporary Facilities and Controls: Temporary interior enclsoures.

E. Section 01 78 00 - Closeout Submittals: Project record documents, operation and maintenance data, warranties.

1.03 REFERENCE STANDARDS

A. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2022, with Errata (2021).

1.04 SUBMITTALS

A. Cutting and Patching: Submit written request in advance of cutting or alteration that affects:
   1. Structural integrity of any element of Project.
   2. Integrity of weather exposed or moisture resistant element.
   3. Efficiency, maintenance, or safety of any operational element.
   4. Visual qualities of sight exposed elements.
   5. Work of Owner or separate Contractor.
   6. Include in request:
      a. Identification of Project.
      b. Location and description of affected work.
      c. Necessity for cutting or alteration.
      d. Description of proposed work and products to be used.
      e. Effect on work of Owner or separate Contractor.
      f. Written permission of affected separate Contractor. Date and time work will be executed.

B. Project Record Documents: Accurately record actual locations of capped and active utilities.

1.05 PROJECT CONDITIONS

A. Dust Control: Execute work by methods to minimize raising dust from construction operations.

Provide positive means to prevent air-borne dust from dispersing into atmosphere and over adjacent property.

B. Noise Control: Provide methods, means, and facilities to minimize noise produced by construction operations.
   1. Outdoors: Limit conduct of especially noisy exterior work to the hours of 8 am to 5 pm.

C. Pollution Control: Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations. Comply with federal, state, and local regulations.

1.06 COORDINATION

A. See Section 01 10 00 for occupancy-related requirements.

B. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.

C. Notify affected utility companies and comply with their requirements.

D. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.

E. Coordinate space requirements, supports, and installation of electrical work that are indicated diagrammatically on drawings. Follow routing indicated for pipes and conduit as closely as practicable. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

F. In finished areas except as otherwise indicated, conceal pipes and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.

G. Coordinate completion and clean-up of work of separate sections.

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

PART 2 PRODUCTS

2.01 PATCHING MATERIALS

A. New Materials: As specified in product selections; match existing products and work for patching and extending work.

B. Type & Quality of Exisitng Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.

C. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 01 60 00 – Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.

B. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.

C. Examine and verify specific conditions described in individual specification sections.

D. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or mis-fabrication.

E. Verify that utility services are available, of the correct characteristics, and in the correct locations.

F. Prior to Cutting: Examine existing conditions prior to commencing work, including elements

subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

3.02 PREPARATION

A. Clean substrate surfaces prior to applying next material or substance.

B. Seal cracks or openings of substrate prior to applying next material or substance.

C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

3.03 PREINSTALLATION MEETINGS

A. When required in individual specification sections, convene a preinstallation meeting at the site prior to commencing work of the section.

B. Require attendance of parties directly affecting, or affected by, work of the specific section.

C. Notify Design Professional five days in advance of meeting date.

D. Prepare agenda and preside at meeting:
   1. Review conditions of examination, preparation and installation procedures.
   2. Review coordination with related work.

E. Record minutes and distribute copies within two days after meeting to participants, with two copies to Design Professional, Owner, participants, and those affected by decisions made.

3.04 GENERAL INSTALLATION REQUIREMENTS

A. In addition to compliance with regulatory requirements, conduct construction operations in compliance with NFPA 241, including applicable recommendations in Appendix A.

B. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.

C. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.

D. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.

E. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.

F. Make neat transitions between different surfaces, maintaining texture and appearance.

3.05 ALTERATIONS

A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
   1. Verify that construction and utility arrangements are as indicated.
   2. Report discrepancies to Design Professional before disturbing existing installation.
   3. Beginning of alterations work constitutes acceptance of existing conditions.

B. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications): Remove, relocate, and extend existing systems to accommodate new construction.
   1. Verify that abandoned services serve only abandoned facilities.
   2. Remove abandoned pipe, conduits, and equipment, back to source of supply where possible, otherwise cap stub and tag with identification; patch holes left by removal using materials specified for new construction.

C. Protect existing work to remain.
   1. Prevent movement of structure; provide shoring and bracing if necessary.
   2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
   3. Repair adjacent construction and finishes damaged during removal work.

D. Adapt existing work to fit new work: Make as neat and smooth transition as possible.
   1. When existing finished surfaces are cut so that a smooth transition with new work is not

possible, terminate existing surface along a straight line at a natural line of division and make recommendation to Design Professional.

2. Where a change of plane of 1/4 inch or more occurs in existing work, submit recommendation for providing a smooth transition for Design Professional review and request instructions.

E. Remove demolition debris and abandoned items from alterations areas and dispose of off-site; do not burn or bury.

F. Comply with all other applicable requirements of this section.

3.06 CUTTING AND PATCHING

A. Whenever possible, execute the work by methods that avoid cutting or patching.

B. Perform whatever cutting and patching is necessary to:

1. Complete the work.
2. Fit products together to integrate with other work.
3. Provide openings for penetration of electrical, and other services.
4. Match work that has been cut to adjacent work.
5. Repair areas adjacent to cuts to required condition.
6. Repair new work damaged by subsequent work.
7. Remove samples of installed work for testing when requested.
8. Remove and replace defective and non-complying work.

C. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.

D. Employ skilled and experienced installers to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.

E. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.

F. Restore work with new products in accordance with requirements of Contract Documents.

G. Fit work tightly to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

H. Patching:

1. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
2. Match color, texture, and appearance.
3. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.

3.07 PROGRESS CLEANING

A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.

B. Broom and clean areas prior to start of surface finishing, and continue cleaning to eliminate dust.

C. Collect and remove waste materials, debris, and trash/rubbish from site weekly and dispose off-site; do not burn or bury.

3.08 PROTECTION OF EXISTING AND INSTALLED WORK

A. Protect installed work from damage by construction operations.

B. Provide special protection where specified in individual specification sections.

C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.

D. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.

E. Protect work from spilled liquids. If work is exposed to spilled liquids, immediately remove protective coverings, dry out work, and replace protective coverings.

F. Prohibit traffic from landscaped areas.

G. Remove protective coverings when no longer needed; reuse or recycle coverings if possible.

3.09 SYSTEM STARTUP

A. Coordinate schedule for start-up of various equipment and systems.

B. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.

C. Verify that wiring and support components for equipment are complete and tested.

D. Execute start-up under supervision of applicable Contractor personnel in accordance with manufacturers' instructions.

E. When specified in individual specification Sections, require manufacturer to provide authorized representative to be present at site to inspect, check, and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.

F. Submit a written report that equipment or system has been properly installed and is functioning correctly.

3.10 DEMONSTRATION AND INSTRUCTION

A. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at scheduled time, at equipment location.

B. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.

C. Provide a qualified person who is knowledgeable about the Project to perform demonstration and instruction of Owner's personnel.

3.11 FINAL CLEANING

A. Execute final cleaning prior to Substantial Completion.
   1. Clean areas to be occupied by Owner prior to final completion before Owner occupancy.

B. Use cleaning materials that are nonhazardous.

C. Clean surfaces exposed to view; remove temporary labels, stains and foreign substances.

D. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on electrical equipment.

E. Clean debris from storm drainage systems.

F. Clean site; sweep paved areas, rake clean landscaped surfaces.

G. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

3.12 CLOSEOUT PROCEDURES

A. Make submittals that are required by governing or other authorities.
   1. Provide copies to Design Professional and Owner.

B. Accompany Contractor and/or Owner on preliminary inspection to determine items to be listed for completion or correction in the Contractor's Correction Punch List for Contractor's Notice of Substantial Completion.

C. Notify Design Professional when work is considered ready for Design Professional's Substantial Completion inspection.

D. Submit written certification containing Contractor's Correction Punch List, that Contract

Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Design Professional's Substantial Completion inspection.

E. Conduct Substantial Completion inspection and create Final Correction Punch List containing Design Professional's and Contractor's comprehensive list of items identified to be completed or corrected and submit to Design Professional.

F. Correct items of work listed in Final Correction Punch List and comply with requirements for access to Owner-occupied areas.

G. Notify Design Professional when work is considered finally complete and ready for Design Professional's Substantial Completion final inspection.

H. Complete items of work determined by Design Professional listed in executed Certificate of Substantial Completion.

3.13 MAINTENANCE

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

B. Maintenance Period: As indicated in specification sections or, if not indicated, not less than one year from the Date of Substantial Completion or the length of the specified warranty, whichever is longer.

C. Examine system components at a frequency consistent with reliable operation. Clean, adjust, and lubricate as required.

D. Maintenance service shall not be assigned or transferred to any agent or subcontractor without prior written consent of the Owner.

END OF SECTION

SECTION 01 78 00
CLOSEOUT SUBMITTALS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Project record documents.

B. Operation and maintenance data.

C. Warranties and bonds.

1.02 RELATED REQUIREMENTS

A. Section 00 60 00 - General Conditions: Performance bond and labor and material payment bonds, warranty, and correction of work.

B. Section 01 70 00 - Execution and Closeout Requirements: Contract closeout procedures.

C. Individual Product Sections: Specific requirements for operation and maintenance data.

D. Individual Product Sections: Warranties required for specific products or Work.

1.03 SUBMITTALS

A. Project Record Documents: Submit documents to Design Professional with claim for final Application for Payment.

B. Operation and Maintenance Data:

1. Submit two copies of preliminary draft or proposed formats and outlines of contents before start of Work. Design Professional will review draft and return one copy with comments.
2. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit completed documents within ten days after acceptance.
3. Submit one copy of completed documents 30 days prior to final inspection. This copy will be reviewed and returned after final inspection, with Design Professional comments. Revise content of all documents sets as required prior to final submission.
4. Submit two sets of revised final documents in final form prior to final inspection.

C. Warranties and Bonds:

1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within 10 days after acceptance.
2. Make other submittals within 10 days after Date of Substantial Completion, prior to final Application for Payment.
3. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within 10 days after acceptance, listing the date of acceptance as the beginning of the warranty period.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PROJECT RECORD DOCUMENTS

A. Maintain on site one set of the following record documents; record actual revisions to the Work:

1. Drawings.
2. Specifications.
3. Addenda.
4. Change Orders and other modifications to the Contract.
5. Reviewed shop drawings, product data, and samples.
6. Manufacturer's instruction for assembly, installation, and adjusting.

B. Ensure entries are complete and accurate, enabling future reference by Owner. Store record documents separate from documents used for construction.

C. Record information concurrent with construction progress.

D. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:

1. Manufacturer's name and product model and number.
2. Product substitutions or alternates utilized.
3. Changes made by Addenda and modifications.

E. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction including:

1. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
2. Field changes of dimension and detail.
3. Details not on original Contract drawings.

3.02 OPERATION AND MAINTENANCE DATA

A. Source Data: For each product or system, list names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.

B. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.

C. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.

D. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

3.03 OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES

A. For Each Product, Applied Material, and Finish:

1. Product data, with catalog number, size, composition, and color and texture designations.
2. Information for re-ordering custom manufactured products.

B. Instructions for Care and Maintenance: Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental cleaning agents and methods, and recommended schedule for cleaning and maintenance.

C. Moisture protection and weather-exposed products: Include product data listing applicable reference standards, chemical composition, and details of installation. Provide recommendations for inspections, maintenance, and repair.

D. Additional information as specified in individual product specification sections.

E. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

3.04 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS

A. For Each Item of Equipment and Each System:

1. Description of unit or system, and component parts.
2. Identify function, normal operating characteristics, and limiting conditions.
3. Include performance curves, with engineering data and tests.
4. Complete nomenclature and model number of replaceable parts.

B. Where additional instructions are required, beyond the manufacturer's standard printed

instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

C. Panelboard Circuit Directories: Provide electrical service characteristics, controls, and communications; typed. Include color coded wiring diagrams as installed.

D. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shutdown, and emergency instructions. Include summer, winter, and any special operating instructions.

E. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and troubleshooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.

F. Provide servicing and lubrication schedule, and list of lubricants required.

G. Include manufacturer's printed operation and maintenance instructions.

H. Include sequence of operation by controls manufacturer.

I. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

J. Provide control diagrams by controls manufacturer as installed.

K. Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.

L. Include test and balancing reports.

M. Additional Requirements: As specified in individual product specification sections.

3.05 ASSEMBLY OF OPERATION AND MAINTENANCE MANUALS

A. Assemble operation and maintenance data into durable manuals for Owner's personnel use, with data arranged in the same sequence as, and identified by, the specification sections.

B. Where systems involve more than one specification section, provide separate tabbed divider for each system.

C. Binders: Commercial quality, 8-1/2 by 11-inch three D side ring binders with durable plastic covers; 2-inch maximum ring size. When multiple binders are used, correlate data into related consistent groupings.

D. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.

E. Project Directory: Title and address of Project; names, addresses, and telephone numbers of Design Professional, Consultants, Contractor and subcontractors, with names of responsible parties.

F. Tables of Contents: List every item separated by a divider, using the same identification as on the divider tab; where multiple volumes are required, include all volumes Tables of Contents in each volume, with the current volume clearly identified.

G. Dividers: Provide tabbed dividers for each separate product and system; identify the contents on the divider tab; immediately following the divider tab include a description of product and major component parts of equipment.

H. Text: Manufacturer's printed data, or typewritten data on 20-pound paper.

I. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

J. Arrangement of Contents: Organize each volume in parts as follows:

1. Project Directory.
2. Table of Contents, of all volumes, and of this volume.
3. Operation and Maintenance Data: Arranged by system, then by product category.

a. Source data.

b. Product data, shop drawings, and other submittals.

c. Operation and maintenance data.

d. Field quality control data.

e. Original warranties and bonds.

3.06 WARRANTIES AND BONDS

A. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within 10 days after completion of the applicable item of work. Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial completion is determined.

B. Verify that documents are in proper form, contain full information, and are notarized.

C. Co-execute submittals when required.

D. Retain warranties and bonds until time specified for submittal.

E. Include originals of each in operation and maintenance manuals, indexed separately on Table of Contents.

END OF SECTION 01 78 00

SECTION 02 41 00
SELECTIVE DEMOLITION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Selective demolition of building elements for alteration purposes.

1.02 RELATED REQUIREMENTS

A. Section 01 10 00 - Summary: Limitations on Contractor's use of site and premises.

B. Section 01 10 00 - Summary: Description of items to be salvaged or removed for re-use by Contractor.

C. Section 01 50 00 - Temporary Facilities and Controls: Site fences, security, protective barriers, and waste removal.

D. Section 01 60 00 - Product Requirements: Handling and storage of items removed for salvage and relocation.

E. Section 01 70 00 - Execution and Closeout Requirements: Project conditions; protection of bench marks, survey control points, and existing construction to remain; reinstallation of removed products; temporary bracing and shoring.

1.03 DEFINITIONS

A. Demolish: Dismantle, raze, destroy, or wreck any building or structure or any part thereof.

B. Remove: Detach or dismantle items from existing construction and dispose of them off site, unless items are indicated to be salvaged or reinstalled.

C. Remove and Salvage: Detach or dismantle items from existing construction in a manner to prevent damage. Clean, package, label and deliver salvaged items to Owner in ready-for-reuse condition.

D. Remove and Reinstall: Detach or dismantle items from existing construction in a manner to prevent damage. Clean and prepare for reuse and reinstall where indicated.

E. Existing to Remain: Designation for existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.

1.04 REFERENCE STANDARDS

A. 29 CFR 1926 - Safety and Health Regulations for Construction.

1.05 SUBMITTALS

A. See Section 01 40 00 - Quality Requirements for submittal procedures.

B. Demolition Plan: Submit demolition plan as required by OSHA and local AHJs.
   1. Indicate extent of demolition, removal sequencing, bracing and shoring, and location and construction of barricades and fences.
   2. Summary of safety procedures.
   3. Schedule of building demolition activities with starting and ending dates for each activity.
   4. Demolition firm qualifications.
   5. Include measures for environmental protection, for dust control, and for noise control.
   6. Detail special measures proposed to protect adjacent buildings to remain including means of egress from those buildings.

C. Pre-demolition photographs or video.

D. Inventory of items that have been removed and salvaged.

E. Project Record Documents: Accurately record actual locations of capped and active utilities and subsurface construction.

1.06 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Standards: Comply with ASSE A10.6 and NFPA 241.

1.07 FIELD CONDITIONS

A. Spaces immediately adjacent to demolition area will be occupied. Conduct demolition so operations of occupied spaces will not be disrupted.
   1. Provide not less than 72 hours' notice of activities that will affect operations of adjacent occupied spaces.
   2. Maintain access to existing walkways, exits, and other facilities used by occupants of adjacent spaces.
      a. Do not close or obstruct walkways, exits, or other facilities used by occupants of adjacent spaces without written permission from authorities having jurisdiction.

B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

C. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
   1. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.

D. On-site storage or sale of removed items or materials is not permitted.

E. Arrange demolition schedule so as not to interfere with Owner's on-site operations or operations of adjacent occupied spaces.

PART 2 PRODUCTS -- NOT USED

PART 3 EXECUTION

3.01 DEMOLITION

A. Selective demolition of the building as required to accommodate new work as shown in demolition plans.

B. Remove other items indicated, for salvage and relocation.

3.02 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition waste becomes property of Contractor.

B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.
   1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

3.03 GENERAL PROCEDURES AND PROJECT CONDITIONS

A. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
   1. Obtain required permits.
   2. Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures.
      a. Survey existing conditions of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during building demolition operations. Notify Architect or Engineer of any concerns.
   3. Provide, erect, and maintain temporary barriers and security devices.

4. Use physical barriers to prevent access to areas that could be hazardous to workers or the public.
    a. Remove temporary barriers and protections where hazards no longer exist.
    b. Where open excavations or other hazardous conditions remain, leave temporary barriers and protections in place.
5. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
6. Do not close or obstruct roadways or sidewalks without permits from authority having jurisdiction.
7. Conduct operations to minimize obstruction of public and private entrances and exits. Do not obstruct required exits at any time. Protect persons using entrances and exits from removal operations.
8. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon, or limit access to their property.

B. Do not begin removal until receipt of notification to proceed from Owner.

C. Do not begin removal until built elements to be salvaged or relocated have been removed.

D. Do not begin removal until vegetation to be relocated has been removed and vegetation to remain has been protected from damage.
1. Erect a plainly visible fence around drip line of individual trees or around perimeter drip line of groups of trees to remain.

E. Survey existing conditions of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during building demolition operations. Notify Architect or Engineer of any concerns.

F. Protect existing structures and other elements to remain in place and not removed.
1. Provide bracing and shoring.
2. Prevent movement or settlement of adjacent structures.
3. Stop work immediately if adjacent structures appear to be in danger.

G. Hazardous Materials:
1. If hazardous materials are discovered during removal operations, stop work and notify Architect and Owner; hazardous materials include regulated asbestos containing materials, lead, PCBs, and mercury.

3.04 EXISTING UTILITIES

A. Coordinate work with utility companies. Notify utilities before starting work, comply with their requirements, and obtain required permits.

B. Protect existing utilities to remain from damage.

C. Do not disrupt public utilities without permit from authority having jurisdiction.

D. Do not close, shut off, or disrupt existing life safety systems that are in use without at least 7 days prior written notification to Owner.

E. Do not close, shut off, or disrupt existing utility branches or take-offs that are in use without at least 3 days prior written notification to Owner.

F. Locate and mark utilities to remain; mark using highly visible tags or flags, with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.

G. Remove exposed piping, valves, meters, equipment, supports, and foundations of disconnected and abandoned utilities.

3.05 SELECTIVE DEMOLITION FOR ALTERATIONS

A. Existing construction and utilities indicated on drawings are based on casual field observation and existing record documents only.

1. Verify construction and utility arrangements are as indicated.
2. Report discrepancies to Architect before disturbing existing installation.
3. Beginning of demolition work constitutes acceptance of existing conditions that would be apparent upon examination prior to starting demolition.

B. Cooperate with the Owner and Authorities Having Jurisdiction to provide Interim Life Safety Measures (ILSM) in all areas affected by demolition or construction operations. ILSM consists of the following measures:
   1. Ensure exits provide an unobstructed egress. Building areas under construction must maintain escape facilities for construction workers at all times. Provide alternate routes around closed or obstructed traffic-ways if required by authorities having jurisdiction.
   2. Ensure fire alarm, detection and suppression systems are not impaired. Provide temporary systems if necessary.
   3. Ensure temporary construction partitions are smoke-tight and built of non-combustible or limited combustible materials that will not contribute to the development or spread of fire.
   4. Use water mist and other suitable methods to limit spread of dust and dirt. Comply with governing environmental-protection regulations.
   5. Develop and enforce storage, housekeeping, and debris removal practices that reduce the flammable and combustible fire load of the building to the lowest level necessary for daily operations as stated in the general conditions.
   6. Provide hazard surveillance of building, grounds, and equipment with attention to construction areas, construction storage, and field offices.
   7. Follow NFPA 241 guidelines pertaining to safe-guarding for construction and demolition processes.
   8. Follow NFPA 1 guidelines pertaining to fire prevention measures.

C. Separate areas in which demolition is being conducted from areas that remain occupied.
   1. Provide, erect, and maintain temporary dustproof partitions of construction specified in Section 01 50 00 in locations indicated on drawings.
   2. Provide sound retardant partitions of construction and in locations indicated on drawings.

D. Maintain weatherproof exterior building enclosure, except for interruptions required for replacement or modifications; prevent water and humidity damage.

E. Salvaged Items: Comply with the following:
   1. Clean salvaged items of dirt and demolition debris.
   2. Pack or crate items after cleaning. Identify contents of containers.
   3. Protect items from damage during transport and storage.

F. Remove existing work as indicated and required to accomplish new work.
   1. Remove rotted wood, corroded metals, and deteriorated masonry and concrete; replace with new construction indicated.
   2. Remove items indicated on drawings.
   3. Inventory and record the condition of items to be removed and salvaged.

G. Services including, but not limited to, HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications: Remove existing systems and equipment as indicated.
   1. Maintain existing active systems to remain in operation, and maintain access to equipment and operational components.
   2. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
   3. See Section 01 10 00 - Summary for limitations on outages and required notifications.
   4. Verify that abandoned services serve only abandoned facilities before removal.
   5. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings. Remove back to source of supply where possible, otherwise cap stub and tag with identification.

H. Protect existing work to remain.
    1. Prevent movement of structure. Provide shoring and bracing as required.
    2. Perform cutting to accomplish removal work neatly and as specified for cutting new work.
    3. Repair adjacent construction and finishes damaged during removal work.
    4. Patch to match new work.

3.06 DEBRIS AND WASTE REMOVAL

A. Remove debris, junk, and trash from site.
    1. Do not allow demolished materials to accumulate on-site.
    2. Locate building demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
    3. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
    4. General Contractor to provide dumpster and coordinate with waste hauler for drop off and pick-up.
    5. Dumpster to be located as agreed upon at Pre-Bid meeting or by Owner.

B. Leave site in clean condition, ready for subsequent work.

C. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION

SECTION 03 05 16
UNDERSLAB VAPOR BARRIER

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Sheet vapor barrier under concrete slabs on grade.

B. Accessories necessary to maintain moisture / vapor resistant installation of concrete slabs.

1.02 RELATED REQUIREMENTS

A. Structural Drawings: Preparation of subgrade, granular fill, placement of concrete.

1.03 REFERENCE STANDARDS

A. ASTM D882 - Standard Test Method for Tensile Properties of Thin Plastic Sheeting.

B. ASTM D1709 - Standard Test Methods for Impact Resistance of Plastic Film by the Free-Falling Dart Method.

C. ASTM E1643 - Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.

D. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate the installation of sheet vapor barrier with size, location and installation of subgrade utility lines.

B. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.

C. Sequencing: Ensure that utility penetrations through vapor barrier are achieved in an orderly and expeditious manner.

1.05 SUBMITTALS

A. See Section 01 40 00 - Quality Requirements, for submittal procedures.

B. Product Data: Submit manufacturers' data on manufactured products.

C. Test Data: Submit report of tests showing compliance with specified requirements.

D. Certificates: Certify that products of this section meet or exceed specified requirements.

E. Manufacturer's Installation Instructions: Indicate installation procedures and interface required with adjacent construction.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this Section.

B. Installer Qualifications: Company specializing in performing the work of this section.

1.07 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to project site in original manufacturer's containers.

B. Store materials and accessories under cover and elevated above grade.

PART 2 PRODUCTS

2.01 MATERIALS

A. Underslab Vapor Barrier:
   1. Water Vapor Permeance: Not more than 0.010 perms, maximum.
   2. Complying with ASTM E1745 Class A.

3. Minimum Puncture Resistance: 2200 grams when tested in accordance with ASTM D1709.
4. Minimum Tensile Strength: 45.0 lb-ft / inch when tested in accordance with ASTM D882.
5. Thickness: 15 mils.
6. Product:
    a. Epro Services; e.shield 115: www.eproserv.com.
    b. Henry; Moistop Ultra Underslab Vapor Retarder: www.henry.com.
    c. **BASIS OF DESIGN:** Stego Industries LLC; Stego Wrap Vapor Barrier: www.stegoindustries.com/#sle.
    d. W.R. Meadows, Inc.; PERMINATOR 15 Mil: www.wrmeadows.com.

B. Accessory Products: Vapor barrier manufacturer's recommended tape, adhesive, mastic, etc., for sealing seams and penetrations in vapor barrier.

C. Seam Tape: Manufacturer's pressure-sensitive type with maximum WVTR - 0.1 Perms.

D. Vapor Proofing Mastic: Manufacturer's recommended material with maximum WVTR - 0.1 Perms.

E. Pipe Boots / Slab Penetrations: Provide manufacturer's recommended sealant system compatible with vapor barrier.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surface over which vapor barrier is to be installed is complete and ready before proceeding with installation of vapor barrier.

B. Verify that under slab aggregate fill is properly compacted and free of sharp projections which may puncture or damage vapor barrier.

3.02 INSTALLATION

A. Install vapor barrier in accordance with manufacturer's instructions and ASTM E1643.

B. Install vapor barrier under interior slabs on grade; lap sheet over footings and seal to foundation walls.

C. Lap joints minimum 6 inches.

D. Seal joints, seams and penetrations watertight with manufacturer's recommended products and follow manufacturer's written instructions.

E. No penetration of vapor barrier is allowed except for reinforcing steel and permanent utilities.

F. Repair damaged vapor retarder before covering with other materials.

3.03 FIELD QUALITY CONTROL

A. Perform visual inspection of vapor barrier prior to placing concrete; ensure continuity of taped joints and sealing of penetrations and sealing to perimeter or terminations of barrier.

B. Provide services of vapor barrier manufacturer's field representative to observe for proper installation of system and submit report required prior to pouring of concrete.

3.04 PROTECTION

A. Protect installed vapor barrier from damage resulting from subsequent construction operations.

B. Repair damaged areas with additional layer of sheet vapor barrier; overlap damaged area 6 inches and tape entire perimeter of patch.

END OF SECTION

SECTION 03 35 11
CONCRETE FLOOR FINISHES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Liquid densifiers and hardeners (SC).

1.02 RELATED REQUIREMENTS

A. Structural Drawings: Finishing of concrete surface to tolerance; floating, troweling, and similar operations; curing.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the work with concrete floor placement and concrete floor curing.

1.04 SUBMITTALS

A. See Section 01 40 00 - Quality Requirements, for submittal procedures.

B. Product Data: Manufacturer's published data on each finishing product, including information on compatibility of different products and limitations.

C. Maintenance Data: Provide data on maintenance and renewal of applied finishes.

D. Maintenance and Cleaning: Provide manufacturer's printed maintenance and cleaning instructions and recommendations to Owner for all concrete floor sealer finishes.
   1. Ensure that Owner has received a list of cleaning materials that are known to be acceptable for cleaning and another list of materials known to be deleterious to the finished concrete floors.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with at least 5 years of documented experience.

B. Flooring supplier shall approve concrete mix additives, topical treatments and curing methods prior to concrete placement.

C. Applicator Qualifications: Company specializing in performing the work of this section and approved by manufacturer of products specified.

1.06 DELIVERY, STORAGE, AND HANDLING

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

B. Comply with manufacturer's written storage instructions.

C. Comply with manufacturer's written handling instructions prior to mixing.

1.07 FIELD CONDITIONS

A. Maintain light level equivalent to a minimum 200 W light source at 8 feet above the floor surface over each 20 foot square area of floor being finished.

B. Do not finish floors until interior heating system is operational.

C. Maintain ambient temperature of 50 degrees F minimum.

PART 2 PRODUCTS

2.01 APPLICATIONS

A. Densifier and Hardener:
   1. Use at the following locations: all areas of exposed concrete.

2.02 DENSIFIERS AND HARDENERS

A. Liquid Densifier and Hardener: Penetrating chemical compound that reacts with concrete, filling the pores, hardening, and dustproofing; for application to concrete after set.
   1. Composition: silicate and siliconate polymers.
   2. Products:
      a. Concrete Sealers USA; PS103 or PS107: www.concretesealersusa.com/#sle.
      b. CureCrete; Ashford Formula; www.ashfordformula.com
      c. Dayton Superior Corporation; Sure Hard Densifier J17: www.daytonsuperior.com/#sle.
      d. Euclid Chemical Company; EucoDiamond Hard; www.euclidchemical.com
      e. Kaufman Products Inc; SureHard LS: www.kaufmanproducts.net/#sle.
      f. L&M Construction Chemicals, Inc, a subsidiary of Laticrete International, Inc; SEAL HARD: www.lmcc.com.
      g. L.M. Scofield Company; SCOFIELD Formula One Lithium Densifier MP: www.scofield.com.
      h. Nox-Crete Products Group; Duro-Nox LS: www.nox-crete.com.
      i. PROSOCO, Inc; Consolideck LS/CS: www.prosoco.com/consolideck/#sle.
      j. SpecChem, LLC; LithSeal SC: www.specchemllc.com/#sle.
      k. W. R. Meadows, Inc; Liqui-Hard Ultra: www.wrmeadows.com/#sle.
      l. Substitutions: See Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

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

B. Verify that flaws in concrete have been patched and joints filled with methods and materials suitable for further finishes.

C. Verify that surface is free of previous coatings, sealers, curing compounds, water repellents, laitance, efflorescence, fats, oils, grease, wax, soluble salts, residues from cleaning agents, and other impediments to adhesion.
   1. If water droplets applied to surface do not soak in within 30 seconds, additional preparation is required. Chemically etch surface prior to proceeding with coating application.

D. Verify that water vapor emission from concrete and relative humidity in concrete are within limits established by coating manufacturer.

3.02 GENERAL

A. Apply materials in accordance with manufacturer's instructions.

3.03 COATING APPLICATION

A. Verify that surface is free of previous coatings, sealers, curing compounds, water repellents, laitance, efflorescence, fats, oils, grease, wax, soluble salts, residues from cleaning agents, and other impediments to adhesion.

B. Protect adjacent non-coated areas from drips, overflow, and overspray; immediately remove excess material.

C. Apply coatings in accordance with manufacturer's instructions, matching approved mock-ups for color, special effects, sealing and workmanship.

3.04 PROTECTION

A. Protect installed coatings from subsequent construction operations.

B. Do not permit traffic over unprotected floor surface.

C. Take appropriate precautions to prevent staining of concrete floor surfaces. Since no satisfactory procedures are available to remove petroleum and rust stains from concrete, comply with the following:
   1. Cover and protect floor surfaces from damage and staining during the construction period.
   2. Ensure that construction equipment, particularly components that may drip oil, hydraulic fluid, and other liquids, are provided with suitable diaper.
   3. In addition to diaper, equipment such as pipe cutting machines shall be placed on suitable drop cloths.
   4. Do not permit temporary placement and storage of steel members on concrete slabs.

END OF SECTION

SECTION 04 20 00
UNIT MASONRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Concrete block.

B. Mortar and grout.

C. Reinforcement and anchorage.

D. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 05 50 00 - Metal Fabrications: Loose steel lintels.

1.03 REFERENCE STANDARDS

A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

B. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.

C. ASTM A951/A951M - Standard Specification for Steel Wire for Masonry Joint Reinforcement.

D. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.

E. ASTM C90 - Standard Specification for Dry-Cast Loadbearing Concrete Masonry Units.

F. ASTM C129 - Standard Specification for Dry-Cast Nonloadbearing Concrete Masonry Units.

G. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar.

H. ASTM C150/C150M - Standard Specification for Portland Cement.

I. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes.

J. ASTM C270 - Standard Specification for Mortar for Unit Masonry.

K. ASTM C404 - Standard Specification for Aggregates for Masonry Grout.

L. ASTM C476 - Standard Specification for Grout for Masonry.

M. ASTM C1714/C1714M - Standard Specification for Preblended Dry Mortar Mix for Unit Masonry.

N. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures.

O. UL (FRD) - Fire Resistance Directory.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by all relevant installers.

1.05 SUBMITTALS

A. See Section 01 40 00 - Quality Requirements for submittal procedures.

B. Product Data: Provide data for masonry units, fabricated wire reinforcement, mortar, masonry accessories, and proposed cleaning products.

C. Shop Drawings: Indicate pertinent dimensions, materials, anchorage, size and type of fasteners, and accessories for brickwork support system.

D. Steel Reinforcement Shop Drawings: Prepare Shop Drawings showing details of fabrication, bending, and placement, prepared according to ACI 315, “Details and Detailing of Concrete Reinforcement”.

1. Include material, grade, bar schedules, tie and/or stirrup spacing, splices, bent bar diagrams, and other arrangements and assemblies required for fabrication and placement of reinforcement for masonry work.
2. Show all walls in plan and elevation.

E. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.
1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C 109/C 109M for compressive strength, ASTM C 1506 for water retention, and ASTM C 91 for air content.

F. Manufacturer's Certificate: Certify that masonry units meet or exceed specified requirements.

1.06 QUALITY ASSURANCE

A. Comply with provisions of TMS 402/602, except where exceeded by requirements of Contract Documents.

B. See Section 01 4533 for testing and inspection requirements. Testing and inspection shall comply with the requirements of the governing edition of the IBC.

C. Fire Rated Assemblies: Comply with applicable code for UL (FRD) Assembly No. listed on wall types.

D. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section with minimum three years of documented experience.

E. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

F. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.

G. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.

B. Handle and store concrete block in protective cartons or trays. Do not remove from protective packaging until ready for installation.

C. Deliver preblended, dry mortar mix in moisture-resistant containers designed for use with dispensing silos.

D. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.

E. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

1.08 FIELD CONDITIONS

A. Cold and Hot Weather Requirements: Comply with requirements of TMS 402/602 or applicable building code, whichever is more stringent.

B. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F (4 deg C) and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.

C. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
   1. Extend cover a minimum of 24 inches (600 mm) down both sides of walls and hold cover securely in place.
   2. Where one wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches (600 mm) down face next to unconstructed wythe and hold cover in place.

D. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
   1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
   2. Protect sills, ledges, and projections from mortar droppings.
   3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
   4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.

PART 2 PRODUCTS

2.01 UNIT MASONRY - GENERAL

A. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not use units where such defects will be exposed in the completed Work.

2.02 CONCRETE MASONRY UNITS

A. Concrete Block: Comply with referenced standards and as follows:
   1. Size: Standard units with nominal face dimensions of 16 by 8 inches and nominal depth of 8 inches.
   2. Special Shapes: Provide nonstandard blocks configured for corners, lintels, headers, and other detailed conditions.
      a. Provide bullnose units for outside corners exposed in the finished work.
      b. Provide finished edge blocks at exposed outside corners or end walls.
   3. Nonloadbearing Units: ASTM C129.
      a. Both hollow and solid block, as indicated.
      b. Normal weight.
      c. Compressive Strength: 1.5 ksi, unless otherwise indicated on drawings.
      d. Exposed Faces: Manufacturer's standard color and texture.

2.03 MORTAR AND GROUT MATERIALS

A. At Contractor's option, mortar and grout may be field-mixed from packaged dry materials, made from factory premixed dry materials with addition of water only, or ready-mixed.

B. Portland Cement: ASTM C150/C150M, Type I; color as required to produce approved color sample.
   1. Not more than 0.60 percent alkali.

C. Hydrated Lime: ASTM C207, Type S.

D. Mortar Aggregate: ASTM C144.

E. Grout Aggregate: ASTM C404.

F. Water: Clean and potable.

G. Packaged Dry Material for Mortar for Unit Masonry: Premixed Portland cement, hydrated lime, and sand; complying with ASTM C1714/C1714M and capable of producing mortar of the specified strength in accordance with ASTM C270 with the addition of water only.
   1. Color: Standard gray.
   2. Manufacturers:
      a. Amerimix, an Oldcastle brand; AMX 405C: www.amerimix.com
      b. Cemex; USA; Masonry Mortar; www.cemexusa.com.
      c. SpecMix; Portland, Lime and Sand Mortar; www.specmix.com.
      d. Substitutions: See Section 01 60 00 - Product Requirements.

2.04 REINFORCEMENT AND ANCHORAGE

A. Recycled Content: Provide steel products with an average recycled content of not less than 70 percent.

B. Reinforcing Steel: ASTM A615/A615M, Grade 40 (40,000 psi), deformed billet bars; uncoated.

C. Joint Reinforcement: Use ladder type joint reinforcement where vertical reinforcement is involved and truss type elsewhere, unless otherwise indicated.

D. Prefabricated Corners and Tees: Standards of joint reinforcement manufacturer to match adjacent reinforcing type.

E. Single Wythe Joint Reinforcement: ASTM A951/A951M.
   1. Material: ASTM A1064/A1064M steel wire, hot dip galvanized after fabrication to ASTM A153/A153M Class B.
   2. Size: 0.1483 inch side rods with 0.1483 inch cross rods; width as required to provide not less than 5/8 inch of mortar coverage on each exposure.
   3. Basis of Design: WIRE-BOND; Series 200 Ladder Mesh: www.wirebond.com.

F. Flexible Anchors: 2-piece anchors that permit differential movement between masonry and building frame, sized to provide not less than 5/8 inch of mortar coverage from masonry face.

2.05 ACCESSORIES

A. Joint Filler: Closed cell polypropylene; oversized 50 percent to joint width; self expanding; 3/8 inch wide in maximum lengths available.

B. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.

2.06 MORTAR AND GROUT MIXING

A. Mortar for Unit Masonry: ASTM C270, using the Proportion Specification.
   1. Exterior, non-loadbearing masonry: Type N.

B. Grout: ASTM C476; consistency required to fill completely volumes indicated for grouting; fine grout for spaces with smallest horizontal dimension of 2 inches or less; coarse grout for spaces with smallest horizontal dimension greater than 2 inches.
   1. Minimum compressive strength: 2000 psi, unless otherwise noted.

C. Admixtures: Add to mixture at manufacturer's recommended rate and in accordance with manufacturer's instructions; mix uniformly.

D. Mixing: Use mechanical batch mixer and comply with referenced standards.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive masonry.

B. Verify that related items provided under other sections are properly sized and located.

C. Verify that built-in items are in proper location, and ready for roughing into masonry work.

3.02 PREPARATION

A. Direct and coordinate placement of metal anchors supplied for installation under other sections.

B. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.

C. Plug clean-out holes for grouted masonry with block masonry units. Brace masonry to resist wet grout pressure.

3.03 COLD AND HOT WEATHER REQUIREMENTS

A. Comply with requirements of TMS 402/602 or applicable building code, whichever is more stringent.

3.04 COURSING

A. Establish lines, levels, and coursing indicated. Protect from displacement.

B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.

C. Concrete Masonry Units:
   1. Bond: Running.
   2. Coursing: One unit and one mortar joint to equal 8 inches.
   3. Mortar Joints: Concave.

3.05 PLACING AND BONDING

A. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.

B. Lay hollow masonry units with face shell bedding on head and bed joints.

C. Buttering corners of joints or excessive furrowing of mortar joints is not permitted.

D. Remove excess mortar and mortar smears as work progresses.

E. Remove excess mortar with water repellent admixture promptly. Do not use acids, sandblasting or high pressure cleaning methods.

F. Interlock intersections and external corners.

G. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.

H. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.

I. Cut mortar joints flush where resilient base is scheduled.

J. Isolate masonry partitions from vertical structural framing members with a control joint as indicated.

K. Isolate top joint of masonry partitions from horizontal structural framing members and slabs or decks with compressible joint filler.

3.06 REINFORCEMENT AND ANCHORAGE - GENERAL AND SINGLE WYTHE MASONRY

A. Unless otherwise indicated on drawings or specified under specific wall type, install horizontal joint reinforcement 16 inches on center.

B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.

C. Place continuous joint reinforcement in first and second joint below top of walls.

D. Lap joint reinforcement ends minimum 6 inches.

E. Fasten anchors to structural framing and embed in masonry joints as masonry is laid. Unless otherwise indicated on drawings or closer spacing is indicated under specific wall type, space anchors at maximum of 36 inches horizontally and 24 inches vertically.

F. Embed ties and anchors in mortar joint and extend into masonry unit a minimum of 1-1/2 inches with at least 5/8 inch mortar cover to the outside face of the anchor.

G. See Grouting Article for vertical reinforcement.

3.07 GROUTED COMPONENTS

A. Reinforce masonry unit cores and cavities with reinforcing bars and grout as shown on structural drawings. Grout all cores containing rebar and as indicated on drawings.
   1. For non-structural walls shown on architectural drawings, use #5 vertical bars at 32 inches on center in fully grouted cores.

B. Lap splices minimum 24 bar diameters.

C. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch of dimensioned position.

D. Place and consolidate grout fill without displacing reinforcing.

E. Grouting: Do not place grout until entire pour height of masonry to be grouted has attained enough strength to resist grout pressure.
   1. Comply with requirements in ACI 530.1/ASCE 6/TMS 602 for grout mix design, cleanouts, and for grout placement, including minimum grout space and maximum pour height. Cleanouts are required at the base of every vertical cell containing reinforcement where the grout pour height exceeds 12.67 feet.

F. Limit height of vertical grout lifts to not more than 60 inches. ACI compliant procedure for higher grout lift may be submitted for approval. Place and consolidate grout fill without displacing reinforcing.

G. At bearing locations, fill masonry cores with grout for a minimum 12 inches either side of opening.

3.08 BUILT-IN WORK

A. As work progresses, install built-in metal door frames, glazed frames, anchor bolts, and plates and other items to be built into the work and furnished under other sections.

B. Install built-in items plumb, level, and true to line.

C. Bed anchors of metal door and glazed frames in adjacent mortar joints. Fill frame voids solid with grout.
   1. Fill adjacent masonry cores with grout minimum 12 inches from framed openings.

D. Do not build into masonry construction organic materials that are subject to deterioration.

3.09 TOLERANCES

A. Maximum Variation From Unit to Adjacent Unit: 1/16 inch.

B. Maximum Variation from Plane of Wall: 1/4 inch in 10 ft and 1/2 inch in 20 ft or more.

C. Maximum Variation from Plumb: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.

D. Maximum Variation from Level Coursing: 1/8 inch in 3 ft and 1/4 inch in 10 ft; 1/2 inch in 30 ft.

E. Maximum Variation of Mortar Joint Thickness: Head joint, minus 1/4 inch, plus 3/8 inch.

3.10 CUTTING AND FITTING

A. Cut and fit for chases. Coordinate with other sections of work to provide correct size, shape, and location.

B. Obtain approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

3.11 CLEANING

A. Remove excess mortar and mortar droppings.

B. Replace defective mortar. Match adjacent work.

C. Clean soiled surfaces with cleaning solution.

D. Use non-metallic tools in cleaning operations.

3.12 PROTECTION

A. Without damaging completed work, provide protective boards at exposed external corners that are subject to damage by construction activities.

B. During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.

C. Increase extent of cover in first subparagraph below as needed to suit local climatic conditions.

D. Extend cover a minimum of 24 inches (600 mm) down both sides of walls and hold cover securely in place.

E. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least three days after building masonry walls or columns.

F. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.

1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
2. Protect sills, ledges, and projections from mortar droppings.
3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.

END OF SECTION

SECTION 04 26 13
MASONRY VENEER

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Clay Facing Brick (BRK-#).

B. Mortar and grout.

C. Reinforcement and anchorage.

D. Flashings.

E. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 07 92 00 - Joint Sealants: Sealing control and expansion joints.

1.03 REFERENCE STANDARDS

A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

B. ASTM A240/A240M - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.

C. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.

D. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar.

E. ASTM C150/C150M - Standard Specification for Portland Cement.

F. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes.

G. ASTM C216 - Standard Specification for Facing Brick (Solid Masonry Units Made from Clay or Shale).

H. ASTM C270 - Standard Specification for Mortar for Unit Masonry.

I. ASTM C404 - Standard Specification for Aggregates for Masonry Grout.

J. ASTM C476 - Standard Specification for Grout for Masonry.

K. ASTM C979/C979M - Standard Specification for Pigments for Integrally Colored Concrete.

L. BIA Technical Notes No. 7 - Water Penetration Resistance – Design and Detailing.

M. BIA Technical Notes No. 28B - Brick Veneer/Cold-Formed Steel Framed Walls.

N. BIA Technical Notes No. 46 - Maintenance of Brick Masonry.

1.04 SUBMITTALS

A. See Section 01 40 00 - Quality Requirements, for submittal procedures.

B. Product Data: Provide data for masonry units, fabricated wire reinforcement, mortar, and accessories.

C. Masonry restoration work shall comply with TMS 402 and TMS 602, except where exceeded by requirements of the contract documents.

D. Cold and Hot Weather Requirements: Comply with requirements of ACI 530/530.1/ERTA, or applicable building code, whichever is more stringent.

E. Samples: Submit four samples of facing brick units to illustrate color, texture, and extremes of color range.
   1. Strap samples with approved mortar.

F. Shop Drawings: Indicate dimensions, layout, joints, construction details, methods of anchorage, flashings and accessory locations.

G. Steel Reinforcement Shop Drawings: Prepare Shop Drawings showing details of fabrication, bending, and placement, prepared according to ACI 315, “Details and Detailing of Concrete Reinforcement”.
   1. Include material, grade, bar schedules, tie and/or stirrup spacing, splices, bent bar diagrams, and other arrangements and assemblies required for fabrication and placement of reinforcement for masonry work.
   2. Show all walls in plan and elevation.

H. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.
   1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C 109/C 109M for compressive strength, ASTM C 1506 for water retention, and ASTM C 91 for air content.

1.05 QUALITY ASSURANCE

A. Comply with provisions of TMS 402/602, except where exceeded by requirements of Contract Documents.

B. See Section 014533 for testing and inspection requirements. Testing and inspection shall comply with the requirements of the governing edition of the IBC.

C. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section with minimum three years of documented experience.

D. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

E. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.

F. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.

B. Handle and store masonry units in protective cartons or trays. Do not remove from protective packaging until ready for installation.

C. Deliver preblended, dry mortar mix in moisture-resistant containers designed for use with dispensing silos.

D. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.

E. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

1.07 FIELD CONDITIONS

A. Cold and Hot Weather Requirements: Comply with requirements of TMS 402/602 or applicable building code, whichever is more stringent.
   1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F (4 deg C) and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.

B. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.

1. Extend cover a minimum of 24 inches (600 mm) down both sides of walls and hold cover securely in place.
2. Where one wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches (600 mm) down face next to unconstructed wythe and hold cover in place.

C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
2. Protect sills, ledges, and projections from mortar droppings.
3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.

PART 2 PRODUCTS

2.01 UNIT MASONRY - GENERAL

A. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not use units where such defects will be exposed in the completed Work.

2.02 BRICK UNITS

A. Manufacturers:
1. Belden Brick; www.beldenbrick.com
2. Endicott Clay Products Co: www.endicott.com.
3. Glen-Gery Brick Center
4. Sioux City Brick
5. United Brick, A Division of Sioux City Brick; www.united-brick.com
6. Substitutions: See Section 01 60 00 - Product Requirements.

B. Facing Brick: ASTM C216, Type FBX, Grade SW.
1. Color and Texture: to match existing.
2. Size: Modular.
3. Special Shapes: Molded units as required by conditions indicated, unless standard units can be sawn to produce equivalent effect.
   a. Solid brick at soldier course corners and top of planter.
4. Colored Mortar:
   a. Color: As selected by Architect to match brick color.

2.03 MORTAR AND GROUT MATERIALS

A. At Contractor's option, mortar and grout may be field-mixed from packaged dry materials, made from factory premixed dry materials with addition of water only, or ready-mixed.

B. Portland Cement: ASTM C150/C150M, Type I; color as required to produce approved color sample.
1. Not more than 0.60 percent alkali.

C. Hydrated Lime: ASTM C207, Type S.

D. Mortar Aggregate: ASTM C144.
1. For joints less than 1/4 inch (6 mm) thick, use aggregate graded with 100 percent passing the No. 16 (1.18-mm) sieve.
2. White-Mortar Aggregates: Natural white sand or crushed white stone.
3. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.

E. Grout Aggregate: ASTM C404.

F. Pigments for Colored Mortar: Pure, concentrated mineral pigments specifically intended for mixing into mortar and complying with ASTM C979/C979M.
   1. Color(s): As selected by Architect from manufacturer's full range.
   2. Manufacturers:
      a. Davis Colors, a division of Venator Materials PLC: www.daviscolors.com/#sle.
      b. Lambert Corporation: www.lambertusa.com/#sle.
      c. Solomon Colors, Inc: www.solomoncolors.com/#sle.
      d. Substitutions: See Section 01 60 00 - Product Requirements.

G. Water: Clean and potable.

H. DO NOT use calcium chloride in mortar or grout.

I. Packaged Dry Material for Mortar for Unit Masonry: Premixed Portland cement, hydrated lime, and sand; complying with ASTM C1714/C1714M and capable of producing mortar of the specified strength in accordance with ASTM C270 with the addition of water only.
   1. Manufacturers:
      a. Amerimix, an Oldcastle brand; AMX 405C: www.amerimix.com/#sle.
      b. Cemex; USA; Masonry Mortar; www.cemexusa.com.
      c. SpecMix; Portland, Lime and Sand Mortar; www.specmix.com.
      d. Substitutions: See Section 01 6000 - Product Requirements.

2.04 REINFORCEMENT AND ANCHORAGE

A. Manufacturers:
   1. Blok-Lok Limited: www.blok-lok.com/#sle.
   2. Heckmann Building Products, Inc.: www.heckmannbuildingprods.com.
   3. Hohmann & Barnard, Inc: www.h-b.com/#sle.
   4. WIRE-BONDwww.wirebond.com/#sle.
   5. Substitutions: See Section 01 6000 - Product Requirements.

B. Reinforcing Steel: ASTM A615/A615M, Grade 40 (40,000 psi) yield strength, deformed billet bars; galvanized.

C. Joint Reinforcement Type: Use ladder type joint reinforcement where vertical reinforcement is involved and truss type elsewhere, unless otherwise indicated.

D. Prefabricated Corners and Tees: Standards of joint reinforcement manufacturer to match adjacent reinforcing type.

E. Masonry Veneer Anchors: 2-piece anchors that permit differential movement between masonry veneer and structural backup, hot dip galvanized to ASTM A 153/A 153M, Class B.
   1. Anchor plates: Not less than 0.075 inch thick, designed for fastening to structural backup through sheathing by two fasteners; provide design with legs that penetrate sheathing and insulation to provide positive anchorage.
   2. Width as required to provide not more than 1 inch and not less than 1/2 inch of mortar coverage on each exposure.
   3. Wire ties: Manufacturer's standard shape, 0.1875 inch thick.
   4. Vertical adjustment: Not less than 2 inches.
   5. Insulation Clips: Provide pintle ends designed to secure insulation against outer face of inner wythe of masonry.
   6. Accommodate thickness of cavity wall insulation.
   7. Basis of Design:
      a. Stud Backup: WIRE-BOND: RJ-711 Adjustable Veneer Anchor (Hook & Eye)
      b. Substitutions: See Section 01 60 00 - Product Requirements.

2.05 MISCELLANEOUS ANCHORS

A. Postinstalled Anchors: Torque-controlled expansion anchors or chemical anchors.

1. Structural Applications:
    a. As indicated.
2. Non-Structural Applications:
    a. Acceptable Manufacturers and products:
        1) Hilti Fastening Systems
            (a) Kwik Bolt III Expansion Anchor
            (b) HIT HY 70
        2) ITW Red Head:
            (a) Trubolt Wedge Anchor
            (b) Epcon C6 Adhesive.
        3) Powers Fastening Inc:
            (a) Power-Stud Expansion Anchor
            (b) PE1000+ Adhesive.
        4) Or approved equivalent.
3. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 5 unless otherwise indicated.

2.06 FLASHINGS

A. Verify compatibility of masonry flashing and associated materials with weather membrane specified in Section 07 27 00.

B. Stainless Steel/Polymer Fabric Flashing: ASTM A240/A240M; 2 mil type 304 stainless steel sheet bonded on one side to one sheet of polymer fabric.
1. Puncture Resistance: 2,500 psi per ASTM E154.
2. Manufacturers:
    a. Hohmann & Barnard, Inc; Mighty-Flash Stainless Flashing: www.h-b.com/#sle.
    b. WIRE-BOND: www.wirebond.com/#sle.
    c. York Flashings; Multi-Flash SS: www.yorkflashings.com/#sle.
    d. Substitutions: See Section 01 60 00 - Product Requirements.

C. Stainless Steel/Polymer Fabric Flashing - Self-Adhering: ASTM A240/A240M; 2 mil type 304 stainless steel sheet bonded on inward facing side to a sheet of polymer fabric that has a clear adhesive with a removable release liner.
1. Use with manufacturer's standard, self-adhering, stainless steel lap tape.
2. Puncture Resistance: 2,500 psi per ASTM E154.
3. Manufacturers:
    a. Hohmann & Barnard, Inc; Mighty Flash SA: www.h-b.com/#sle.
    b. York Manufacturing, Inc; York 304.
    c. Substitutions: See Section 01 60 00 - Product Requirements.

D. Stainless Steel/Polymer Fabric Drainage Plane Flashing: ASTM A240/A240M; 2 mil type 304stainless steel sheet bonded between one sheet of polymer fabric and one sheet of non-woven drainage material.
1. Use with manufacturer's standard, self-adhering, stainless steel lap tape.
2. Manufacturers:
    a. York Flashings; Flash-Vent SS: www.yorkflashings.com/#sle.
    b. Substitutions: See Section 01 60 00 - Product Requirements.

E. Stainless Steel/Polymer Fabric Drainage Plane Flashing - Self-Adhering: ASTM A240/A240M; 2 mil type 304 stainless steel sheet with 8 mil of butyl adhesive and a removable release liner on one side and a sheet of non-woven drainage material bonded to the other side.
1. Manufacturers:
    a. York Manufacturing, Inc; Flash-Vent SA: www.yorkmfg.com/#sle.
    b. Substitutions: See Section 01 60 00 - Product Requirements.

F. Flashing Sealant/Adhesives: Silicone, polyurethane, or silyl-terminated polyether/polyurethane, or other type required or recommended by flashing manufacturer; type capable of adhering to type of flashing used.
   1. Manufacturers, Modified Polyether Products:
      a. Hohmann and Barnard; HB Sealant; www.h-b.com..
      b. Mortar Net Solutions: www.mortarnet.com/#sle.
      c. York Manufacturing, Inc; UniverSeal US-100 Liquid Tape: www.yorkmfg.com/#sle.
      d. Substitutions: See Section 01 60 00 - Product Requirements.

G. Termination Bars: Stainless steel; compatible with membrane and adhesives.

H. Drip Edge: Stainless steel; angled drip with hemmed edge; compatible with membrane and adhesives.
   1. Provide prefabricated inside and outside corners.
   2. Manufacturers:
      a. Hohmann & Barnard, Inc; DP-FTS: www.h-b.com/#sle.
      b. Mortar Net Solutions; Metal Drip Edges: www.mortarnet.com/#sle.
      c. York Manufacturing, Inc: www.yorkmfg.com/#sle.
      d. Wirebond: #4165 Drip Edge Flashing; www.wirebond.com
      e. Substitutions: See Section 01 60 00 - Product Requirements.

I. Lap Sealants and Tapes: As recommended by flashing manufacturer; compatible with membrane and adhesives.

2.07 ACCESSORIES

A. Acceptable Manufacturers:
   1. Any acceptable manufacturer of joint reinforcement and anchors listed above.
   2. Advanced Building Products, Inc.: www.advancedbuildingproducts.com.
   3. CavClear/Archovations, Inc.: www.cavclear.com.
   4. Mortar Net Solutions: www.mortarnet.com.
   5. Masonry Technology Incorporated: www.mtidry.com.
   6. Substitutions: See Section 01 6000 - Product Requirements.

B. Preformed Control Joints: Rubber material. Provide with corner and tee accessories, fused joints.
   1. Basis of Design: WIRE-BOND; 2901 or 2902 Rubber Control Joints: www.wirebond.com.

C. Joint Filler: Closed cell polyvinyl chloride; oversized 50 percent to joint width; self expanding; in maximum lengths available.

D. Cavity Weep/Vents: Rectangular shaped, UV-stable, high impact polystyrene sheets, sized for mortar joints, formed with corrugations.
   1. Color: as selected by Architect from manufacturer's full range (to match mortar color).
   2. Manufacturers:
      a. Heckman Building Products: No. 85 Cell Vent
      b. Hohmann & Barnard: Quadro-Vent
      c. WireBond: Cell Vents
      d. Substitutions: See Section 016000 - Product Requirements.

E. Cavity Mortar Control: Semi-rigid polyethylene or polyester mesh panels, sized to thickness of wall cavity, and designed to prevent mortar droppings from clogging weeps and cavity vents and allow proper cavity drainage.
   1. Not required with Stainless Steel/Polymer Fabric Drainage Plane Flashing
   2. Mortar Diverter: Semi-rigid mesh designed for installation at flashing locations.
      a. Manufacturers:
         1) Advanced Building Products, Inc; Mortar Break DT: www.advancedbuildingproducts.com/#sle.

2) CavClear/Archovations, Inc: www.cavclear.com/#sle.
3) Mortar Net Solutions; MortarNet: www.mortarnet.com/#sle.
4) Substitutions: See Section 01 60 00 - Product Requirements.

F. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.
1. Acceptable Manufacturer and Product: As expressly recommended and approved for intended use by manufacturers of brick masonry units and mortar being cleaned.
2. Manufacturer's proprietary standard-strength general purpose cleaner designed for removing mortar and grout stains, efflorescence, and other construction-related stains from brick masonry unit and mortar surfaces without discoloring or damaging masonry work or adjacent materials.
a. Suitable for conditions at Project Site, including, but not limited to, windows, doors, other wall elements, and adjacent walks or landscaping.
b. Cleaning Restrictions: The following methods are not permitted nor will they be allowed:
1) Hydrochloric acid.
2) Muriatic acid.
3) Pressurized water blasting.
4) Abrasive blasting.

2.08 MORTAR AND GROUT MIXING

A. Mortar for Unit Masonry: ASTM C270, Proportion Specification.
1. Masonry below grade and in contact with earth; Type S.
2. Exterior, non-loadbearing masonry; Type N.

B. Colored Mortar: Proportion selected pigments and other ingredients to match Architect's sample, without exceeding manufacturer's recommended pigment-to-cement ratio.

C. Grout: ASTM C476; consistency as required to fill volumes completely for grouting; fine grout for spaces with smallest horizontal dimension of 2 inches or less; coarse grout for spaces with smallest horizontal dimension greater than 2 inches.
1. Minimum compressive strength: 2000 psi, unless otherwise noted.

D. Admixtures: Add to mixture at manufacturer's recommended rate and in accordance with manufacturer's instructions; mix uniformly.

E. Mixing: Use mechanical batch mixer and comply with referenced standards.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive masonry.

B. Verify that related items provided under other sections are properly sized and located.

C. Verify that built-in items are in proper location, and ready for roughing into masonry work.

3.02 PREPARATION

A. Direct and coordinate placement of metal anchors supplied for installation under other sections.

B. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.

C. Plug clean-out holes for grouted masonry with block masonry units. Brace masonry to resist wet grout pressure.

3.03 COLD AND HOT WEATHER REQUIREMENTS

A. Comply with requirements of TMS 402/602 or applicable building code, whichever is more stringent.

3.04 COURSING

A. Establish lines, levels, and coursing indicated. Protect from displacement.

B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.

C. Brick Units:
   1. Bond: as indicated above in brick types.
   2. Coursing: Three units and three mortar joints to equal 8 inches.
   3. Mortar Joints: Concave.

3.05 PLACING AND BONDING

A. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.

B. Lay hollow masonry units with face shell bedding on head and bed joints.

C. Buttering corners of joints or excessive furrowing of mortar joints is not permitted.

D. Remove excess mortar and smears as work progresses.

E. Remove excess mortar with water repellent admixture promptly. Do not use acids, sandblasting or high pressure cleaning methods.

F. Interlock intersections and external corners, except for units laid in stack bond.

G. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.

H. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.

I. Isolate top joint of masonry veneer from horizontal structural framing members or support angles with compressible joint filler.

J. Cut existing bricks for new openings, replace broken bricks and infill with new brick selected to match existing.
   1. At infilled openings or tying into existing brick, tooth bricks into adjacent walls. Remove lintels to minimize visual evidence of infill.

3.06 WEEPS/CAVITY VENTS

A. Install weeps in veneer walls at 24 inches on center horizontally on top of through-wall flashing above shelf angles and lintels and at bottom of walls.

B. Install cavity vents in veneer walls at 32 inches on center horizontally below shelf angles and lintels and at top of walls.

3.07 CAVITY MORTAR CONTROL

A. Do not permit mortar to drop or accumulate into cavity air space or to plug weep/cavity vents.

B. For cavity walls, build inner wythe ahead of outer wythe to accommodate accessories.

C. Install cavity mortar diverter at base of cavity and at other flashing locations as recommended by manufacturer to prevent mortar droppings from blocking weep/cavity vents.

3.08 REINFORCEMENT AND ANCHORAGE - MASONRY VENEER

A. Stud back-Up: Secure veneer anchors to stud framed back-up and embed into masonry veneer at maximum 2-2/3 sq ft of wall surface per anchor. Place additional anchors at perimeter of openings and ends of panels, so maximum spacing of anchors is 8 inches on center.

3.09 MASONRY FLASHINGS

A. Whether or not specifically indicated, install masonry flashing to divert water to exterior at all locations where downward flow of water will be interrupted.

1. Extend flashings full width at such interruptions and at least 6 inches, minimum, into adjacent masonry or turn up at least 1 inch, minimum, to form watertight pan at non-masonry construction.
2. Remove or cover protrusions or sharp edges that could puncture flashings.
3. Seal lapped ends and penetrations of flashing before covering with mortar.

B. Terminate flashing up 8 inches minimum on vertical surface of backing:
1. Install vertical leg of flashing over fluid-applied or self-adhered air/vapor barriers over backing or per manufacturer's directions.
2. Anchor vertical leg of flashing into backing with a termination bar and sealant.
3. Apply cap bead of sealant on top edge of self-adhered flashing.

C. Install flashing in accordance with manufacturer's instructions and BIA Technical Notes No. 7.

D. Support flexible flashings across gaps and openings.

E. Lap end joints of flashings at least 6 inches, minimum, and seal watertight with flashing sealant/adhesive.

3.10 CONTROL AND EXPANSION JOINTS

A. Install brick expansion joints where indicated on Drawings as "EJ", but not less than one for each 24 feet of wall length, at changes in veneer plane, at changes in veneer height, to restrict individual horizontal brick veneer panels to a height to length ratio of 1 to 4 maximum, unless otherwise justified by calculations.

B. Locate brick expansion joints within 2 feet of each side of exterior corners and at inside corners, unless otherwise indicated on Drawings.

C. Do not continue horizontal joint reinforcement through control or expansion joints.

D. Install preformed control joint device in continuous lengths. Seal butt and corner joints in accordance with manufacturer's instructions.

3.11 BUILT-IN WORK

A. As work progresses, install built-in metal door frames, glazed frames, anchor bolts, and plates and other items to be built into the work and furnished under other sections.

B. Install built-in items plumb, level, and true to line.

C. Bed anchors of metal door and glazed frames in adjacent mortar joints. Fill frame voids solid with grout.

D. Do not build into masonry construction organic materials that are subject to deterioration.

3.12 TOLERANCES

A. Maximum Variation From Unit to Adjacent Unit: 1/16 inch.

B. Maximum Variation from Plane of Wall: 1/4 inch in 10 ft and 1/2 inch in 20 ft or more.

C. Maximum Variation from Plumb: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.

D. Maximum Variation from Level Coursing: 1/8 inch in 3 ft and 1/4 inch in 10 ft; 1/2 inch in 30 ft.

E. Maximum Variation of Mortar Joint Thickness: Head joint, minus 1/4 inch, plus 3/8 inch.

F. Maximum Variation from Cross Sectional Thickness of Walls: 1/4 inch.

3.13 CUTTING AND FITTING

A. Cut and fit for pipes, conduit, and boxes. Coordinate with other sections of work to provide correct size, shape, and location.

B. Obtain approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

3.14 FIELD QUALITY CONTROL

A. An independent testing agency will perform field quality control tests, as specified in Section 01 4000 - Quality Requirements.

B. Mortar Tests: Test mortar in accordance with ASTM C780, testing with same frequency as masonry samples.

3.15 CLEANING

A. Remove excess mortar and mortar smears as work progresses.

B. Replace defective mortar. Match adjacent work.

C. Clean soiled surfaces with cleaning solution.

D. Use non-metallic tools in cleaning operations.

3.16 PROTECTION

A. Without damaging completed work, provide protective boards at exposed external corners that are subject to damage by construction activities.

B. During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.

C. Increase extent of cover in first subparagraph below as needed to suit local climatic conditions.

D. Extend cover a minimum of 24 inches (600 mm) down both sides of walls and hold cover securely in place.

E. Where one wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches (600 mm) down face next to unconstructed wythe and hold cover in place.

F. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least three days after building masonry walls or columns.

G. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.

1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
2. Protect sills, ledges, and projections from mortar droppings.
3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.

END OF SECTION

SECTION 04 72 00
CAST STONE MASONRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Architectural cast stone.

B. Units required are:
   1. Exterior wall units, including sills (CS).
   2. Interior units, including fireplace surround.

1.02 RELATED REQUIREMENTS

A. Section 04 26 13 - Masonry Veneer: Installation of cast stone in conjunction with masonry.

B. Section 07 92 00 - Joint Sealants: Sealing joints indicated to be left open for sealant.

1.03 REFERENCE STANDARDS

A. ACI CODE-318 - Building Code for Structural Concrete—Code Requirements and Commentary.

B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

C. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.

D. ASTM A767/A767M - Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement.

E. ASTM A775/A775M - Standard Specification for Epoxy-Coated Steel Reinforcing Bars.

F. ASTM A884/A884M - Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement.

G. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.

H. ASTM C33/C33M - Standard Specification for Concrete Aggregates.

I. ASTM C150/C150M - Standard Specification for Portland Cement.

J. ASTM C270 - Standard Specification for Mortar for Unit Masonry.

K. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete.

L. ASTM C979/C979M - Standard Specification for Pigments for Integrally Colored Concrete.

M. ASTM C1364 - Standard Specification for Architectural Cast Stone.

1.04 SUBMITTALS

A. See Section 01 40 00 - Quality Requirements, for submittal procedures.

B. Product Data: Test results of cast stone components made previously by the manufacturer.

C. Shop Drawings: Include elevations, dimensions, layouts, profiles, cross sections, reinforcement, exposed faces, arrangement of joints, anchoring methods, anchors, and piece numbers.

D. Mortar Color Selection Samples.

E. Verification Samples: Pieces of actual cast stone components not less than 6 inches square, illustrating range of color and texture to be anticipated in components furnished for the project.
   1. Include samples with specified sealer applied to a half of the surface of a cast stone sample.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications:
   1. A firm with a minimum of 5 years experience producing cast stone of types required for project.
   2. Current producer member of the Cast Stone Institute or the Architectural Precast Association.
   3. Adequate plant capacity to furnish quality, sizes, and quantity of cast stone required without delaying progress of the work.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver cast stone components secured to shipping pallets and protected from damage and discoloration. Protect corners from damage.

B. Number each piece individually to match shop drawings and schedule.

C. Store cast stone components and installation materials in accordance with manufacturer's instructions.

D. Store cast stone components on pallets with nonstaining, waterproof covers. Ventilate under covers to prevent condensation. Prevent contact with dirt.

E. Protect cast stone components during handling and installation to prevent chipping, cracking, or other damage.

F. Store mortar materials where contamination can be avoided.

G. Schedule and coordinate production and delivery of cast stone components with unit masonry work to optimize on-site inventory and to avoid delaying the work.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Architectural Cast Stone:
   1. Any current producer member of the Architectural Precast Association.
   2. Any current producer member of the Cast Stone Institute.
   3. American Artstone
   4. Big River Cast Stone: www.bigrivercaststone.com.
   5. Edwards Cast Stone Co: www.edwardscaststone.com
   6. MarcStone, LLC: www.marcstone.com.
   7. Midwest Cast Stone: www.midwestcaststone.com
   8. Rock Cast Architectural Series
   9. Substitutions: See Section 01 60 00 - Product Requirements.

B. Fireplace Surround Units:
   1. The Finished Edge, LLC; Tucson.
   2. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 ARCHITECTURAL CAST STONE

A. Cast Stone: Architectural concrete product manufactured to simulate appearance of natural limestone, complying with ASTM C1364.
   1. Compressive Strength: As specified in ASTM C1364; calculate strength of pieces to be field cut at 80 percent of uncut piece.
   2. Absorption: Maximum of 6 percent by cold water method, maximum of 11 percent by boiling method; ASTM C 1195.
   3. Air Content: For wet cast product shall be 4 to 8 percent for units exposed to freeze-thaw environments, ASTM C173 or ASTM C 231.
   4. Freeze-Thaw Resistance: Demonstrated by laboratory testing in accordance with ASTM C1364.
   5. Linear Shrinkage: Maximum of 0.065 percent, ASTM C 426.

6. Surface Texture: Fine grained texture, with no bugholes, air voids, or other surface blemishes visible from distance of 20 feet.
7. Color: Selected by Architect from manufacturer's full range.
8. Remove cement film from exposed surfaces before packaging for shipment.

B. Shapes: Provide panels in sizes as indicated on drawings.
1. Variation from Any Dimension, Including Bow, Camber, and Twist: Maximum of plus/minus 1/8 inch or length divided by 360, whichever is greater, but not more than 1/4 inch.
2. Unless otherwise indicated on drawings, provide:
a. Wash or slope of 1:12 on exterior horizontal surfaces.
b. Drips on projecting components, wherever possible.
c. Raised fillets at back of sills and at ends to be built in.

C. Reinforcement: Provide reinforcement as required to withstand handling and structural stresses; comply with ACI CODE-318.
1. Pieces More than 12 inches in Any Dimension: Provide full length two-way reinforcement of cross-sectional area not less than 0.25 percent of unit cross-sectional area.

2.03 MATERIALS

A. Portland Cement: ASTM C150/C150M.
1. For Units: Type I or III, white or gray as required to match Architect 's sample.
2. For Mortar: Type I or II, except Type III may be used in cold weather.

B. Coarse Aggregate: ASTM C33/C33M, except for gradation; granite, quartz, or limestone.

C. Fine Aggregate: ASTM C33/C33M, except for gradation; natural or manufactured sands.

D. Pigments: ASTM C979, inorganic iron oxides; do not use carbon black.

E. Admixtures: ASTM C494/C494M.

F. Water: Potable.

G. Reinforcing Bars: ASTM A615/A615M, Grade 40 (40,000 psi), deformed bars, galvanized.
1. Galvanized in accordance with ASTM A767/A767M, Class I.
2. Epoxy coated in accordance with ASTM A775/A775M.

H. Steel Welded Wire Reinforcement: ASTM A1064/A1064M, galvanized or ASTM A884/A884M, epoxy coated.
1. Welded wire fabric reinforcing shall not be used in dry cast products.

I. Embedded Anchors, Dowels, and Inserts: Type 304 stainless steel, of type and size as required for conditions.

J. Shelf Angles and Similar Structural Items: Hot-dip galvanized steel per ASTM A123/A123M, of shapes and sizes as required for conditions.

K. Mortar: Portland cement-lime, ASTM C270 Type N ; do not use masonry cement.

L. Flashings: As specified in Section 04 26 13 - Masonry Veneer.

M. Sealant: As specified in Section 07 92 00 - Joint Sealants.

N. Cleaner: General-purpose cleaner designed for removing mortar and grout stains, efflorescence, and other construction stains from new masonry surfaces without discoloring or damaging masonry surfaces; approved for intended use by cast stone manufacturer and by cleaner manufacturer for use on cast stone and adjacent masonry materials.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine construction to receive cast stone components. Notify Architect if construction is not acceptable.

B. Do not begin installation until unacceptable conditions have been corrected.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install cast stone components in conjunction with masonry, complying with requirements of Section 04 26 13 .

C. Install flashings of longest practical length and seal watertight to back-up. Lap end joint minimum 6 inches and seal watertight.

D. Erect stone in accordance with stone supplier's instructions and erection drawings.

E. Install anchors and place setting buttons to support stone and to establish joint dimensions.

F. Mechanically anchor each cast stone unit.

G. Install weep/cavity vents in vertical stone joints at 24 inches on center horizontally, immediately above horizontal flashings, above shelf angles and supports, at bottom of walls, and at top of each cavity space; do not permit mortar accumulation in cavity space.

H. Joints in Exterior Work: Seal joints with joint sealant over backer rod, following sealant manufacturer's instructions; tool sealant surface to concave profile.

3.03 TOLERANCES

A. Joints: Make all joints 3/8 inch, except as otherwise detailed.
   1. Leave the following joints open for sealant:
      a. Joints in projecting units.
      b. Joints between rigidly anchored units, including panels.
      c. Joints below ledge and relieving angles.
      d. Joints labeled "expansion joint".

B. Sealant Joints: Install sealants as specified in Section 07 92 00 - Joint Sealants.

C. Installation Tolerances:
   1. Variation from Plumb: Not more than 1/8 inch in 10 feet or 1/4 inch in 20 feet or more.
   2. Variation from Level: Not more than 1/8 inch in 10 feet or 1/4 inch in 20 feet, or 3/8 inch maximum.
   3. Variation in Joint Width: Not more than 1/8 inch in 36 inches or 1/4 of nominal joint width, whichever is less.
   4. Variation in Plane Between Adjacent Surfaces (Lipping): Not more than 1/16 inch difference between planes of adjacent units or adjacent surfaces indicated to be flush with units.

3.04 REPAIR

A. Repair chips and other surface damage noticeable when viewed in direct daylight at 20 feet.

B. Repair with matching touch-up material provided by the manufacturer and in accordance with manufacturer's instructions.

C. Repair methods and results subject to Architect 's approval.

3.05 CLEANING

A. Clean completed exposed cast stone after mortar is thoroughly set and cured.
   1. Wet surfaces with water before applying cleaner.
   2. Apply cleaner to cast stone in accordance with manufacturer's instructions.
   3. Remove cleaner promptly by rinsing thoroughly with clear water.
   4. Do not use acidic cleaners.

3.06 PROTECTION

A. Protect completed work from damage.

B. Clean, repair, or restore damaged or mortar-splashed work to condition of new work.

END OF SECTION

SECTION 05 50 00
METAL FABRICATIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Shop fabricated steel items, including:
   1. Bollards with bollard covers (BOL).

B. Slotted Channel Adjustable Framing System

C. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.

1.02 RELATED REQUIREMENTS

A. Structural Drawings: Placement of metal fabrications in concrete.

1.03 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.

B. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

C. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

D. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

E. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates.

F. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength.

G. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.

H. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

I. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.

J. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel.

K. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).

L. ASTM F1554 - Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength.

M. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification.

N. AWS D1.1/D1.1M - Structural Welding Code - Steel.

O. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer.

P. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic).

Q. SSPC-SP 2 - Hand Tool Cleaning.

1.04 SUBMITTALS

A. See Section 01 40 00 - Quality Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's data sheets on each prefabricated product to be used, including installation instructions.

C. Welders' Qualification Statement: Welders' certificates in accordance with AWS B2.1/B2.1M and dated no more than 12 months before start of scheduled welding work.

1.05 QUALITY ASSURANCE

A. Design members and connections under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located.

B. Fabricate steel items in accordance with AISC "Steel Construction Manual."

PART 2 PRODUCTS

2.01 MATERIALS - STEEL

A. Steel Sections: ASTM A36/A36M.

B. Steel Tubing: ASTM A501/A501M hot-formed structural tubing.

C. Plates: ASTM A283/A283M.

D. Pipe: ASTM A53/A53M, Grade B Schedule 40, black finish.

E. Slotted Channel Framing: ASTM A653/A653M, Grade 33.

F. Slotted Channel Fittings: ASTM A1011/A1011M.

G. Bolts, Nuts, and Washers: ASTM A307, Grade A, galvanized to ASTM A153/A153M where connecting galvanized components.

H. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

I. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

J. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

K. Anchoring Devices:

1. Anchor Rods: Anchor rods used with structural steel members shall be plain steel rods conforming to ASTM F1554 (Grade 36), complete with suitable nuts and washers, unless noted otherwise.
2. Expansion Bolts: Expansion anchors shall consist of one-piece wedge type carbon steel anchor bolts with heavy-duty nuts and washers. All components shall be zinc plated in accordance with ASTM B633.
    a. Structural Applications
        1) Acceptable products must have a valid and current ICC report, as listed at www.icc-es.org .
    b. Non-Structural Applications
        1) Acceptable Manufacturers and products: Hilti Fastening Systems- Kwik Bolt III Anchor; ITW Red Head Mechanical Anchoring Systems - Trubolt Wedge Anchor; Powers Fastening Inc - Power-Stud Anchor; (or approved equivalent)
3. Epoxy Adhesive Anchoring System: Epoxy anchoring shall consist of a threaded rod and the epoxy adhesive cartridge.
    a. Structural Applications
        1) Acceptable products must have a valid and current ICC report, as listed at www.icc-es.org .
    b. Non-Structural Applications
    c. Acceptable Manufacturers and products: Hilti Fastening System - HIT RE 500; ITW Red Head Adhesive Anchoring Systems - Epcon C6 Adhesive; Powers Fastening Inc. - PE1000+; (or approved equivalent.

L. Grout: Non-shrink, non-metallic aggregate type, complying with ASTM C1107/C1107M and capable of developing a minimum compressive strength of 5,000 psi at 28 days.

2.02 FABRICATION

A. Fit and shop assemble items in largest practical sections, for delivery to site.

B. Fabricate items with joints tightly fitted and secured.

C. Continuously seal joined members by continuous welds, where welding is indicated.

D. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

E. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.

F. Furnish components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

G. Welded Joints: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings. Weld corners and seams continuously where visible or where exposed to moisture, even if intermittent or stitch welds are structurally adequate, and to comply with the following:
   1. Exterior Components: Continuously seal joined pieces by continuous welds. Drill condensate drainage holes at bottom of members at locations that will not encourage water intrusion.
   2. Interior Components: Continuously seal joined pieces by continuous welds.
   3. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

2.03 FABRICATED ITEMS

A. Bollards: Steel pipe, Schedule 40, 1/4" wall thickness, concrete filled, crowned steel plate cap, diameters as indicated; 42-inches tall and 42-inches into grade, unless otherwise indicated; zinc-rich primer for field finish.
   1. Bollard Sleeve/Visibility Cover: Provide manufacturer's thermoplastic 1/4 inch thick HDPE cover with UV inhibitors.
      a. Size: coordinate sleeve diameter prior to production of bollard.
      b. Sleeve Configuration: domed cap, smooth finish.
      c. Color: Yellow with white horizontal reflective stripes
      d. Manufacturers:
         1) IdealShield; BPD-YL-06-084-SILVER STRIPES; www.idealshield.com
         2) Substitutions: See Section 01 60 00 - Product Requirements.

B. Ledge Angles, Shelf Angles, Channels, and Plates Not Attached to Structural Framing: For support of metal decking and other non-structural members; prime paint finish.

2.04 FINISHES - STEEL

A. Prime paint steel items.
   1. Exceptions: Galvanize items to be embedded in concrete, items to be embedded in masonry, and items specified for exposed finish.
   2. Exceptions: Do not prime surfaces in direct contact with concrete, where field welding is required, and items to be covered with sprayed fireproofing.

B. Prepare surfaces to be primed in accordance with SSPC-SP2.

C. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.

D. Prime Painting: One coat.

E. Galvanizing of Structural Steel Members: Galvanize after fabrication to ASTM A123/A123M requirements. Provide minimum 1.7 oz/sq ft galvanized coating.

F. Galvanizing of Non-structural Items: Galvanize after fabrication to ASTM A123/A123M requirements.

2.05 FABRICATION TOLERANCES

A. Squareness: 1/8 inch maximum difference in diagonal measurements.

B. Maximum Offset Between Faces: 1/16 inch.

C. Maximum Misalignment of Adjacent Members: 1/16 inch.

D. Maximum Bow: 1/8 inch in 48 inches.

E. Maximum Deviation From Plane: 1/16 inch in 48 inches.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

B. Examine substrates and site area for conditions that might prevent satisfactory installation.

C. Verify that dimensions of supporting structure are within plus/minus 1/8 inch of dimensions shown on shop drawings.

D. Verify that all adjacent painting, roofing, masonry work, and other work that might damage prefinished items has been completed prior to installation.

3.02 PREPARATION

A. Clean and strip primed steel items to bare metal where site welding is required.

B. Furnish setting templates to the appropriate entities for steel items required to be cast into concrete or embedded in masonry.

C. Remove all mill scale, rust, grease, foreign matter and surface imperfections from steel components that will be painted to ensure a smooth, even appearance of finish.

3.03 INSTALLATION

A. Install premanufactured items in accordance with manufacturer's installation instructions.

B. Install items plumb and level, accurately fitted, free from distortion or defects.

C. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

D. Anchor units to structure as indicated on the drawings.

E. Field weld components as indicated on shop drawings.

F. Perform field welding in accordance with AWS D1.1/D1.1M.

G. Obtain approval prior to site cutting or making adjustments not scheduled.

H. After erection, prime welds, abrasions, and surfaces not shop primed , except surfaces to be in contact with concrete.

I. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag bolts, wood screws, and other connectors. Grout voids as required to result in secure installation.

J. Touch-up damaged finish coating using material provided by manufacturer to match original coating.

3.04 TOLERANCES

A. Maximum Variation From Plumb: 1/8 inch per story or 10 feet, non-cumulative.

B. Maximum Offset From True Alignment: 1/8 inch in 10 feet.

C. Maximum Out-of-Position: 1/8 inch in 48 inches.

3.05 CLEANING

A. Clean exterior surfaces of dust and debris; follow manufacturer's cleaning instructions for the finish used.

3.06 PROTECTION

A. Protect items after installation to prevent damage due to other work until Date of Substantial Completion

END OF SECTION

SECTION 05 52 13
EXTERIOR RAILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wall mounted handrails.

B. Aluminum guardrails.

1.02 RELATED REQUIREMENTS

A. Structural Drawings: Placement of anchors in concrete.

1.03 REFERENCE STANDARDS

A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix).

B. AISC 207 - Standard for Certification Programs.

C. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

D. ASTM E935 - Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings.

E. ASTM E985 - Standard Specification for Permanent Metal Railing Systems and Rails for Buildings.

F. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination.

G. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification.

H. AWS D1.1/D1.1M - Structural Welding Code - Steel.

1.04 SUBMITTALS

A. See Section 01 40 00 - Quality Requirements, for submittal procedures.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners, and accessories.
   1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
   2. Include the design engineer's seal and signature on each sheet of shop drawings.

C. Samples: Submit one, 6 inch long samples of handrail. Sample to include one elbow or tee.

D. Welders' Qualification Statement: Welders' certificates in accordance with AWS B2.1/B2.1M and dated within the previous 12 months.

1.05 QUALITY ASSURANCE

A. Structural Designer Qualifications: Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located, or personnel under direct supervision of such an engineer.

B. Welder Qualifications: Welding processes and welding operators qualified within previous 12 months.

C. Fabricator Qualifications:
   1. A qualified steel fabricator that is certified by the American Institute for Steel Construction (AISC) under AISC 207.

PART 2 PRODUCTS

2.01 RAILINGS - GENERAL REQUIREMENTS

A. Design, fabricate, and test railing assemblies in accordance with the most stringent requirements of applicable local code.

B. Distributed Loads: Design railing assembly, wall rails, and attachments to resist distributed force of 75 pounds per linear foot applied to the top of the assembly and in any direction, without damage or permanent set.

C. Concentrated Loads: Design railing assembly, wall rails, and attachments to resist a concentrated force of 200 pounds applied at any point on the top of the assembly and in any direction, without damage or permanent set.

D. Allow for expansion and contraction of members and building movement without damage to connections or members.

E. Dimensions: See drawings for configurations and heights.
   1. Top Rails and Wall Rails: 1-1/2 inches diameter, round.

F. Line posts shall be welded, ground, polishes, etc to provide a seamless, continuous finish.

G. Provide anchors and other components as required to attach to structure, made of same materials as railing components unless otherwise indicated; where exposed fasteners are unavoidable provide flush countersunk fasteners.
   1. For anchorage to concrete, provide inserts to be cast into concrete, for bolting anchors.

H. Provide welding fittings to join lengths, seal open ends, and conceal exposed mounting bolts and nuts, including but not limited to elbows, T-shapes, splice connectors, flanges, escutcheons, and wall brackets.

I. Welded and Brazed Joints: Make visible joints butt tight, flush, and hairline; use methods that avoid discoloration and damage of finish; grind smooth, polish, and restore to required finish.
   1. Ease exposed edges to a small uniform radius.
   2. Welded Joints:
      a. Carbon Steel: Perform welding in accordance with AWS D1.1/D1.1M.

2.02 STEEL RAILING SYSTEM

A. Steel Pipe: ASTM A53/A53M Grade B Schedule 40, galvanized finish.

B. Non-Weld Mechanical Fittings: Slip-on, galvanized malleable iron castings, for Schedule 40 pipe, with flush setscrews for tightening by standard hex wrench, no bolts or screw fasteners.

C. Exposed Fasteners: No exposed bolts or screws, except as approved by Architect.

D. Nonshrink, Nonmetallic Grout: ASTM C 1107; recommended by manufacturer for exterior applications.

2.03 ALUMINUM GUARDRAILS

A. Railing System Description: 2 rail system with square posts, square balusters, and a decorative top rail.

B. Railing System Configuration:
   1. Guardrail Height: as indicated in drawings.
   2. Decorative Top Rail: 1.75 inches wide by 1.375 inches high.
   3. Posts: Square, aluminum post with welded base plate.
   4. Plain Type: 2 inches square, plain posts.
   5. Balusters, Square: 0.75 inch by 0.75 inch.
   6. Baluster Spacing: 4.625 inches on center.
   7. Bottom Rail: 1.75 inches wide by 1.25 inches high.
   8. Product:
      a. Digger Specialties Inc.; Westbuty Tuscan C10

b. Substitutions: See Section 01 60 00 - Product Requirements.

2.04 FABRICATION

A. Accurately form components to suit specific project conditions and for proper connection to building structure.

B. Fit and shop assemble components in largest practical sizes for delivery to site.

C. Fabricate components with joints tightly fitted and secured. Provide spigots and sleeves to accommodate site assembly and installation.
   1. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

D. Weld connections that cannot be shop welded due to size limitations.
   1. Weld in accordance with AWS D1.1/D1.1M.
   2. Match shop welding and bolting.
   3. Clean welds, bolted connections, and abraded areas.

2.05 ALUMINUM FINISHES

A. Superior Performance Organic Coating System: AAMA 2605 multiple coat, thermally cured polyvinylidene fluoride system.

B. Color: As indicated on drawings.

C. Touch-Up Materials: As recommended by coating manufacturer for field application.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION

A. Supply items required to be cast into concrete with setting templates, for installation as work of other sections.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install components plumb and level, accurately fitted, free from distortion or defects, with tight joints.

C. Anchor railings securely to structure.

3.04 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per floor level, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch.

C. Maximum Out-of-Position: 1/4 inch.

END OF SECTION

SECTION 06 10 53
MISCELLANEOUS ROUGH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Preservative treated wood materials.

B. Fire retardant treated wood materials.

1.02 REFERENCE STANDARDS

A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

B. ASTM D2898 - Standard Practice for Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

D. AWPA U1 - Use Category System: User Specification for Treated Wood.

E. PS 1 - Structural Plywood.

F. PS 20 - American Softwood Lumber Standard.

1.03 SUBMITTALS

A. See Section 01 40 00 - Quality Requirements for submittal procedures.

B. Product Data: Provide technical data on construction panel materials.

1. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials, both before and after exposure to elevated temperatures when tested according to ASTM D5516.
2. Include data for wood preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used, net amount of preservative retained, and chemical treatment manufacturer's written instructions for handling, storing, installing, and finishing treated material.

C. Manufacturer's Certificate: Certify that wood products supplied for rough carpentry meet or exceed specified requirements.

1.04 DELIVERY, STORAGE, AND HANDLING

A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.

B. Fire Retardant Treated Wood: Prevent exposure to precipitation during shipping, storage, and installation.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.

1. If no species is specified, provide species graded by the agency specified; if no grading agency is specified, provide lumber graded by grading agency meeting the specified requirements.
2. Grading Agency: Grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee (www.alsc.org) and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.
3. Lumber of other species or grades is acceptable provided structural and appearance characteristics are equivalent to or better than products specified.

B. Engineered wood products containing added urea-formaldehyde are not permitted.

2.02 DIMENSION LUMBER FOR CONCEALED APPLICATIONS

A. Sizes: Nominal sizes as indicated on drawings, S4S.

B. Moisture Content: S-dry or MC19.

C. Fire-retardant treated.

D. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:
   1. Lumber: S4S, No.1 or Construction Grade.
   2. Boards: Standard or No.3.

2.03 CONSTRUCTION PANELS

A. Concealed Backing for wall-mounted items- provide backing as required for loading from one of the following:
   1. All required to be Fire-Retardant treated.
      a. Dimension Lumber: as noted above
      b. Plywood: as noted below
      c. Sheet metal on top of studs, beneath gypsum board finish: 12-inch wide strips of 18 gage galvanized sheet metal on top of studs, beneath gypsum board finish, 30 inches on center vertically and in locations as required to support wall-mounted items indicated.
      d. Fire-resistance-treated blocking and bracing in width indicated or required for loading: ClarkDietrich Building Systems LLC Danback Fire-Treated Wood Backing Plate or approved equal.

B. Other Applications:
   1. Plywood Concealed From View But Located Within Exterior Enclosure: PS 1, C-C Plugged or better, Exterior grade.
   2. Plywood Exposed to View But Not Exposed to Weather: PS 1, A-D, or better.
   3. Other Locations: PS 1, C-D Plugged or better.

2.04 ACCESSORIES

A. Fasteners and Anchors:
   1. Metal and Finish: Stainless steel for high humidity and preservative-treated wood locations, unfinished steel elsewhere.
   2. Anchors: as follows:
      a. Toggle bolt type for anchorage to hollow masonry.
      b. Expansion shield and lag bolt type for anchorage to solid masonry or concrete.
      c. Bolt or ballistic fastener for anchorages to steel.
   3. Wood Screws: ASME B18.6.1.
   4. Lag Bolts: ASME B18.2.1.
   5. Power Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ACC-ES AC70.

2.05 FACTORY WOOD TREATMENT

A. Treated Lumber and Plywood: Comply with requirements of AWPA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.
   1. Fire-Retardant Treated Wood: Mark each piece of wood with producer's stamp indicating compliance with specified requirements.
   2. Preservative-Treated Wood: Provide lumber and plywood marked or stamped by an ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWPA standards.

B. Fire Retardant Treatment:

1. Exterior Type: AWPA U1, Category UCFB, Commodity Specification H, chemically treated and pressure impregnated; capable of providing a maximum flame spread index of 25 when tested in accordance with ASTM E84, with no evidence of significant combustion when test is extended for an additional 20 minutes both before and after accelerated weathering test performed in accordance with ASTM D2898.
    a. Kiln dry wood after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.
    b. Do not use treated wood in direct contact with ground.
2. Interior Type A: AWPA U1, Use Category UCFA, Commodity Specification H, low temperature, low hygroscopic type, chemically treated and pressure impregnated; capable of providing a maximum flame spread index of 25 when tested in accordance with ASTM E84, with no evidence of significant combustion when test is extended for an additional 20 minutes.
    a. Kiln dry wood after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.
    b. Interior rough carpentry items are to be fire retardant treated.
    c. Treat rough carpentry items as indicated.
    d. Do not use treated wood in applications exposed to weather or where the wood may become wet.

C. Preservative Treatment:
1. Preservative Pressure Treatment of Lumber Above Grade: AWPA U1, Use Category UC3B, Commodity Specification A using waterborne preservative to 0.10 to 0.31 lb/cu ft retention.
    a. Kiln dry lumber after treatment to maximum moisture content of 19 percent.
    b. Treat lumber in contact with roofing, flashing, or waterproofing.
    c. Treat lumber in contact with masonry or concrete.
    d. Treat lumber less than 18 inches above grade.
    e. Treat lumber in other locations as indicated.
2. Preservative Pressure Treatment of Plywood Above Grade: AWPA U1, Use Category UC2 and UC3B, Commodity Specification F using waterborne preservative.
    a. Kiln dry plywood after treatment to maximum moisture content of 19 percent.
    b. Treat plywood in contact with roofing, flashing, or waterproofing.
    c. Treat plywood in contact with masonry or concrete.
    d. Treat plywood less than 18 inches above grade.
    e. Treat plywood in other locations as indicated.

PART 3 EXECUTION

3.01 PREPARATION

A. Coordinate installation of rough carpentry members specified in other sections.

3.02 INSTALLATION - GENERAL

A. Select material sizes to minimize waste.

B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.

C. Where treated wood is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.

3.03 BLOCKING, NAILERS, AND SUPPORTS

A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.

B. In framed assemblies that have concealed spaces, provide solid wood fireblocking as required by applicable local code, to close concealed draft openings between floors and between top

story and roof/attic space; other material acceptable to code authorities may be used in lieu of solid wood blocking.

C. In metal stud walls, provide continuous blocking around door and window openings for anchorage of frames, securely attached to stud framing.

D. Provide the following specific nonstructural framing and blocking:
   1. Cabinets and shelf supports.
   2. Wall brackets.
   3. Handrails.
   4. Towel and bath accessories.
   5. Wall-mounted door stops.
   6. Chalkboards, tack boards and marker boards.
   7. Wall paneling and trim.
   8. Joints of rigid wall coverings that occur between studs.
   9. Wall-protection items, including corner guards
   10. Owner-provided wall-mounted equipment, whether owner-installed or contractor-installed

3.04 INSTALLATION OF CONSTRUCTION PANELS

3.05 CLEANING

A. Waste Disposal: See Section 01 74 19 - Construction Waste Management and Disposal .
   1. Comply with applicable regulations.
   2. Do not burn scrap on project site.
   3. Do not burn scraps that have been pressure treated.
   4. Do not send materials treated with pentachlorophenol, CCA, or ACA to co-generation facilities or “waste-to-energy” facilities.

B. Do not leave wood, shavings, sawdust, etc. on the ground or buried in fill.

C. Prevent sawdust and wood shavings from entering the storm drainage system.

END OF SECTION

SECTION 06 16 00
SHEATHING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Sheathing.

1.02 RELATED REQUIREMENTS

A. Section 07 27 00 - Air Barriers: Air barrier over sheathing.

B. Section 09 21 16 - Gypsum Board Assemblies: Gypsum-based sheathing.

1.03 REFERENCE STANDARDS

A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

B. PS 20 - American Softwood Lumber Standard.

1.04 SUBMITTALS

A. See Section 01 40 00 - Quality Requirements for submittal procedures.

B. Product Data: Provide technical data on panel products.

1.05 DELIVERY, STORAGE, AND HANDLING

A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.

1.06 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty: Provide manufacturer warranty for materials and workmanship commencing on Date of Substantial Completion.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Engineered wood products containing added urea-formaldehyde are not permitted.

2.02 CONSTRUCTION PANELS

A. Wall Sheathing: Oriented strand board wood structural panel; PS 2.
   1. Grade: Structural 1 Sheathing.
   2. Bond Classification: Exposure 1.
   3. Performance Category: 1/2 PERF CAT.
   4. Edges: Square.
   5. Exposure Time: Sheathing will not delaminate or require sanding due to moisture absorption from exposure to weather for up to 500 days.
   6. Provide fastening guide on top panel surface with separate markings indicating fastener spacing for 16 inches and 24 inches on center, respectively.

B. Other Applications:
   1. Blocking: See Section 06 10 00 - Rough Carpentry.

2.03 ACCESSORIES

A. Fasteners and Anchors:
   1. Metal and Finish: Hot-dipped galvanized steel complying with ASTM A153/A153M for high humidity and preservative-treated wood locations, unfinished steel elsewhere.

PART 3 EXECUTION

3.01 INSTALLATION - GENERAL

A. Select material sizes to minimize waste.

B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.

3.02 INSTALLATION OF CONSTRUCTION PANELS

3.03 TOLERANCES

A. Variation from Plane, Other than Floors: 1/4 inch in 10 feet maximum, and 1/4 inch in 30 feet maximum.

3.04 CLEANING

A. Waste Disposal:
   1. Comply with applicable regulations.
   2. Do not burn scrap on project site.
   3. Do not burn scraps that have been pressure treated.
   4. Do not send materials treated with pentachlorophenol, CCA, or ACA to co-generation facilities or “waste-to-energy” facilities.

B. Do not leave wood, shavings, sawdust, etc. on the ground or buried in fill.

C. Prevent sawdust and wood shavings from entering the storm drainage system.

END OF SECTION

SECTION 06 20 00
FINISH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Finish carpentry items, including:
   1. Wood door frames.
   2. Wall trim (TRIM).
   3. Wall base (WB-1)
   4. Nurse's station base bid re-face material.
   5. Plastic laminate shelving for installation on existing standards and brackets.

1.02 RELATED REQUIREMENTS

A. Section 06 10 53 - Miscellaneous Rough Carpentry: Support framing, grounds, and concealed blocking.

B. Section 06 41 00 - Architectural Wood Casework: Coordinate with shop fabricated custom cabinet work.

1.03 PRICE AND PAYMENT PROCEDURES

A. Alternates:
   1. See Section 00 42 00 - Alternates for product alternates affecting this section.
   2. This section includes base bid items.

1.04 REFERENCE STANDARDS

A. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition.

B. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards.

C. BHMA A156.9 - Cabinet Hardware.

D. NEMA LD 3 - High-Pressure Decorative Laminates.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the work with electrical rough-in and installation of associated and adjacent components.

B. Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.

1.06 SUBMITTALS

A. See Section 01 40 00 - Quality Requirements for submittal procedures.

B. Product Data:
   1. Provide data on fire retardant treatment materials and application instructions.
   2. Provide data for finish hardware.
   3. Provide data of compliance with Formaldehyde Emissions Evaluation.

C. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.
   1. Scale of Drawings: 1-1/2 inch to 1 foot, minimum.
   2. Provide information as required by AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS).

D. Samples: Submit two samples of finish plywood, 12 by 12 inch in size illustrating wood grain and specified finish.

1.07 QUALITY ASSURANCE

A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.
   1. Company that follows AWI's "Architectural Woodwork Quality Standards".

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver factory-fabricated units to project site in original packages, containers or bundles bearing brand name and identification.

B. Store finish carpentry items under cover, elevated above grade, and in a dry, well-ventilated area not exposed to heat or sunlight.

C. Protect from moisture damage.

D. Handle materials and products to prevent damage to edges, ends, or surfaces.

1.09 FIELD CONDITIONS

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, utilities, and other related work to ensure that finish carpentry items can be supported and installed as indicated.

B. Locate concealed framing, blocking, and reinforcements that support cabinets by field measurements before being enclosed, and indicate measurements on Shop Drawings.

C. During and after installation of finish carpentry, maintain temperature and humidity conditions in building spaces at same levels planned for occupancy.

D. Do not deliver product until the building is secure and weathertight.

PART 2 PRODUCTS

2.01 FINISH CARPENTRY ITEMS

A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.

B. Surface Burning Characteristics: Provide materials having fire and smoke properties as required by authority having jurisdiction.

C. Interior Woodwork Items:
   1. Wall Trim: boards made of real wood, finger jointed and coated with acrylic latex primer.
      a. Product: as indicated in Finish Schedule.
   2. Wall Base: boards made of real wood, finger jointed and coated with acrylic latex primer.
      a. Product: as indicated in Finish Schedule.
   3. Nurse's station base bid re-face material: Solid wood tambour; poplar as indicated in Finish Schedule.
   4. Door Frames: poplar; prepare for paint finish.
   5. Plastic laminate shelving for installation on existing standards and brackets.

2.02 SHEET MATERIALS

A. Medium Density Fiberboard (MDF): ANSI A208.2; type as specified in AWI/AWMAC Architectural Woodwork Quality Standards Illustrated; composed of wood fibers pressure bonded with moisture resistant adhesive to suit application; sanded faces
   1. Thickness: 3/4-inch, unless otherwise detailed.

2.03 PLASTIC LAMINATE MATERIALS

A. Plastic Laminate: NEMA LD 3, HGS; refer to section 06 41 00.

2.04 FASTENINGS

A. Adhesive for Purposes Other Than Laminate Installation: Suitable for the purpose; not containing formaldehyde or other volatile organic compounds.

B. Concealed Fasteners: Of size and type to suit application; any finish in concealed locations

C. Fasteners: Trim nails or torx-head finish screw, of size and type to suit application; satin stainless steel finish in exposed locations.

D. Concealed Joint Fasteners: Threaded steel.

2.05 ACCESSORIES

A. Lumber for Shimming: Softwood lumber of pine species.

B. Primer: Alkyd primer sealer.

C. Wood Filler: Solvent base, tinted to match surface finish color.

2.06 HARDWARE

A. Hardware: Comply with BHMA A156.9.

2.07 FABRICATION

A. Shop assemble work for delivery to site, permitting passage through building openings.

B. Finish exposed edges of panels as specified by grade requirements.

C. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

2.08 SHOP FINISHING

A. Sand work smooth and set exposed nails and screws.

B. Apply wood filler in exposed nail and screw indentations.

C. On items to receive transparent finishes, use wood filler that matches surrounding surfaces and is of type recommended for the applicable finish.

D. Back prime woodwork items to be field finished, prior to installation.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify adequacy of backing and support framing.

B. Verify mechanical, electrical, and building items affecting work of this section are placed and ready to receive this work.

C. See Section 06 10 00 - Rough Carpentry for installation of recessed wood blocking.

3.02 INSTALLATION

A. Install custom fabrications in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade indicated.

B. Do not begin installation until wood materials have been fully acclimated to interior conditions.

C. Set and secure materials and components in place, plumb and level.

D. Carefully scribe work abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim to conceal larger gaps.

E. Set exposed fasteners, fill with wood plugs, and finish to match panel finish.

F. Install hardware in accordance with manufacturer's written instructions.

3.03 PREPARATION FOR SITE FINISHING

A. Set exposed fasteners. Apply wood filler in exposed fastener indentations. Sand work smooth.

B. Site Finishing: See Section 09 91 23.

C. Before installation, prime paint surfaces of items or assemblies to be in contact with cementitious materials.

3.04 TOLERANCES

A. Maximum Variation from True Position: 1/16 inch.

B. Maximum Offset from True Alignment with Abutting Materials: 1/32 inch.

END OF SECTION

SECTION 06 41 00
ARCHITECTURAL WOOD CASEWORK

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wood casework with laminate cladding (PLV-1).

B. Shop finishing.

C. Cabinet and drawer hardware.

1.02 ABBREVIATIONS AND ACRONYMS

A. AWI: Architectural Woodwork Institute.

1.03 REFERENCE STANDARDS

A. ANSI A208.1 - American National Standard for Particleboard.

B. ANSI A208.2 - Medium Density Fiberboard (MDF) for Interior Applications.

C. ANSI/AWI 0400 - Factory Finishing.

D. ANSI/AWI 0620 - Finish Carpentry/Installation.

E. ANSI/AWI 0641 - Architectural Wood Casework.

F. AWI 200 - Care and Storage.

G. AWI 300 - Materials.

H. ANSI/AWI 0620 - Finish Carpentry/Installation.

I. ANSI/AWI 0641 - Architectural Wood Casework.

J. AWI 100 - Submittals.

K. AWI 200 - Care and Storage.

L. BHMA A156.9 - Cabinet Hardware.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene preinstallation meeting not less than one week prior to completion of framing behind casework; require attendance of contractor, framing contractor, casework fabricator, and casework installer.
   1. Review locations of casework backing and structural support.
   2. Review backing attachment method to wall framing as indicated on drawings.

1.05 SUBMITTALS

A. See Section 01 40 00 - Quality Requirements for submittal procedures.

B. Product Data: Submit manufacturer's published, product descriptive data.
   1. Hardware: For each type of cabinet and drawer hardware.
   2. Locks: For each type of cabinet and drawer lock.

C. Shop Drawings:
   1. General: Each sheet sequentially numbered and dated.
      a. Contents: Indicate project name and project address.
      b. Comply with AWI 100.
   2. Reference Plans: Casework locations in relative context of building floor plans.
   3. Plans and Elevations: Plan and elevation views of each assembly type.
   4. Detailed Section: Dimensioned section views of each casework configuration and cabinet type.
   5. Details: Dimensioned casework assembly details with material thicknesses.

D. Samples:

1. Samples, Wood Veneer Panels: For each wood veneer species and cut, submit twofinished samples, indicating specified species, cut, and finish; size: 8 by 8 inches, minimum; thickness: 3/4 inch.
2. Samples, Laminate-Clad Panels: For each laminate-clad type, submit two, laminate-clad sample panels; size: 8 by 8 inches, minimum; thickness: 3/4 inch.
3. Samples, Hardware: For each hinge, pull, shelf rest, and locks type, submit one sample, full-size, indicating specified design, quality, and finish.

E. Shop Drawings: Indicate casework locations, large scale plans, elevations, cross sections, rough-in and anchor placement dimensions and tolerances, clearances required. Indicate materials, component profiles, configurations, assembly methods, fastening methods, jointing details, utility and service requirements and locations, accessory listings, hardware location and schedule of finishes.

F. Informational Submittals:
1. Test Reports: Valid AWI "Performance Quality Test Report" indicating compliance with specified ANSI/AWI 0641 Structural Performance Duty Level.

1.06 QUALITY ASSURANCE

A. Fabricator/Installer Qualifications: Firm specializing in fabricating and installing products specified in this section with minimum five years of documented experience; with qualifications indicating ability to comply with requirements of this section.

B. Perform work in accordance with ANSI/AWI Standards unless other quality is indicated for specific items.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver products in original packaging materials bearing product identification.

B. Store products prior to installation on flat, level, clean surfaces; elevate products above floors and protect from sunlight.

C. Store products in interior rooms with completed wet work and overhead work.

D. Accept casework on site. Inspect on arrival for damage.

1.08 FIELD CONDITIONS

A. Ambient Conditions for Acclimation, Installation, and Post-Installation of Wood-Based Products:

B. Coordinate casework installation with size, location and installation of service utilities.

C. Coordinate layout and installation of blocking and reinforcement in walls for support of casework.

D. Verify dimensions of countertops by field measurements after base cabinets are installed but before countertop fabrication is complete. Coordinate fabrication schedule with construction progress to avoid delaying the work.

E. Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.

F. Do not deliver product until the following conditions are met:
1. Windows and doors are installed and the building is secure and weathertight.
2. Ceiling, overhead ductwork and lights are installed.
3. All painting is completed and floor tile is installed.

PART 2 PRODUCTS

2.01 ARCHITECTURAL WOOD CASEWORK

A. Casework Finish: Wood casework with laminate cladding.

B. Provide casework and casework components in sizes and profiles as indicated on drawings.
1. Interior Clearances: Comply with specified performance requirements.

C. Adjustable Shelves, Number of Shelves Per Cabinet Unit:
   1. Base Cabinets: As indicated on drawings.
   2. Wall Cabinets: As indicated on drawings.

D. Scribed Fillers:
   1. Finish and Materials: Same materials and finish as exposed surfaces.
   2. Material thickness: Comply with specified performance requirements.

2.02 PERFORMANCE REQUIREMENTS

A. Architectural Woodwork Institute (AWI) Performance Requirements:
   1. Comply with AWI 300, ANSI/AWI 0641, ANSI/AWI 0400, and ANSI/AWI 0620 as applicable for specified casework finish, aesthetic grade, and performance duty level.
      a. Aesthetic Grade: Custom.
      b. Product Performance Duty Level: Duty Level 3.
   2. Panel and Material Thicknesses: Provide panels and materials as required to meet specified performance duty level, subject to minimum thickness requirements of AWI 300 and ANSI/AWI 0641 and flatness requirements indicated below.
   3. Panel Flatness: Provide panels with maximum variation from flat in 12 inches as measured diagonally across panel.
      a. Custom Grade: Plus or minus 0.047 inch maximum.
   4. Cabinet Door Flatness:
      a. Comply with specified performance requirements.

2.03 WOOD CASEWORK WITH LAMINATE CLADDING

A. Casework Construction:
   1. Frameless Cabinet and Door Interface: Flush overlay.
   2. Door and Drawer Front Profile: Flush.
   3. Reveal Dimensions: Comply with performance requirements.

B. Wood Drawer Boxes with Laminate Cladding:
   1. Comply with specified performance requirements.

C. Custom Grade - Laminate-Clad Wood Casework:
   1. Exposed Exterior Surfaces, Panels to Receive Laminate Cladding:
      a. HPDL Panels; Surface Finish: As specified.
   2. Exposed Interior Surfaces at Door and Drawer Fronts:
      a. Same laminate materials and thicknesses as exposed exterior surfaces.
         1) Color to match exposed interior or face.
   3. Exposed Interior Surfaces Except Door and Drawer Front Surfaces, Panels to Receive Laminate Cladding:
      a. HPDL: Compatible laminate in color and pattern to exposed exterior surfaces.
   4. Semi-Exposed Surfaces; Panels to Receive Laminate Cladding:
      a. Comply with specified performance requirements.

D. Edgebanding Applications for Laminate-Clad Wood Casework:
   1. Edgebanding: Provide edgebanding on exposed edges.
   2. Drawer Box Top Edges:
      a. Visible Cores: Not permitted.

E. Edgebanding Materials for Laminate-Clad Wood Casework:
   1. PVC: Well-matched to exposed face; radiused and beveled on edges and corners if thickness is greater than 0.039 inch.

2.04 EDGE TREATMENT APPLICATIONS

A. Front Edges of Frameless Cabinets:
   1. Provide edgebanding.

B. Top Edges of Cabinets:
   1. Comply with specified performance requirements.

C. Bottom Edges of Wall Cabinet Ends:
   1. Comply with specified performance requirements.

D. Hinged Door Edges:
   1. Provide edgebanding on all four edges except for solid wood doors.

E. Drawer Front and Drawer False Front Edges:
   1. Provide edgebanding on all four edges except for solid wood drawers.

F. Adjustable Shelf Edges, Semi-Exposed Surfaces:
   1. Comply with specified performance requirements.

2.05 PANEL CORES

A. Type, grade and thickness complying with structural performance requirements specified.

B. Particleboard (PTB):
   1. Description: Composite panel composed of cellulosic particles, additives, and bonding system; comply with ANSI A208.1.
   2. Grade and Thickness: As required to meet performance requirements.

C. Medium Density Fiberboard (MDF):
   1. Description: Composite panel composed of cellulosic fibers, additives, and bonding system cured under heat and pressure; comply with ANSI A208.2.
   2. Grade and Thickness: As required to meet performance requirements.

2.06 CONCEALED CABINET BASE COMPONENTS

A. Cabinet Base Toe-Kick Subfronts:
   1. Materials and Size: Fabricator's choice subject to requirements of ANSI/AWI 0641.
   2. Size: As indicated on drawings.
   3. Finished Face of Toe Kick Subfronts: As indicated on drawings.

B. Cabinet Base Blocking and Stretchers:
   1. Materials and Size: Fabricator's choice subject to requirements of ANSI/AWI 0641.

C. Cabinet Base Sleepers:
   1. Materials and Size: Fabricator's choice subject to requirements of ANSI/AWI 0641.

2.07 WOOD AND WOOD-BASED MATERIALS

A. AWI 200 Wood Moisture Content Requirements:
   1. Climate Zone 2: Between 6 and 10 percent.

B. AWI 300 General Requirements for Wood.
   1. Provide wood in accordance with AWI 300.

C. Wood Anchoring Strips:
   1. Materials and Size: Fabricator's choice subject to requirements of ANSI/AWI 0641.

2.08 CABINET AND DRAWER HARDWARE

A. Hinges, Self-Closing, Integrated Damper Hinges:
   1. Description: Self-closing hinges with integrated damper mechanisms.
   2. Comply with BHMA A156.9, .
   3. Features: Provide soft-closing integrated damper hinges.
   4. Opening Range: Between 95 to 110 to degrees.
   5. Products:
      a. Hardware Resources: www.hardwareresources.com.
      b. Substitutions: See Section 01 60 00 - Product Requirements.

B. Cabinet Door and Drawer Pulls:

1. Description: Back-mounted pulls.
2. Design: U-shape wire pulls.
3. Center-to-Center Mounting Dimension: 4 inches.
4. Material and Finish: Satin anodized aluminum.
5. Products:
    a. Substitutions: See Section 01 60 00 - Product Requirements.

C. Shelf Rests:
1. Description: Dual pin shelf supports for installation into prepared holes in substrate.
2. Must meet or exceed specified performance requirements.
3. Material and Finish: Manufacturers standard; color: clear.

D. Drawer Slides:
1. Description: Hardware units that suspend drawers and provide controlled drawer sliding.
2. Comply with BHMA A156.9, Standard Duty Grade 1.
3. Features: Self-closing and soft-closing with integral stop.
4. Mounting: Side-mounted.
5. Travel: Full extension.
    a. for File Drawers: Full extension with overtravel.
6. Products:
    a. Accuride International, Inc: www.accuride.com/#sle.
    b. Knape & Vogt Manufacturing Company: www.knapeandvogt.com/#sle.
    c. Substitutions: See Section 01 60 00 - Product Requirements.

E. Cabinet Door Keyed Locks with Dead Bolts:
1. Description: Keyed cylinder locks for securing cabinet doors.
2. Keying Action: Key projects and retracts dead bolts.
3. Interchangeable Cores: Provide interchangeable cores.
4. Key Control: See Section 08 71 00.
5. Products:
    a. Olympus Lock; 721 Series.

2.09 CASEWORK ACCESSORY COMPONENTS

A. Edgebanding: PVC, flat, matte finish; width to match component thickness.
1. Color: As selected by Architect from manufacturers' standard range.

2.10 ACCESSORIES

A. Fasteners: Size and type to suit application.

B. Concealed Joint Fasteners: Threaded steel.

C. Bolts, Nuts, Washers, Lags, Pins, and Screws: Of size and type to suit application; chrome-plated finish in concealed locations and stainless steel or chrome-plated finish in exposed locations.

D. Adhesives: Type recommended by fabricator to suit application.

E. Wall Cleats: French cleats for stud wall partitions, with lower cleat fastened to wall and upper cleat fastened to millwork.

2.11 FABRICATION

A. Shop-fabricate casework to dimensions, profiles, and details indicated on drawings.

B. Fabricate to maximum extents plausible, including doors, drawers, and hardware; fabricate units in sizes transportable through building openings.

C. When necessary to cut and fit on site, provide materials with sufficient allowance for cutting.

D. Wood Casework with Laminate Cladding: Apply laminates in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline.

E. Provide cutouts for plumbing fixtures, inserts, appliances, outlet boxes, and fixtures and fittings. Verify locations of cutouts from on-site dimensions. Fully finish exposed cut edges.

F. Edgebanding: Apply where specified; do not use more than one piece for any single length.

G. Hardware: Install hardware in accordance with hardware manufacturer's written instructions; use fasteners supplied by hardware manufacturer.

2.12 SHOP FINISHING

A. Surface Preparation: Comply with:
   1. ANSI/AWI 0400 for specified aesthetic grade.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify casework and materials required for installation have been delivered, handled and stored as specified.

B. Verify wood blocking that provides casework backing is installed as indicated on drawings.

C. Verify location and sizes of rough-in plumbing and rough-in electrical associated with work of this section.

D. Verify location and sizes of cutouts for appliances and special equipment to be mounted in or adjacent to casework.

E. Verify casework and materials required for installation have been delivered, handled, ans stored in accordance with AWI 200 and requirements specified in Part 1 - Delivery, Storage and Handling.

F. Verify field conditions comply with AWI 200 and requirements specified in Part 1 - Field Conditions.

3.02 PREPARATION

A. Acclimate casework to the environment in which it will be installed for a minimum of 72 hours prior to installation. Comply with AWI 200.

3.03 INSTALLATION

A. Install work in accordance with ANSI/AWI 0620 requirements for grade indicated.

B. Install work of this section rigid, plumb, and level and in accordance with fabricator's documented instructions; secure casework as indicated on drawings.

C. Base and Wall Cabinet Anchorage Support Construction:
   1. See Section 06 10 53 for non-load-bearing wood blocking providing backing for casework.

D. Install cabinet hardware in accordance with hardware manufacturer's documented instructions using hardware manufacturer's furnished fasteners.

E. Install scribe fillers to close gaps between casework and adjacent walls.

F. Install hardware in accordance with hardware manufacturer's written instructions using fasteners furnished by hardware manufacturer.

3.04 TOLERANCES

3.05 INSTALLATION ITEMS BY TRADE CONTRACTOR

A. Install plumbing and electrical service to and within equipment.

B. Set plumbing fixtures and accessory fixtures, and make final connections of such.

C. Complete wiring and connection to electrical boxes, receptacles, switches, lights, and flush plates. Work shall be in accordance with local codes, whether or not specifically called for in the contract documents.

3.06 ADJUSTING

A. Adjust hardware for smooth operation in accordance with hardware manufacturer's documented instructions.

3.07 CLEANING

A. See Section 01 70 00 - Execution and Closeout Requirements for additional requirements.

B. Clean exposed surfaces of casework, shelving, and hardware.

C. Clean all materials provided under this section and all adjacent materials, which may have become soiled from this work.
   1. High Pressure Laminates (HPL): refer to NEMA publication Ld3-2005 Annex B Care and Cleaning of Laminates.

D. Wipe out millwork interiors and empty drawers of dirt and debris. Remove pencil marks and other blemishes from millwork surfaces.

E. Remove foreign matter that could affect operation or appearance of hardware.

F. Make final adjustments to drawers and doors. Doors shall swing freely. All doors shall be aligned both vertically and horizontally. Drawers shall open and close smoothly, without binding or excessive slide and play.

3.08 PROTECTION OF FINISHED WORK

A. Do not permit finished casework to be exposed to continued construction activity.

B. Cover with protective cover, taped to casework.

C. Remove temporary protective cover at date of Substantial Completion.

END OF SECTION

SECTION 06 83 16
FIBERGLASS REINFORCED PANELING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fiberglass reinforced plastic panels (FRP).

B. Trim.

1.02 REFERENCE STANDARDS

A. 9 CFR 416.2 - Regulatory Requirements Under the Federal Meat Inspection Act and the Poultry Products Inspection Act, Part 416-Sanitation.

B. ASTM D256 - Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics.

C. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.

D. ASTM D5319 - Standard Specification for Glass-Fiber Reinforced Polyester Wall and Ceiling Panels.

E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

F. ISO 846 - Plastics - Evaluation of the Action of Microorganisms.

G. ISO 2812-1 - Paints and Varnishes -- Determination of Resistance to Liquids -- Part 1: Immersion in Liquids Other than Water.

1.03 SUBMITTALS

A. See Section 01 40 00 - Quality Requirements, for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.

C. Samples: Submit two samples 8 by 8 inch in size illustrating material and surface design of panels.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Store panels flat, indoors, on a clean, dry surface. Remove packaging and allow panels to acclimate to room temperature for 48 hours prior to installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Fiberglass Reinforced Plastic Panels:
   1. Crane Composites, Inc: www.cranecomposites.com/#sle.
   2. Marlite, Inc: www.marlite.com/#sle.
   3. Nudo Products, Inc: www.nudo.com/#sle.
   4. Panolam Industries International, Inc: www.panolam.com/#sle.
   5. Substitutions: See Section 01 6000 - Product Requirements.

2.02 PANEL SYSTEMS

A. Wall Panels:
   1. Panel Size: 4 by 10 feet.
   2. Panel Thickness: 0.09 inch.
   3. Surface Design: Smooth.
   4. Color: as indicated in Finish Schedule.
   5. Attachment Method: Adhesive only, with trim at perimeter and corners and sealant in intermediate joints..

2.03 MATERIALS

A. Panels: Fiberglass reinforced plastic (FRP), complying with ASTM D5319.
   1. Surface Burning Characteristics: Maximum flame spread index of 25 and smoke developed index of 450; when system tested in accordance with ASTM E84.
   2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
   3. Impact Strength: Greater than 6 ft lb force per inch, when tested in accordance with ASTM D256.
   4. Sanitation and Cleanability: Comply with 9 CFR 416.2.
   5. Chemical Cleanability: Excellent chemical resistance to common cleaners and detergents when tested in accordance with ISO 2812-1.
   6. Biological Resistance: Rating of 0, when tested in accordance with ISO 846.

B. Trim: Vinyl; color coordinating with panel.

C. Adhesive: Type recommended by panel manufacturer.

D. Sealant: Type recommended by panel manufacturer; white.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions and substrate flatness before starting work.

B. Verify that substrate conditions are ready to receive the work of this section.

3.02 INSTALLATION - WALLS

A. Install panels in accordance with manufacturer's instructions.

B. Cut and drill panels with carbide tipped saw blades, drill bits, or snips.

C. Apply adhesive to the back side of the panel using trowel as recommended by adhesive manufacturer.

D. Apply panels to wall with seams plumb and pattern aligned with adjoining panels.

E. Install panels with manufacturer's recommended gap for panel field and corner joints.

F. Place trim on panel before fastening edges, as required.

G. Fill channels in trim with sealant before attaching to panel.

H. Install trim with adhesive and screws or nails, as required.

I. Seal gaps at floor, ceiling, and between panels with applicable sealant to prevent moisture intrusion.

J. Remove excess sealant after paneling is installed and prior to curing.

END OF SECTION

SECTION 07 01 50.19
PREPARATION FOR RE-ROOFING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Removal of existing roofing systems in preparation for entire new roofing system.

B. Removal of existing flashing and counterflashings.

C. Temporary roofing protection.

1.02 RELATED REQUIREMENTS

A. Section 07 31 13 - Asphalt Shingles.

B. Section 07 62 00 - Sheet Metal Flashing and Trim: Replacement of flashing and counterflashings.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordinate with affected mechanical and electrical work associated with roof penetrations.

B. Preinstallation Meeting: Convene one week before starting work of this section.
   1. Attendees:
      a. Architect.
      b. Contractor.
      c. Owner.
      d. Installer.
      e. Roofing system manufacturer's field representative.
   2. Meeting Agenda: Provide agenda to participants prior to meeting in preparation for discussions on the following:
      a. Removal and installation schedule.
      b. Necessary preparatory work.
      c. Protection before, during, and after roofing system installation.
      d. Removal of existing roofing system.
      e. Installation of new roofing system.
      f. Temporary roofing and daily terminations.
      g. Transitions and connection to and with other work.

C. Schedule work to coincide with commencement of installation of new roofing system.

1.04 SUBMITTALS

A. See Section 01 40 00 - Quality Requirements for submittal procedures.

B. Product Data: Submit for each type of material.

C. Shop Drawings: Indicate size, configuration, and installation details.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.
   1. When same installer as new roofing system, comply with related requirements of section indicated for new roofing system.

1.06 DELIVERY, STORAGE, AND HANDLING

A. See Section 01 74 19 - Construction Waste Management and Disposal for packaging waste requirements.

B. Ensure storage and staging of materials does not exceed static and dynamic load-bearing capacities of roof decking.

1.07 FIELD CONDITIONS

A. Existing Roofing System: Asphalt shingle roofing.

B. Do not remove existing roofing when weather conditions threaten the integrity of building contents or intended continued occupancy.

C. Maintain continuous waterproof temporary protection prior to and during installation of new roofing system.

D. Provide notice at least three days before starting activities that will affect normal building operations.

E. Verify that occupants have been evacuated from building areas when work on structurally impaired roof framing or decking is scheduled to begin.

F. Owner will occupy building areas directly below re-roofing area.
   1. Provide Owner with at least 48 hours written notice of roofing activities that may affect their operations and to allow them to prepare for upcoming activities as necessary.
   2. Do not disrupt Owner's operations or activities.
   3. Maintain access of Owner's personnel to corridors, existing walkways, and adjacent buildings.

PART 2 PRODUCTS

2.01 COMPONENTS

A. See the following sections for additional information on components relating to this work:
   1. Replacement and removal of existing roofing system in preparation for entire new roofing system, see Sections noted above in Related Sections.
   2. Remove existing flashing and counterflashings in preparation for replacement of these materials as part of this work, see Section 07 62 00 for material requirements.

2.02 MATERIALS

A. Patching Materials: Provide necessary materials in accordance with requirements of existing roofing system.

B. Temporary Roofing Protection Materials:
   1. Contractor's responsibility to select appropriate materials for temporary protection of roofing areas as determined necessary for this work.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that existing roof surface has been cleared of materials being removed from existing roofing system and ready for next phase of work as required.

3.02 PREPARATION

A. Remove loose refuse and dispose of properly off-site.

3.03 MATERIAL REMOVAL

A. Remove only existing roofing materials that can be replaced with new materials as the weather will permit.

B. Remove metal counter flashings.

C. Remove sheathing paper and underlayment.

D. Repair existing wood deck surface to provide smooth working surface for new roof system.

3.04 INSTALLATION

A. Coordinate scope of this work with requirements for installation of new roofing system, see Section 073110 / 073126 for additional requirements.

3.05 PROTECTION

A. Provide protection of existing roofing system that is not having work performed on it.

B. Provide temporary protective sheeting over uncovered deck surfaces.

C. Turn sheeting up and over parapets and curbing. Retain sheeting in position with temporary fasteners.

D. Provide for surface drainage from sheeting to existing drainage facilities.

E. Do not permit traffic over unprotected or repaired deck surface.

END OF SECTION

SECTION 07 13 00
SHEET WATERPROOFING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Self-adhered modified bituminous sheet membrane.

1.02 RELATED REQUIREMENTS

A. Structural Drawings: Concrete substrate.

B. Section 07 21 00 - Thermal Insulation: Insulation used for protective cover.

1.03 ABBREVIATIONS

A. HDPE - High-Density Polyethylene.

B. PVC - Polyvinyl Chloride.

C. TPO - Thermoplastic Polyolefin.

1.04 REFERENCE STANDARDS

A. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension.

B. ASTM D570 - Standard Test Method for Water Absorption of Plastics.

C. ASTM D882 - Standard Test Method for Tensile Properties of Thin Plastic Sheeting.

D. ASTM D5295/D5295M - Standard Guide for Preparation of Concrete Surfaces for Adhered (Bonded) Membrane Waterproofing Systems.

E. ASTM D5385/D5385M - Standard Test Method for Hydrostatic Pressure Resistance of Waterproofing Membranes.

F. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials.

G. NRCA (WM) - The NRCA Waterproofing Manual.

1.05 SUBMITTALS

A. See Section 01 40 00 - Quality Requirements for submittal procedures.

B. Product Data: Provide data for membrane, surface conditioner, flexible flashings, joint cover sheet, and joint and crack sealants.

C. Shop Drawings: Indicate special joint or termination conditions and conditions of interface with other materials.

D. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

A. Membrane Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than ten years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least five years of documented experience and approved by manufacturer.

1.07 FIELD CONDITIONS

A. Maintain ambient temperatures above 40 degrees F for 24 hours before and during application and until liquid or mastic accessories have cured.

1.08 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

B. Contractor to correct defective Work within period of five years after Date of Substantial Completion; remove and replace materials concealing waterproofing at no extra cost to Owner.

C. Provide fifteen year manufacturer warranty for waterproofing failing to resist penetration of waterand methane gas, except where such failures are the result of structural failures of building. Hairline cracking of concrete due to temperature change or shrinkage is not considered a structural failure.

PART 2 PRODUCTS

2.01 SHEET WATERPROOFING APPLICATIONS

A. Self-Adhered Modified Bituminous Sheet Membrane:
   1. Location: depressed slab areas, horizontal and vertical surfaces.
   2. Cover with drainage panel.

2.02 SHEET WATERPROOFING MATERIALS

A. Self-Adhered Modified Bituminous Sheet Membrane:
   1. Thickness: 60 mil, 0.060 inch, minimum.
   2. Sheet Width: 36 inches, minimum.
   3. Tensile Strength:
      a. Film: 5,000 psi, minimum, measured in accordance with ASTM D882 and at grip-separation rate of 2 inches per minute.
      b. Membrane: 325 psi, minimum, measured in accordance with ASTM D412 Method A, using die C and at spindle-separation rate of 2 inches per minute.
   4. Elongation at Break: 350 percent, minimum, measured in accordance with ASTM D412.
   5. Water Vapor Permeance: 0.05 perm, maximum, measured in accordance with ASTM E96/E96M.
   6. Water Absorption: 0.1 percent increase in weight, maximum, measured in accordance with ASTM D570, 24 hour immersion.
   7. Hydrostatic Pressure Resistance: Membrane resists leakage for at least one hour from pressure equivalent to 230 feet head of water applied in accordance with test method ASTM D5385/D5385M.
   8. Adhesives, Sealants, Tapes, and Accessories: As recommended by membrane manufacturer.
   9. Products:
      a. Henry, a Carlisle Company; MiraDRI 860/861: www.henry.com/#sle.
      b. Substitutions: See Section 01 60 00 - Product Requirements.

B. Termination Bars: Stainless steel; compatible with membrane and adhesives.

C. Adhesives: As recommended by membrane manufacturer.

2.03 ATTACHMENT MATERIALS

A. Disc Washers and Screws: manufacturer's standard.

2.04 ACCESSORIES

A. Sealant for Cracks and Joints In Substrates: Resilient elastomeric joint sealant compatible with substrates and waterproofing materials.

B. Drainage Panel: Drainage layer with geotextile filter fabric on earth side.
   1. Composition: Dimpled polystyrene, polyethylene, or polypropylene core; polypropylene filter fabric.
   2. Thickness: As indicated on drawings.
   3. Products:
      a. Carlisle CCW MiraDRAIN 6200xl @ vertical applications, 9000 @ horizontal applications.
      b. Substitutions: See Section 01 60 00 - Product Requirements.

C. Cant Strips: Premolded composition material.

D. Flexible Flashings: TPO, as recommended by membrane manufacturer.

E. Double-sided seam tape: manufacturer's standard seam tape for sealing non-factory and cut edges, and for detailing

F. Self-adhering detail tape: manufacturer's standard detail tape with pre-applied adhesive coating for detailing

G. Self-curing liquid detailing membrane: As recommended by membrane manufacturer.

H. Pre-formed, high-impact resistant, heavy-duty thermoplastic tie-back cover: manufacturer's standard for protecting the membrane integrity at soil retention tie-back systems

I. Self-adhering pre-formed hydrophilic waterstop: manufacturer's standard for use in non-moving joints to create watertight concrete joints

J. Miscellaneous products: accessory products approved by manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions are acceptable prior to starting work.

B. Verify substrate surfaces are durable; free of matter detrimental to adhesion or application of waterproofing system.

C. Verify that items penetrating surfaces to receive waterproofing are securely installed.

3.02 PREPARATION

A. Clean and prepare surfaces to receive waterproofing in accordance with manufacturer's instructions; vacuum substrate clean.

B. Do not apply waterproofing to surfaces unacceptable to membrane manufacturer.

C. Fill nonmoving joints and cracks with a filler compatible with waterproofing materials.

D. Seal moving cracks with sealant and nonrigid filler, using procedures recommended by sealant and waterproofing manufacturers.

E. Prepare building expansion joints at locations as indicated on drawings.

F. Surfaces for Adhesive Bonding: Apply surface conditioner at a rate recommended by manufacturer, and protect conditioner from rain or frost until dry.

G. Concrete Surfaces for Adhesive Bonding: Prepare concrete substrate in accordance with ASTM D5295/D5295M.
   1. Remove substances that inhibit adhesion including form release agents, curing compounds admixtures, laitance, moisture, dust, dirt, grease and oil.
   2. Repair surface defects including honeycombs, fins, tie holes, bug holes, sharp offsets, rutted cracks, ragged corners, deviations in surface plane, spalling and delaminations, as described in reference standard.
      a. Gaps or voids greater than 1.0 in. (25mm) shall be filled or covered with manufacturer approved material.
   3. Remove and replace areas of defective concrete; see Section 03 30 00.
   4. Prepare concrete for adhesive bonded waterproofing using mechanical or chemical methods described in referenced standard.
   5. Test concrete surfaces as described in referenced standards, and verify surfaces are ready to receive adhesive bonded waterproofing membrane system.

H. Gravel subbase aggregate must be 3/4" or smaller, level and compacted. There is to be no standing water.

3.03 INSTALLATION - DRAINAGE PANEL

A. Install drainage panel prior to membrane with the fabric side facing down.

3.04 INSTALLATION - MEMBRANE

A. Install membrane waterproofing in accordance with manufacturer's instructions and NRCA (WM) applicable requirements.
   1. Apply in standard roll size or longest workable cut length to reduce the number of T-Joints (three-way overlaps).
   2. Install with the thermoplastic membrane side out, and grey APC geotextile side directly in contact with the concrete to be waterproofed

B. Roll out membrane, and minimize wrinkles and bubbles.

C. Carefully position successive sheets to overlap the previous sheet by 3 in. (75mm) minimum along the lap line. Be sure the product lays flat with no openings. End laps must be staggered.

D. At side laps, simultaneously remove the release liner on the factory applied tape and pre-primed strip then mate the two sheets together. After the seam is fully constructed, roll the seam with a hard rubber roller using firm hand pressure. Side laps shall be held back a minimum of 12” from any vertical inside or outside corner.

E. At end laps, install seam tape between overlapping sheets of membrane. Remove release liner from seam tape and mate the two sheets together. After the seam is fully constructed, roll the seam with a hard rubber roller using firm hand pressure.

F. Remove release liner from the field of the membrane as necessary during installation to assist with detailing and fastening. Release liner may be replaced after detailing and fastening is complete but is required to be removed prior to steel reinforcement placement and concrete placement.

G. For vertical installations, install fasteners as required by manufacturer to assist with installation:
   1. Fasten perimeter edges of membrane approximately 12” on center and a minimum of 6” from the edge with a manufacturer approved fastener.
   2. For membrane lengths greater than 8 ft., fasten the field of the membrane approximately at 1 fastener per 2 ft² with a manufacturer approved fastener.
   3. Avoid overdriven fasteners which can cause stress in the membrane and seams.
   4. Cover fastener heads with a minimum 6" x 6" piece of seam tape or detail tape.

H. Mechanically Fastened Membrane: Install mechanical fasteners in accordance with manufacturer's instructions, and bond sheet to membrane discs.

I. Flashings: Seal items watertight that penetrate through waterproofing membrane with flexible or liquid flashings as recommended by manufacturer.

J. Seal membrane and flashings to adjoining surfaces.
   1. Install termination bar along edges.
   2. Install counterflashing over exposed edges.

3.05 PROTECTION

A. Protect waterproofing as per manufacturer’s recommendations until concrete placement.

B. Inspect waterproofing for damage after steel reinforcement placement and just prior to concrete placement. Repair waterproofing as per manufacturer’s recommendations.

C. Do not permit traffic over unprotected or uncovered membrane.

END OF SECTION

SECTION 07 21 00
THERMAL INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Board insulation at :
   1. Perimeter foundation wall.

B. Batt insulation in exterior wall construction.

1.02 RELATED REQUIREMENTS

A. Structural Drawings: Coordination of insulation installation.

B. Section 09 21 16 - Gypsum Board Assemblies: Acoustic insulation inside walls and partitions.

1.03 REFERENCE STANDARDS

A. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.

B. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.

C. ASTM D2842 - Standard Test Method for Water Absorption of Rigid Cellular Plastics.

D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

E. ASTM E136 - Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750 Degrees C.

F. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.

G. ASTM E2178 - Standard Test Method for Determining Air Leakage Rate and Calculation of Air Permeance of Building Materials.

1.04 SUBMITTALS

A. See Section 01 40 00 - Quality Requirements for submittal procedures.

B. Product Data: Provide data on product characteristics, performance criteria, and product limitations.

C. Shop Drawings: Submit drawings that indicate location of joint or termination detail conditions and conditions of interface with other materials.

1.05 FIELD CONDITIONS

A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

PART 2 PRODUCTS

2.01 APPLICATIONS

A. Insulation at Perimeter of Foundation: Extruded polystyrene (XPS) board.

B. Insulation in Wood Framed Walls: Batt insulation with separate vapor retarder.

2.02 FOAM BOARD INSULATION MATERIALS

A. Extruded Polystyrene (XPS) Board Insulation: Comply with ASTM C578 with either natural skin or cut cell surfaces.
   1. Type and Compressive Resistance: Type IV, 25 psi (173 kPa), minimum.
   2. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.
   3. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
   4. Type and Thermal Resistance, R-value: Type IV, 5.0 (0.88), minimum, per 1 inch thickness at 75 degrees F mean temperature.

5. Board Edges: Square.
6. Type and Water Absorption: Type IV, 0.3 percent by volume, maximum, by total immersion.
7. Products:
    a. DuPont de Nemours, Inc; Styrofoam Brand Square Edge: building.dupont.com/#sle.
    b. Kingspan Insulation LLC; GreenGuard GG25-LG XPS Insulation Board: www.kingspan.com/#sle.
    c. Owens Corning Corporation; FOAMULAR 250 XPS: www.owenscorning.com/en-us/#sle.
    d. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 BATT AND BLANKET INSULATION MATERIALS

A. Flexible Glass Fiber Blanket Thermal Insulation: Preformed insulation, complying with ASTM C665; friction fit.
1. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.
2. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.
3. Combustibility: Non-combustible, when tested in accordance with ASTM E136.
4. Formaldehyde Content: Zero.
5. Thermal Resistance: R-value of 21, minimum.
6. Facing: Unfaced.
7. Products:
    a. CertainTeed Corporation; CertaPRO Fiberglass Insulation Batts: www.certainteed.com/#sle.
    b. Johns Manville; Formaldehyde-Free Fiberglass Insulation: www.jm.com/#sle.
    c. Knauf Insulation; Performance+ EcoBatt Insulation: www.knaufinsulation.com/#sle.
    d. Owens Corning Corporation; EcoTouch PINK FIBERGLAS Insulation: www.owenscorning.com/en-us/#sle.
    e. Substitutions: See Section 01 60 00 - Product Requirements.

2.04 FOAMED-IN-PLACE INSULATION

A. Shim Space Insulation: Polyurethane type, single component spray foam system, reduced expansion spray foam system; semi-rigid; closed cell.
1. Application: Fill shim spaces around aluminum framing, for sealing seams in board insulation within the joint, and joints greater than 1/8” between furring and insulation.
2. Thermal Value (R), Minimum: 4.50 per inch, when tested in accordance with ASTM C 518.
3. Density: 1.3 lb/cu ft, when tested in accordance with ASTM D 1622.
4. Flame Spread: 20, when tested in accordance with UL 1715 Fire Test.
5. Smoke Development: 25, when tested in accordance with UL 1715 Fire Test.
6. Product:
    a. Convenience Products: “Touch 'n Seal No-Warp Foam”.
    b. Hilti: “CF 812 Window and Door Pro Low-Pressure Filler Foam”.
    c. Approved equivalent.

B. Primer: Compatible liquid primer recommended by foam manufacturer.

C. Protective Overcoat/Thermal Barrier: Compatible cementitious or intumescent coating approved by foamed-in-place insulation manufacturer and listed on current ICC-ESR for use in

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation.

B. Verify substrate surfaces are flat, free of honeycomb, fins, irregularities, or materials or substances that may impede adhesive bond.

C. Verify substrate materials are compatible with insulation and adhesives.

3.02 BOARD INSTALLATION AT FOUNDATION PERIMETER

A. Apply adhesive to back of boards:
   1. Three continuous beads per board length.

B. Install boards horizontally on foundation perimeter.
   1. Place boards to maximize adhesive contact.
   2. Install in running bond pattern.
   3. Butt edges and ends tightly to adjacent boards and to protrusions.

C. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

3.03 BATT INSTALLATION

A. Install insulation and vapor retarder in accordance with manufacturer's instructions.

B. Install in exterior wall and roof spaces without gaps or voids. Do not compress insulation.

C. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.

D. Fit insulation tightly in cavities and tightly to exterior side of mechanical and electrical services within the plane of the insulation.

E. At wood framing, place vapor retarder on warm side of insulation by stapling at 6 inches on center. Lap and seal sheet retarder joints over face of member.

F. Tape seal tears or cuts in vapor retarder.

G. Extend vapor retarder tightly to full perimeter of adjacent window and door frames and other items interrupting the plane of the membrane; tape seal in place.

3.04 FOAMED-IN-PLACE INSULATION

A. Mask and protect adjacent surfaces from over spray or dusting.

B. Apply primer in accordnace with manufacturer's instructions.

C. Apply insulation in accordance with manufacturer's instructions.

D. Apply insulation by spray method, to a uniform monolithic density without voids.

E. Apply protective coating monolithically, without voids, to fully cover foam insulation, to achieve fire rating required.

F. Patch damaged areas.

G. Where applied to voids and gaps assure space for expansion to avoid pressure on adjacent materials that may bind operable parts.

H. Trim excess away for applied trim or remove as required for continuous sealant bead.

3.05 PROTECTION

A. Do not permit installed insulation to be damaged prior to its concealment.

END OF SECTION

SECTION 07 26 00
VAPOR RETARDERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Vapor retarders.

1.02 RELATED REQUIREMENTS

A. Section 03 05 16 - Underslab Vapor Barrier: Vapor retarder under concrete slabs on grade.

B. Section 07 21 00 - Thermal Insulation: Vapor retarder installed in conjunction with batt insulation.

1.03 DEFINITIONS

A. Vapor Retarder: Airtight barrier made of material that is relatively water vapor impermeable, to degree specified, with seams and joints sealed to adjacent surfaces.

B. Vapor Retarder Class: A measure of a material or assembly's ability to limit the amount of moisture that passes through that material or assembly. Vapor retarder class is defined using Procedure A, Desiccant Method at 73 degrees F and 50 percent Relative Humidity (RH), in accordance with ASTM E96/E96M and ICC (IBC)-2018, as follows:
   1. Class I: 0.1 perm or less.
   2. Class II: Greater than 0.1 perm to 1.0 perm.
   3. Class III: Greater than 1.0 perm to 10 perms.

1.04 REFERENCE STANDARDS

A. ASTM D4397 - Standard Specification for Polyethylene Sheeting for Construction, Industrial, and Agricultural Applications.

B. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials.

C. ICC (IBC)-2018 - International Building Code.

D. ICC-ES AC148 - Acceptance Criteria for Flexible Flashing Materials.

1.05 SUBMITTALS

A. See Section 01 40 00 - Quality Requirements for submittal procedures.

B. Product Data: Provide data on material characteristics, performance criteria, and limitations.

C. Shop Drawings: Provide drawings of special joint conditions.

D. Manufacturer's Installation Instructions: Indicate preparation, installation methods, and storage and handling criteria.

1.06 FIELD CONDITIONS

A. Maintain temperature and humidity recommended by materials manufacturers before, during, and after installation.

PART 2 PRODUCTS

2.01 VAPOR RETARDERS

A. Underslab Vapor Retarders: See Section 03 05 16 - Underslab Vapor Barrier.

B. Vapor Retarder Sheet: Polyethylene sheeting complying with ASTM D4397, clear colored.
   1. Thickness: 10 mil, 0.010 inch, nominal.
   2. Water Vapor Permeance: 0.1 perm, maximum, when tested in accordance with ASTM E96/E96M.
   3. Seam and Perimeter Tape: Polyethylene self-adhering type, mesh reinforced, 2 inches wide; compatible with sheet material.

2.02 ACCESSORIES

A. Sealants, Tapes, and Accessories for Sealing Vapor Retarder and Adjacent Substrates: As indicated, complying with vapor retarder manufacturer's installation instructions.

B. Sealant for Cracks and Joints in Substrates: Resilient elastomeric joint sealant compatible with substrates and vapor retarder materials.
   1. Application: Apply at 30 to 40 mil, 0.030 to 0.040 inch, nominal thickness.
   2. Color: Green.

C. Flexible Flashing: Self-adhering or mechanically-attached flashing used for wall penetrations in accordance with ICC-ES AC148 requirements.

D. Thinners and Cleaners: As recommended by vapor retarder manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces and conditions comply with requirements of this section.

3.02 PREPARATION

A. Remove projections, protruding fasteners, and loose or foreign matter that might interfere with proper installation.

3.03 INSTALLATION

A. Install materials in accordance with manufacturer's installation instructions.

B. Vapor Retarders: Install continuous airtight barrier over surfaces indicated, with sealed seams and sealed joints to adjacent surfaces.

C. Apply sealants and adhesives within recommended temperature range in accordance with manufacturer's installation instructions.

D. Mechanically Fastened Sheets - Vapor Retarder On Interior:
   1. When insulation is installed within assembly, install vapor retarder over insulation.
   2. Anchor to wood framing using large-headed nails or staples at 12 to 18 inches on center along each framing member covered; cover fasteners with seam tape.
   3. Seal seams, laps, perimeter edges, penetrations, tears, and cuts with self-adhesive tape, providing an airtight seal.
   4. Locate laps at framing members; at laps fasten one sheet to framing member then tape overlapping sheet to first sheet in shingle fashion to shed water.
   5. Seal entire perimeter to structure, window and door frames, and other penetrations.
   6. Where conduits, pipes, wires, ducts, outlet boxes, and other items are installed within insulation cavity, pass vapor retarder sheet behind these items and over insulation to maintain airtight seal.

3.04 FIELD QUALITY CONTROL

A. See Section 01 40 01 - Quality Requirements for additional requirements.

B. Take digital photographs of each portion of installation prior to covering up vapor retarders.

3.05 PROTECTION

A. Do not leave materials exposed to weather longer than recommended by manufacturer.

END OF SECTION

SECTION 07 27 00
AIR BARRIERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Air barriers.

1.02 DEFINITIONS

A. Air Barrier: Airtight barrier made of material that is virtually air impermeable but water vapor permeable, both to amount as specified, with sealed seams and sealed joints to adjacent surfaces.

1.03 REFERENCE STANDARDS

A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

B. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials.

C. ASTM E2178 - Standard Test Method for Determining Air Leakage Rate and Calculation of Air Permeance of Building Materials.

D. ICC-ES AC148 - Acceptance Criteria for Flexible Flashing Materials.

1.04 SUBMITTALS

A. See Section 01 40 00 - Quality Requirements for submittal procedures.

B. Product Data: Provide data on material characteristics, performance criteria, and limitations.

C. Shop Drawings: Provide drawings of special joint conditions.

D. Manufacturer's Installation Instructions: Indicate preparation, installation methods, and storage and handling criteria.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualification: Use evaluated materials from a single manufacturer regularly engaged in air barrier material manufacture, and use secondary materials approved in writing by primary material manufacturer.

B. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.

C. Manufacturer Inspection: Provide a field visit by manufacturer's representative after installation and before work is covered up.

1.06 FIELD CONDITIONS

A. Maintain temperature and humidity recommended by materials manufacturers before, during, and after installation.

PART 2 PRODUCTS

2.01 AIR BARRIER MATERIALS (AIR IMPERMEABLE AND WATER VAPOR PERMEABLE)

A. Air Barrier Sheet, Mechanically Fastened:
   1. Air Permeance: 0.004 cfm/sq ft, maximum, when tested in accordance with ASTM E2178.
   2. Water Vapor Permeance: 10 perms, minimum, when tested in accordance with ASTM E96/E96M using Procedure A - Desiccant Method, at 73.4 degrees F.
   3. Ultraviolet (UV) and Weathering Resistance: Approved by manufacturer for up to 90 days of weather exposure.
   4. Surface Burning Characteristics: Flame spread index of 25 or less, and smoke developed index of 50 or less, Class A, when tested in accordance with ASTM E84.
   5. Seam and Perimeter Tape: Polyethylene self-adhering type, mesh reinforced, 2-1/2 inches wide, compatible with sheet material; unless otherwise indicated.

6. Products:
    a. DuPont de Nemours, Inc; Tyvek CommercialWrap D with Tyvek Fluid Applied Flashing - Brush Formulation, Tyvek Fluid Applied Flashing and Joint Compound, FlexWrap NF, StraightFlash, StraightFlash VF, Tyvek Wrap Caps, and Tyvek Tape: building.dupont.com/#sle.
    b. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 ACCESSORIES

A. Sealants, Tapes, and Accessories for Sealing Air Barrier and Adjacent Substrates: As indicated or in compliance with air barrier manufacturer's installation instructions.

B. Flexible Flashing: Self-adhering or mechanically-attached flashing used for wall penetrations in accordance with ICC-ES AC148 requirements.

C. Liquid Flashing: One part, fast curing, nonsag, gun grade, trowelable.
    1. Products:
        a. Dow; DOWSIL 778 Silicone Liquid Flashing: www.dow.com/en-us/#sle.
        b. Dow; DOWSIL 791 Silicone Weatherproofing Sealant: www.dow.com/en-us/#sle.
        c. Sika Corporation; Parex WeatherFlash: www.parex.com/#sle.
        d. Substitutions: See Section 01 60 00 - Product Requirements.

D. Thinners and Cleaners: As recommended by material manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces and conditions are ready for work of this section.

B. Where existing conditions are responsibility of another installer, notify Architect of unsatisfactory conditions.

C. Do not proceed with this work until unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Remove projections, protruding fasteners, and loose or foreign matter that might interfere with proper installation.

B. Clean and prime substrate surfaces to receive adhesives and sealants in accordance with manufacturer's installation instructions.

3.03 INSTALLATION

A. Install materials in accordance with manufacturer's installation instructions.

B. Air Barriers: Install continuous airtight barrier over surfaces indicated, with sealed seams and with sealed joints to adjacent surfaces.

C. Apply sealants and adhesives within recommended temperature range in accordance with manufacturer's installation instructions.

D. Mechanically Fastened Sheets - On Exterior:
    1. Install sheets shingle fashion to shed water, with seams generally horizontal.
    2. Overlap seams as recommended by manufacturer, 6 inches, minimum.
    3. Overlap at outside and inside corners as recommended by manufacturer, 12 inches, minimum.
    4. For applications indicated to be airtight, seal seams, laps, penetrations, tears, and cuts with self-adhesive tape; use only large-headed, gasketed fasteners as recommended by manufacturer.
    5. Install air barrier underneath jamb flashings.
    6. At framed openings with frames having nailing flanges, extend sheet into opening and over flanges; at head of opening, seal sheet over flange and flashing.

E. Openings and Penetrations in Exterior Air Barriers:

1. Install flashing over sills, covering entire sill frame member, extending at least 5 inches onto air barrier and at least 6 inches up jambs; mechanically fasten stretched edges.
2. At openings with frames having nailing flanges, seal head and jamb flanges using a continuous bead of sealant compressed by flange and cover flanges with sealing tape at least 4 inches wide; do not seal sill flange.
3. At openings with nonflanged frames, seal air barrier to each side of framing at opening using flashing at least 9 inches wide, and covering entire depth of framing.
4. At head of openings, install flashing under air barrier extending at least 2 inches beyond face of jambs; seal air barrier to flashing.
5. At interior face of openings, seal gap between window/door frame and rough framing, using joint sealant over backer rod.
6. Service and Other Penetrations: Form flashing around penetrating item and seal to air barrier surface.

3.04 FIELD QUALITY CONTROL

A. See Section 01 40 01 - Quality Requirements for additional requirements.

B. Take digital photographs of each portion of installation prior to covering up air barriers.

3.05 PROTECTION

A. Do not leave materials exposed to weather longer than recommended by manufacturer.

END OF SECTION

SECTION 07 31 13
ASPHALT SHINGLES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Asphalt shingle roofing (ASR).

B. Flexible sheet membranes for eave protection, underlayment, and valley protection.

C. Flashing.

1.02 RELATED REQUIREMENTS

A. Section 07 62 00 - Sheet Metal Flashing and Trim

B. Section 07 92 00 - Joint Sealants.

1.03 REFERENCE STANDARDS

A. ASTM D226/D226M - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.

B. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.

C. ASTM D3462/D3462M - Standard Specification for Asphalt Shingles Made from Glass Felt and Surfaced with Mineral Granules.

D. ASTM D4586/D4586M - Standard Specification for Asphalt Roof Cement.

E. ASTM D4869/D4869M - Standard Specification for Asphalt-Saturated Organic Felt Underlayment Used in Steep Slope Roofing.

F. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials.

G. ASTM E108 - Standard Test Methods for Fire Tests of Roof Coverings.

H. ASTM F1667/F1667M - Standard Specification for Driven Fasteners: Nails, Spikes, and Staples.

I. ICC-ES AC188 - Acceptance Criteria for Roof Underlayments.

J. NRCA (RM) - The NRCA Roofing Manual.

1.04 SUBMITTALS

A. See Section 01 40 00 - Quality Requirements for submittal procedures.

B. Product Data: Provide data indicating material characteristics, performance criteria, and limitations.

C. Shop Drawings: For metal flashings, indicate specially configured metal flashings, jointing methods and locations, fastening methods and locations, and installation details.

D. Samples: Submit two samples of each shingle color indicating color range and finish texture/pattern.

E. Warranty Documentation: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements for additional provisions.
   2. Extra Shingles: 1 bundle (approximately 33 sq ft) of each type and color

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacture of roofing systems similar to those required for this project, with not less than 5 years of documented experience.

B. Installer Qualifications: Company specializing in installing asphalt shingles, with at least 3 years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. See Section 01 74 19 - Construction Waste Management and Disposal for packaging waste requirements.

B. Deliver and store materials with labels intact in manufacturer's unopened packaging until ready for installation.

C. Store materials under dry and waterproof cover, well ventilated, and elevated above grade on a flat surface.

D. Protect materials from harmful environmental elements, construction dust, direct sunlight, and other potentially detrimental conditions.

E. When storing roofing materials on roofing system ensure no damage occurs to supporting members and other materials.

1.07 FIELD CONDITIONS

A. Do not install shingles, shingles when surface temperatures are below 45 degrees F.

1.08 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

B. Provide 15 -year manufacturer's warranty for material defects and wind damage.

C. Installation: Warrant total roof system, including underlayments, flashings, and other roof components for two years against water penetration.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Asphalt Shingles:
   1. Atlas Roofing Corporation: www.atlasroofing.com/#sle.
   2. CertainTeed: www.certainteed.com/#sle.
   3. GAF: www.gaf.com/#sle.
   4. IKO Industries Inc: www.iko.com/#sle.
   5. Owens Corning Corporation: www.owenscorning.com/en-us/#sle.
   6. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 ASPHALT SHINGLES

A. Asphalt Shingles: Asphalt-coated glass felt, mineral granule surfaced, complying with ASTM D3462/D3462M.
   1. Fire Resistance: Class A, complying with ASTM E108.
   2. Warranted Wind Speed: Not greater than 190 mph.
   3. Self-sealing type with double row of adhesive; provide manufacturer's "Lifetime Limited" warranty.
   4. Style: Architectural Shake Look, to match existing.
   5. Color: As selected by Architect to match existing.

2.03 SHEET MATERIALS

A. Eave Protection and Underlayment: Self-adhering, rubber-modified asphalt sheet complying with ASTM D1970/D1970M; 45 mils, 0.045 inch total thickness; with strippable release film and woven polypropylene sheet top surface.
   1. Provide over entire roof surface.
   2. Minimum Requirements: Comply with ICC-ES AC188.
   3. Top Surface: Polyethylene film.
   4. Self Sealability: Passing nail sealability test specified in ASTM D1970/D1970M.

5. Low Temperature Flexibility: Passing test specified in ASTM D1970/D1970M.
6. Water Vapor Permeance: 0.05 perms, when tested in accordance with ASTM E96/E96M, Procedure A (desiccant method).
7. Tensile strength, membrane: 250 psi, minimum, when tested in accordance with ASTM D412 (Die C modified).
8. Elongation, membrane: 250%, minimum, when tested in accordance with ASTM D412 (Die C modified).
9. Performance: Meet or exceed requirements for ASTM D226/D226M, Type II asphalt-saturated organic felt.
10. Liquid Water Transmission: Passes ASTM D4869/D4869M.
11. Functional Temperature Range: From minus 70 degrees F to 212 degrees F.
12. Products:
    a. Carlisle Coatings and Waterproofing, Inc.; CCW-705 Air and Vapor Barrier Sheet: www.carlisleccw.com
    b. **BASIS OF DESIGN:** Grace Construction Products; Grace Ice & Water Shield
    c. Henry Company; Blueskin SA: www.henry.com
    d. Owens-Corning: WeatherLock Flex
    e. W.R. Meadows, Inc.; Air-Shield: www.wrmeadows.com/sle.
    f. Substitutions: See Section 01 60 00 - Product Requirements.

2.04 FLASHING

A. Metal Flashing: Prefinished galvanized steel; see Section 07 62 00.
   1. Provide sheet metal eave edge, gable edge, ridge, ridge vents, and other flashing as indicated.
      a. Form flashings to profiles indicated on drawings.
      b. Form sections square and accurate to profile, in maximum possible lengths, free from distortion or defects detrimental to appearance or performance.
      c. Hem exposed edges of flashings minimum 1/4 inch on underside.
   2. Coat concealed surfaces of flashings with bituminous paint.

B. Flexible Flashing: Self-adhering polymer-modified asphalt sheet complying with ASTM D1970/D1970M; 40-mil, 0.040-inch total thickness; with strippable treated release paper and polyethylene sheet top surface.

2.05 ACCESSORIES

A. Roofing Nails: Standard round wire shingle type, galvanized steel, stainless steel, aluminum roofing nails, or copper roofing nails, minimum 3/8-inch head diameter, 12-gauge, 0.109-inch nail shank diameter, 1-1/2 inches long and complying with ASTM F1667/F1667M.

B. Asphalt Roof Cement: ASTM D4586/D4586M, asbestos-free.

C. Bituminous Paint: Acid and alkali resistant type; black color.

D. Lap Cement: Fibrated cutback asphalt type, recommended for use in application of underlayment, free of toxic solvents.

E. Plastic Ridge Vents: Extruded plastic with vent openings do not permit direct water or weather entry; flanged to receive shingles.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions prior to starting this work.

B. Verify roof deck is of sufficient thickness to accept fasteners.

C. Verify roof penetrations and plumbing stacks are in place and flashed to deck surface.

D. Verify roof openings are correctly framed.

E. Verify deck surfaces are dry, free of ridges, warps, or voids.

3.02 PREPARATION

A. Seal roof deck joints wider than 1/16 inch as recommended by shingle manufacturer.

B. At areas where eave protection membrane is to be adhered to substrate, fill knot holes and surface cracks with latex filler.

C. Broom clean deck surfaces before installing underlayment or eave protection.

D. Protect surrounding areas and adjacent surfaces from damage during execution of this work.

E. Install eave edge flashings tight with fascia boards, weather lap joints 2 inches and seal with roof cement, and secure flange with nails spaced 6 inches on center.

3.03 INSTALLATION

A. Eave Protection Membrane:
   1. Utilize base layer of underlayment as eave protection.
   2. Install eave protection membrane from eave edge to minimum 48 inches up-slope beyond interior face of exterior wall.
   3. Install eave protection membrane in accordance with manufacturer's instructions and NRCA (RM) applicable requirements.

B. Underlayment:
   1. Install underlayment perpendicular to slope of roof, with ends and edges weather lapped minimum 4 inches; stagger end laps of each consecutive layer, nail in place, and weather lap minimum 4 inches over eave protection.
   2. Weather lap and seal watertight with plastic cement any items projecting through or mounted on roof.

C. Valley Protection:
   1. Install one ply of flexible flashing, minimum 36 inches wide, centered over valleys.
   2. Install flexible flashing in accordance with manufacturer's instructions and NRCA (RM) applicable requirements.
   3. Weather lap joints minimum 2 inches.
   4. Nail in place minimum 18 inches on center, 1 inch from edges.
   5. Install one layer of sheet metal flashing, minimum 24 inches wide, centered over open valley and crimped to guide water flow. Weather lap joints minimum 2-inch wide band of lap cement along each edge of first layer, press roll roofing into cement, and nail in place minimum 18 inches on center and 1 inch from edges.

D. Metal Flashing:
   1. Install flashings in accordance with manufacturer's instructions and NRCA (RM) applicable requirements.
   2. Weather lap joints minimum 2 inches and seal weather tight with plastic cement.
   3. Secure in place with nails at 4 inches on center, and conceal fastenings.
   4. Items Projecting Through or Mounted on Roofing: Flash and seal weather tight with plastic cement.

E. Shingles:
   1. Install shingles in accordance with manufacturer's instructions and NRCA (RM) applicable requirements.
      a. Fasten individual shingles using two nails per shingle, or as required by manufacturer and local building code, whichever is greater.
      b. Fasten strip shingles using four nails per strip, or as required by manufacturer and local building code, whichever is greater.
   2. Place shingles in straight coursing pattern with 5-inch weather exposure to produce double thickness over full roof area, and provide double course of shingles at eaves.
   3. Project first course of shingles 3/4 inch beyond fascia boards.

4. Extend shingles 1/2 inch beyond face of gable edge fascia boards.
5. Extend shingles on both slopes across valley in a weave pattern and fasten; extend shingles a minimum of 12 inches beyond valley center line to achieve woven valley, concealing valley protection.
6. Cap hips with individual shingles, maintaining 5-inch weather exposure, and place to avoid exposed nails.
7. After installation, place one daub of plastic cement 1-inch diameter under each individual shingle tab exposed to weather to prevent lifting.
8. Coordinate installation of roof mounted components or work projecting through roof with weathertight placement of counterflashings.
9. Complete installation to provide weathertight service.

3.04 CLEANING

A. See Section 01 70 00 - Execution and Closeout Requirements for additional requirements.

B. Clean exposed work upon completion of installation; remove grease and oil films, excess joint sealer, handling marks, and debris from installation, leaving work clean and unmarked, free from dents, creases, waves, scratch marks, or other damage to finish.

3.05 PROTECTION

A. Do not permit traffic over finished roof surface; protect roofing until completion of project.

B. Touch-up, repair, or replace damaged asphalt shingles or accessories before Date of Substantial Completion.

END OF SECTION

SECTION 07 42 13
METAL SOFFIT PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Manufactured metal panels for soffits, with related flashings and accessory components.

1.02 RELATED REQUIREMENTS

A. Section 07 92 00 - Joint Sealants: Sealing joints between metal wall panel system and adjacent construction.

1.03 REFERENCE STANDARDS

A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix).

1.04 SUBMITTALS

A. See Section 01 40 00 - Quality Requirements for submittal procedures.

B. Product Data - Wall System: Manufacturer's data sheets on each product to be used, including:
   1. Physical characteristics of components shown on shop drawings.

C. Shop Drawings: Indicate dimensions, layout, joints, construction details, and methods of anchorage.

D. Samples: Submit two samples of soffit panel, 6 inch by 6 inch in size illustrating finish color, sheen, and texture.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years of documented experience.

B. Installer Qualifications: Company specializing in installing products of the type specified in this section and approved by manufacture

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect panels from accelerated weathering by removing or venting sheet plastic shipping wrap.

B. Store prefinished material off the ground and protected from weather; prevent twisting, bending, or abrasion; provide ventilation; slope metal sheets to ensure proper drainage.

C. Prevent contact with materials that may cause discoloration or staining of products.

1.07 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

B. Finish Warranty: Provide 10-year manufacturer warranty against excessive degradation of exterior finish.

C. Correct defective work within a five year period after Date of Substantial Completion, including defects in water tightness and integrity of seals.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Provide Basis of Design manufacturer listed below, or a standard or custom product from one of the other listed manufacturers, approved prior to bid, with equivalent performance, material properties, features, general configuration, appearance, and warranty.

B. Metal Soffit Panels:
   1. **BASIS OF DESIGN:** Longboard Architectural Products.

2. **BASIS OF DESIGN:** Petersen Aluminum Corporation; PAC-750 Soffit: www.pac-clad.com/#sle.
3. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 METAL PANEL SYSTEM

A. Wall Panel System: Factory fabricated prefinished metal panel system, site assembled.
1. Provide soffit panels and subframing assembly (hat channels).
2. Design and size components to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of wall.
3. Design Pressure: In accordance with pressures indicated in Structural Notes.
4. Maximum Allowable Deflection of Panel: L/ 120 for length(L) of span.
5. Movement: Accommodate movement within system without damage to components or deterioration of seals, movement between system and perimeter components when subject to seasonal temperature cycling; dynamic loading and release of loads; and deflection of structural support framing.
6. Drainage: Provide positive drainage to exterior for moisture entering or condensation occurring within panel system.
7. Fabrication: Formed true to shape, accurate in size, square, and free from distortion or defects; pieces of longest practical lengths.
8. Corners: Factory-fabricated in one continuous piece with minimum 18 inch returns.

B. Metal Plank Soffit:
1. Profile: 6 inch V-groove plank; non-perforated.
2. Material: Powder coated extruded aluminum 6063 T5, 1/16 inch base material thickness.
3. Color: to be selected by Architect from manufacturer's full range of woodgrain finishes.

C. Soffit Panels:
1. Profile: Style as indicated.
2. Venting: Vented.
3. Material: Precoated aluminum sheet, 20 gage, 0.032 inch minimum thickness.
4. Panel Width: as indicated in drawings.
5. Color: As selected by Architect from manufacturer's full line.

D. Internal and External Corners: Same material, thickness, and finish as exterior sheets; profile to suit system; shop cut and factory mitered to required angles.

E. Trim, Closure Pieces, Caps, and Flashings: Same material, thickness and finish as exterior sheets; brake formed to required profiles.

F. Anchors: Stainless steel.

2.03 MATERIALS

A. Precoated Aluminum Sheet: ASTM B209 (ASTM B209M), 3003-H14 alloy smooth surface texture; continuous-coil-coated on exposed surfaces with specified finish coating and on panel back with specified panel back coating.

B. Select materials with surface flatness, smoothness, and lack of surface blemishes where exposed to view in finished system.

2.04 FINISHES

A. Fluoropolymer Coil Coating System: Polyvinylidene fluoride (PVDF) multi-coat superior performing organic coatings system complying with AAMA 2605, including at least 70 percent PVDF resin, and at least 80 percent of coil coated aluminum surfaces having minimum total dry film thickness (DFT) of 0.9 mil, 0.0009 inch; color as indicated above.

2.05 ACCESSORIES

A. Miscellaneous Framing Components, General: Behind single-skin cladding areas (over substrate or cladding support system)

1. Hat Channels: Extruded aluminum, mill finish, 2-3/4" wide x 1-1/2" tall, unless otherwise indicated.

B. General: Provide complete metal wall panel assembly incorporating trim, copings, fascia, parapet caps, sills, inside and outside corners, and miscellaneous flashings. Fabricate accessories in accordance with SMACNA Manual. Provide manufacturer's factory-formed clips, shims, flashings, gaskets, lap strips, closure strips, and caps for a complete installation.

C. Sealants: Manufacturer's standard type suitable for use with installation of system; non-staining; color as selected.
1. Concealed Sealants: Non-curing butyl sealant or tape sealant, see Section 07 92 00
2. Exposed Sealant: Elastomeric; silicone, polyurethane, or silyl-terminated polyether/polyurethane, see Section 07 92 00.
3. Seam Sealant: Factory-applied, non-skinning, non-drying type.

D. Fasteners: Manufacturer's standard type to suit application; stainless steel. Exposed fasteners same finish as panel system.
1. Metal-to-Metal Fasteners: Self-drilling, self-tapping screws.

E. Field Touch-up Paint: As recommended by panel manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that support framing members and substrates are ready to receive panels.

3.02 INSTALLATION

A. Overall: Install system in accordance with approved shop drawings and panel manufacturer's instructions and recommendations, as applicable to specific project conditions. Anchor all components of roofing system securely in place while allowing for thermal and structural movement.
1. Minimize field cutting of panels. Where field cutting is absolutely required, use methods that will not distort panel profiles. Use of torches for field cutting is absolutely prohibited.

B. Install panels on soffits in accordance with manufacturer's instructions.

C. Provide 3/8" minimum joints between metal panels and adjacent materials.

D. Separate dissimilar metals; use gasket fasteners, isolation shims, or isolation tape where needed to eliminate possibility of electrolytic action between metals.

E. Fasten panels to structural supports; aligned, level, and plumb.

F. Locate joints over supports.

G. Lap panel ends 2 inches, minimum.

H. Provide expansion joints where indicated.

3.03 TOLERANCES

A. Offset From True Alignment Between Adjacent Members Abutting or In Line: 1/16 inch, maximum.

B. Variation from Plane or Location As Indicated on Drawings: 1/4 inch, maximum.

3.04 CLEANING

A. See Section 01 70 00 - Execution and Closeout Requirements for additional requirements.

B. Remove site cuttings from finish surfaces.

C. Remove protective material from wall panel surfaces.

D. Clean and wash prefinished surfaces with mild soap and water; rinse with clean water.

3.05 PROTECTION

A. Protect metal wall panels until completion of project.

B. Touch-up, repair, or replace damaged wall panels or accessories before Date of Substantial Completion.

C. Do not permit storage of materials or roof traffic on installed roof panels. Provide temporary walkways or planks as necessary to avoid damage to completed work. Protect roofing until completion of project.

D. Replace damaged panels or accessories before Date of Substantial Completion.

END OF SECTION

SECTION 07 42 13
METAL WALL AND SOFFIT PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Manufactured metal panels for walls and soffits, with related flashings and accessory components.

1.02 RELATED REQUIREMENTS

A. Section 05 12 00 - Steel Framing: Support structure.

B. Section 07 92 00 - Joint Sealants: Sealing joints between metal wall panel system and adjacent construction.

1.03 REFERENCE STANDARDS

A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix).

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data - Wall System: Manufacturer's data sheets on each product to be used, including:
   1. Physical characteristics of components shown on shop drawings.

C. Shop Drawings: Indicate dimensions, layout, joints, construction details, and methods of anchorage.

D. Samples: Submit two samples of wall panel, 12 inch by 12 inch in size illustrating finish color, sheen, and texture.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years of documented experience.

B. Installer Qualifications: Company specializing in installing products of the type specified in this section and approved by manufacture

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect panels from accelerated weathering by removing or venting sheet plastic shipping wrap.

B. Store prefinished material off the ground and protected from weather; prevent twisting, bending, or abrasion; provide ventilation; slope metal sheets to ensure proper drainage.

C. Prevent contact with materials that may cause discoloration or staining of products.

1.07 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

B. Finish Warranty: Provide 10-year manufacturer warranty against excessive degradation of exterior finish.

C. Correct defective work within a five year period after Date of Substantial Completion, including defects in water tightness and integrity of seals.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Provide Basis of Design manufacturer listed below, or a standard or custom product from one of the other listed manufacturers, approved prior to bid, with equivalent performance, material properties, features, general configuration, appearance, and warranty.

B. Metal Wall Panels - Concealed Fasteners:
   1. ATAS International, Inc: www.atas.com/#sle.
   2. Berridge Manufacturing Company: www.berridge.com/#sle.
   3. Centria: www.centria.com/#sle.
   4. Drexel Metals Inc: www.drexmet.com/#sle.
   5. Elevate: www.holcimelevate.com/#sle.
   6. Fabral: www.fabral.com/#sle.
   7. **BASIS OF DESIGN:** Longboard Architectural Products.
   8. Morin Corporation; Integrity Series Profile: S-16: www.morincorp.com/#sle.
   9. Petersen Aluminum Corporation: www.pac-clad.com/#sle.
   10. Substitutions: See Section 01 60 00 - Product Requirements.

C. Metal Soffit Panels:
   1. ATAS International, Inc: www.atas.com/#sle.
   2. Berridge Manufacturing Company: www.berridge.com/#sle.
   3. Centria; www.centriaperformance.com
   4. Elevate: www.firestonebpco.com
   5. Fabral: www.fabral.com/#sle.
   6. **BASIS OF DESIGN:** Longboard Architectural Products.
   7. Morin Corporation; Primo Soffit: www.morincorp.com/#sle.
   8. Petersen Aluminum Corporation: www.pac-clad.com/#sle.
   9. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 METAL PANEL SYSTEM

A. Wall Panel System: Factory fabricated prefinished metal panel system, site assembled.
   1. Provide exterior panels and subframing assembly (hat channels).
   2. Design and size components to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of wall.
   3. Design Pressure: In accordance with pressures indicated in Structural Notes.
   4. Maximum Allowable Deflection of Panel: L/ 120 for length(L) of span.
   5. Movement: Accommodate movement within system without damage to components or deterioration of seals, movement between system and perimeter components when subject to seasonal temperature cycling; dynamic loading and release of loads; and deflection of structural support framing.
   6. Drainage: Provide positive drainage to exterior for moisture entering or condensation occurring within panel system.
   7. Fabrication: Formed true to shape, accurate in size, square, and free from distortion or defects; pieces of longest practical lengths.
   8. Corners: Factory-fabricated in one continuous piece with minimum 18 inch returns.

B. Exterior Wall Panels:
   1. Profile: Horizontal; _____.
   2. Seams: Lapped side joints, sealed with continuous bead of sealant.
   3. Material: Precoated aluminum sheet, ___ gage, ___ inch minimum thickness.
   4. Panel Width: ____ inches.
   5. Panel Depth: _____ inches
   6. Color: _____.

C. Soffit Panels:
   1. Profile: Style as indicated.
   2. Venting: Vented.
   3. Material: Precoated aluminum sheet, 20 gage, 0.032 inch minimum thickness.
   4. Panel Width: as indicated in drawings.

5. Color: As selected by Architect from manufacturer's full line.

D. Internal and External Corners: Same material, thickness, and finish as exterior sheets; profile to suit system; shop cut and factory mitered to required angles.

E. Trim, Closure Pieces, Caps, and Flashings: Same material, thickness and finish as exterior sheets; brake formed to required profiles.

F. Anchors: Stainless steel.

2.03 MATERIALS

A. Precoated Aluminum Sheet: ASTM B209 (ASTM B209M), 3003-H14 alloy smooth surface texture; continuous-coil-coated on exposed surfaces with specified finish coating and on panel back with specified panel back coating.

B. Select materials with surface flatness, smoothness, and lack of surface blemishes where exposed to view in finished system.

2.04 FINISHES

A. Fluoropolymer Coil Coating System: Polyvinylidene fluoride (PVDF) multi-coat superior performing organic coatings system complying with AAMA 2605, including at least 70 percent PVDF resin, and at least 80 percent of coil coated aluminum surfaces having minimum total dry film thickness (DFT) of 0.9 mil, 0.0009 inch; color as indicated above.

2.05 ACCESSORIES

A. Miscellaneous Framing Components, General: Behind single-skin cladding areas (over substrate or cladding support system)
   1. Hat Channels: Extruded aluminum, mill finish, 2-3/4" wide x 1-1/2" tall, unless otherwise indicated.

B. General: Provide complete metal wall panel assembly incorporating trim, copings, fascia, parapet caps, sills, inside and outside corners, and miscellaneous flashings. Fabricate accessories in accordance with SMACNA Manual. Provide manufacturer's factory-formed clips, shims, flashings, gaskets, lap strips, closure strips, and caps for a complete installation.

C. Sealants: Manufacturer's standard type suitable for use with installation of system; non-staining; color as selected.
   1. Concealed Sealants: Non-curing butyl sealant or tape sealant, see Section 07 92 00
   2. Exposed Sealant: Elastomeric; silicone, polyurethane, or silyl-terminated polyether/polyurethane, see Section 07 92 00.
   3. Seam Sealant: Factory-applied, non-skinning, non-drying type.

D. Fasteners: Manufacturer's standard type to suit application; stainless steel. Exposed fasteners same finish as panel system.
   1. Metal-to-Metal Fasteners: Self-drilling, self-tapping screws.

E. Field Touch-up Paint: As recommended by panel manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that support framing members and substrates are ready to receive panels.

3.02 INSTALLATION

A. Overall: Install system in accordance with approved shop drawings and panel manufacturer's instructions and recommendations, as applicable to specific project conditions. Anchor all components of roofing system securely in place while allowing for thermal and structural movement.
   1. Minimize field cutting of panels. Where field cutting is absolutely required, use methods that will not distort panel profiles. Use of torches for field cutting is absolutely prohibited.

B. Install panels on walls in accordance with manufacturer's instructions.

C. Provide 3/8" minimum joints between metal panels and adjacent materials.

D. Separate dissimilar metals; use gasket fasteners, isolation shims, or isolation tape where needed to eliminate possibility of electrolytic action between metals.

E. Fasten panels to structural supports; aligned, level, and plumb.

F. Locate joints over supports.

G. Lap panel ends 2 inches, minimum.

H. Provide expansion joints where indicated.

3.03 TOLERANCES

A. Offset From True Alignment Between Adjacent Members Abutting or In Line: 1/16 inch, maximum.

B. Variation from Plane or Location As Indicated on Drawings: 1/4 inch, maximum.

3.04 CLEANING

A. See Section 01 70 00 - Execution and Closeout Requirements for additional requirements.

B. Remove site cuttings from finish surfaces.

C. Remove protective material from wall panel surfaces.

D. Clean and wash prefinished surfaces with mild soap and water; rinse with clean water.

3.05 PROTECTION

A. Protect metal wall panels until completion of project.

B. Touch-up, repair, or replace damaged wall panels or accessories before Date of Substantial Completion.

C. Do not permit storage of materials or roof traffic on installed roof panels. Provide temporary walkways or planks as necessary to avoid damage to completed work. Protect roofing until completion of project.

D. Replace damaged panels or accessories before Date of Substantial Completion.

END OF SECTION

SECTION 07 46 46
FIBER-CEMENT SIDING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fiber-cement siding and trim (FCT-#).

B. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 06 16 00 - Sheathing: Siding substrate.

B. Section 07 21 00 - Thermal Insulation: Coordination.

C. Section 07 27 00 - Air Barriers: Water-resistive barrier under siding.

D. Section 07 62 00 - Sheet Metal Flashing and Trim

E. Section 07 92 00 - Joint Sealants: Sealing joints between siding and adjacent construction and fixtures.

1.03 REFERENCE STANDARDS

A. ASTM C1186 - Standard Specification for Flat Fiber-Cement Sheets.

1.04 SUBMITTALS

A. See Section 01 40 00 - Quality Requirements for submittal procedures.

B. Product Data: Submit manufacturer's data sheets on each product to be used.

C. Shop Drawings: Indicate plans, sections, dimensions, layout, joints, construction details, support clips, edge/termination conditions/treatments, control joints, corners, openings/penetrations, and methods of anchorage.

D. Maintenance Instructions: Periodic inspection recommendations and maintenance procedures.

E. Warranty: Submit copy of manufacturer’s warranty, made out in Owner’s name, showing that it has been registered with manufacturer.

F. Verification Samples: Submit two sample assemblies 12 x 12 inch (300 x 300 mm) minimum in size, attached to supporting structure, illustrating selected color surface texture and fastener type and installation.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than ten years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified in this section with minimum 3 years of experience, and approved by the manufacturer.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store materials in manufacturer's unopened packaging, with labels intact, until ready for installation.

B. Store materials under dry and waterproof cover, well ventilated, and elevated above grade on a flat surface.

C. Protect materials from harmful environmental elements, construction dust, and other potentially detrimental conditions.

D. If panels are exposed to water or water vapor prior to installation, allow to completely dry before installing. Failure to do so may result in panel shrinkage at ship lap joints, and such action may void warranty.

E. Panels MUST be carried on edge. Do not carry or lift panels flat. Improper handling may cause cracking or panel damage.

F. Direct contact between the panels and the ground should be avoided at all times. It is necessary to keep panels clean during installation process.

1.07 FIELD CONDITIONS

A. Do not install panels when air temperature or relative humidity are outside manufacturer's limits.

1.08 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

B. Provide manufacturer’s 15-year warranty for defects in fiber cement panels.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Panel Siding Manufacturers:
   1. Allura, a division of Plycem USA, Inc: www.allurausa.com.
   2. James Hardie Building Products, Inc: www.jameshardie.com.
   3. Nichiha USA, Inc: www.nichiha.com.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 FIBER-CEMENT SIDING

A. Lap Siding: Individual horizontal boards made of cement and cellulose fiber formed under high pressure with integral surface texture, complying with ASTM C1186, Type A, Grade II; with machined edges, for nail attachment.
   1. Style: Standard lap style.
   2. Texture: Smooth.
   3. Length: 12 feet, nominal.
   4. Exposure: 7 inches to match existing.
   5. Thickness: 5/16 inch, nominal.
   6. Finish: Unfinished.
   7. Warranty: 50 year limited; transferable.

B. Panel Siding: Horizontally-oriented panels made of cement and cellulose fiber formed under high pressure with integral surface texture, complying with ASTM C1186, Type A, Grade II; with machined edges, for nail attachment.

C. Trim : Panels made of cement and cellulose fiber formed under high pressure with integral surface texture, complying with ASTM C1186, Type A, Grade II; with machined edges, for nail attachment..
   1. Texture: Smooth.
   2. Thickness: 3/4 inch.
   3. Finish: Factory applied primer.
   4. Products: by same manufacturer as siding.

2.03 ACCESSORIES

A. Concealed Sealants: Non-curing butyl sealant or tape sealant.
   1. Product: As recommended by manufacturer, or as indicated in Section 07 92 00.

B. Exposed Sealant: Silicone, polyurethane, or silyl-terminated polyether/polyurethane.
   1. Product: As recommended by manufacturer, or as indicated in Section 07 92 00.

C. Metal Trim: Extruded aluminum alloy 6063-T5 temper.
   1. Finish: as indicated in drawings.
   2. Outside Corner Trim:
      a. Type: As indicated on drawings.
      b. Products:
         1) Fry Reglet; OC20 Integral Outside Corner Lap.

2) Substitutions: See Section 01 60 00 - Product Requirements.

D. Fasteners: Galvanized or corrosion resistant; length as required to penetrate, 1-1/4 inches, minimum.

E. Shims (if required by support system): 50 year durable material compatible with clips.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrate, clean and repair as required to eliminate conditions that would be detrimental to proper installation.

B. Verify that water-resistant barrier has been installed over substrate completely and correctly; see Section 072700 07 27 00.

C. Do not begin until unacceptable conditions have been corrected.

D. If substrate preparation is responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Protect surrounding areas and adjacent surfaces during execution of this work.

B. Install Sheet Metal Flashing:
   1. Above horizontal trim in field of siding.

3.03 INSTALLATION

A. Install siding in accordance with manufacturer's instructions and recommendations.
   1. Read warranty and comply with terms necessary to maintain warranty coverage.
   2. Use trim details as indicated on drawings.
   3. Touch up field cut edges before installing.
   4. Pre-drill nail holes if necessary to prevent breakage.

B. Over Wood and Wood-Composite Sheathing: Fasten siding through sheathing into studs.

C. Over Steel Studs: Use hot-dipped galvanized self-tapping screws, with the points of at least three screws penetrating each stud the panel crosses and at panel ends.

D. Allow space for thermal movement between both ends of siding panels that butt against trim; seal joint between panel and trim with specified sealant.

E. Install vertical control/expansion joints per manufacturer's recommendations.

F. Joints in Horizontal Siding: Avoid joints in lap siding except at corners; where joints are inevitable stagger joints between successive courses.

G. Do not install siding less than 6 inches from paved surface, not less than 6 inches from the ground nor closer than 1 inch to roofs, patios, porches, and other surfaces where water may collect.

H. Cutting:
   1. Always cut fiber cement panels outside or in a well ventilated area. Do not cut the products in an enclosed area.
   2. Use a dust-reducing circular saw with a diamond-tipped or carbide-tipped blade.

I. After installation, seal joints except lap joints of lap siding; seal around penetrations, and paint exposed cut edges.

3.04 CLEANING

A. See Section 01 70 00 - Execution and Closeout Requirements for additional requirements.

B. Clean faced panels in accordance with manufacturer’s maintenance instructions, using cleaning materials and methods acceptable to manufacturer.

3.05 PROTECTION

A. Protect installed products until Date of Substantial Completion.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 07 62 00
SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fabricated sheet metal items, including flashings, counterflashings, gutters, downspouts, and fascia.

B. Sealants for joints within sheet metal fabrications.

1.02 RELATED REQUIREMENTS

A. Section 07 92 00 - Joint Sealants: Sealing non-lap joints between sheet metal fabrications and adjacent construction.

1.03 REFERENCE STANDARDS

A. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix).

B. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix).

C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

D. ASTM A666/A666M - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.

E. ASTM A755/A755M - Standard Specification for Steel Sheet, Metallic Coated by the Hot-Dip Process and Prepainted by the Coil-Coating Process for Exterior Exposed Building Products.

F. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

G. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

H. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric).

I. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.

J. ASTM D2244 - Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates.

K. ASTM D226/D226M - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.

L. ASTM D4214 - Standard Test Methods for Evaluating the Degree of Chalking of Exterior Paint Films.

M. ASTM D523 - Standard Test Method for Specular Gloss.

N. SMACNA (ASMM) - Architectural Sheet Metal Manual.

1.04 SUBMITTALS

A. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.

B. Samples: Submit two samples 3 by 4 inch in size illustrating metal finish color.

1.05 QUALITY ASSURANCE

A. Perform work in accordance with SMACNA (ASMM) requirements and standard details, except as otherwise indicated.

B. Fabricate and install roof edge profiles to comply with ANSI/SPRI/FM 4435/ES-1 Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems.

C. Fabricator and Installer Qualifications: Company specializing in sheet metal work.

D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces

1.06 DELIVERY, STORAGE, AND HANDLING

A. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.

B. Prevent contact with materials that could cause discoloration or staining.

1.07 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Finish Warranty: Provide manufacturer's written warranty stating that the finish will perform as follows for minimum of 20 years:

1. Chalking: No more than that represented by a No. 8 rating based on ASTM D4214.
2. Color Retention: No fading or color change in excess of 5 Hunter color difference units, calculated in accordance with ASTM D2244.
3. Gloss Retention: Minimum of 30 percent gloss retention, when tested in accordance with ASTM D523.

PART 2 PRODUCTS

2.01 SHEET MATERIALS

A. Galvanized Steel: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 24-gauge, 0.0239-inch thick base metal.

B. Pre-Finished Aluminum: ASTM B209/B209M, 3005 alloy, H12 or H14 temper; 18 gauge, 0.040 inch thick; plain finish shop pre-coated with silicone modified polyester coating.

C. Stainless Steel: ASTM A666/A666M, Type 304 alloy, soft temper, 28 gauge, 0.0156 inch thick; smooth No. 4 - Brushed finish.

2.02 PREFINISHED ALUMINUM SHEETS

A. Description: Factory-applied topcoat systems applied to aluminum flat sheet substrates prior to fabrication by coil coating; topcoat systems consist of primers and organic topcoats on exposed side and backing coats on unexposed side.

B. Aluminum Sheet Substrates: ASTM B209/B209M, alloy and temper as recommended by manufacturer for application.

C. High-Performance Organic Coating System: Comply with AAMA 2604 for aluminum preparation, pretreatment, primer and finish coat system; provide thermally cured, 50-percent PVDF or silicone-modified polyester systems; tested for weathering for 5 years with 5 delta units color change maximum.

2.03 PREPAINTED, METALLIC-COATED STEEL SHEETS

A. Description: Factory-applied coatings applied to metallic-coated steel sheet substrates prior to fabrication by coil coating; topcoat systems consist of primers and organic topcoats on exposed, top side of sheet; washcoats on bottom, unexposed sheet side.

B. Comply with ASTM A755/A755M.

C. Metallic-Coated Steel Sheet Substrates:

D. Substrate Preparation for Prefinishing: Clean and prepare substrate surfaces in accordance with coating manufacturer's recommendations for substrate type and application.

E. Washcoats or Backercoats: Provide washcoats or backercoats in accordance with organic coating manufacturer's recommendations.

F. Primer Coats: Provide basecoat primers in accordance with coating manufacturer's recommendations for substrate type, topcoat, and application.

G. Superior Performance Organic Coating System: Provide thermally cured 70-percent PVDF or FEVE fluoropolymer systems in accordance with AAMA 2605, tested for weathering for 10 years with 5 delta units maximum of color change.

2.04 FABRICATION

A. Form sections true to shape, accurate in size, square, and free from distortion or defects.
   1. Provide custom profiles where indicated.

B. Form pieces in longest possible lengths.

C. Hem exposed edges on underside 1/2 inch; miter and seam corners.

D. Form material with batten seams, except where otherwise indicated; at moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.

E. Fabricate corners from one piece with minimum 18-inch long legs; seam for rigidity, seal with sealant.

F. Fabricate vertical faces with bottom edge formed outward 1/4 inch and hemmed to form drip.

G. Fabricate roof edge copings and flashings to comply with ANSI/SPRI/FM 4435/ES-1 Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems.

2.05 GUTTERS AND DOWNSPOUTS

A. Gutters: SMACNA (ASMM) Rectangular profile, 6 x 6 inches, unless otherwise indicated.

B. Downspouts: Rectangular profile, 4 x 4 inches, unless otherwise indicated.

C. Accessories: Profiled to suit gutters and downspouts.
   1. Anchorage Devices: In accordance with SMACNA (ASMM) requirements.
   2. Gutter Supports: Brackets.
   3. Downspout Supports: Brackets.

D. Splash Pads: none, walkway pad material, as specified in Section 07 54 00 - Thermoplastic Membrane Roofing.

E. Downspout Boots: Steel.

F. Downspout Extenders: Same material and finish as downspouts.

G. Seal metal joints.

2.06 ACCESSORIES

A. General: Provide materials and types of fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation.

B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolt, and other suitable fasteners designed to withstand design loads.
   1. Exposed Fasteners: Heads matching color of sheet metal by means of plastic caps or factory-applied coating.
   2. Fasteners for Flashing and Trim: Blind fasteners or self-drilling screws, gasketed with hex washer heads.
   3. Blind Fasteners: High-strength aluminum or stainless-steel rivets.
   4. Use fasteners of sizes that will penetrate substrate not les than 1-1/4 inches for nails and not less than 3/4 inch for wood screws. Use stainless steel fasteners.
   5. Neoprene washers

C. Underlayment: ASTM D226/D226M, organic roofing felt, Type I, No. 15.

D. Primer Type: Zinc chromate.

E. Protective Backing Paint: Zinc molybdate alkyd, 15 mils DFT minimum.

F. Concealed Sealants: Non-curing butyl sealant.

G. Exposed Sealants: ASTM C920; elastomeric sealant, with minimum movement capability as recommended by manufacturer for substrates to be sealed; color to match adjacent material.

H. Reglets: Surface mounted type, galvanized steel.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.

B. Verify roofing termination and base flashings are in place, sealed, and secure.

3.02 PREPARATION

A. Install starter and edge strips, and cleats before starting installation.

B. Install surface mounted reglets true to lines and levels, and seal top of reglets with sealant.

C. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil, 0.015 inch.

3.03 INSTALLATION

A. Insert flashings into reglets to form tight fit; secure in place with plastic wedges; seal flashings into reglets with sealant.

B. Secure flashings in place using concealed fasteners, and use exposed fasteners only where permitted.

C. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.

D. Apply plastic cement compound between metal flashings and felt flashings.

E. Fit flashings tight in place; make corners square, surfaces true and straight in planes, and lines accurate to profiles.

F. Seal metal joints watertight.

G. Secure gutters and downspouts in place withcolor-matched brackets and stainless steel concealed fasteners, with soft neoprene washers.

H. Join guttter sections with joints sealed with sealant. Provide for thermal expansion. Attach gutters at eave or fascia to firmly anchor them in position. Provide end closures and seal watertight with sealant.

I. Slope gutters 1/8 inch per 10 feet, minimum.

J. Join downspouts sections with 1-1/2-inch telescoping joints.

3.04 SCHEDULE

A. Sill and Ledge Flashings: prefinished aluminum.

B. Flashings and Counterflashings at aluminum-framed openings: prefinished aluminum.

C. Counterflashings at Roofing Terminations (over roofing base flashings): prefinished galvanized steel.

D. Counterflashings at Curb-Mounted Roof Items: pre-finished galvanized steel.

E. Roofing Penetration Flashings, for Pipes, Structural Steel, and Equipment Supports: Stainless Steel: 0.0187 inch thick.

F. Roof-Drain Flashing: Stainless Steel: 0.0156 inch, unless heavier gauge is required for roofing warranty.

END OF SECTION

SECTION 07 92 00
JOINT SEALANTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Nonsag gunnable joint sealants.

B. Self-leveling pourable joint sealants.

C. Joint backings and accessories.

1.02 REFERENCE STANDARDS

A. ASTM C661 - Standard Test Method for Indentation Hardness of Elastomeric-Type Sealants by Means of a Durometer.

B. ASTM C794 - Standard Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants.

C. ASTM C834 - Standard Specification for Latex Sealants.

D. ASTM C881/C881M - Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete.

E. ASTM C919 - Standard Practice for Use of Sealants in Acoustical Applications.

F. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.

G. ASTM C1087 - Standard Test Method for Determining Compatibility of Liquid-Applied Sealants with Accessories Used in Structural Glazing Systems.

H. ASTM C1193 - Standard Guide for Use of Joint Sealants.

I. ASTM C1248 - Standard Test Method for Staining of Porous Substrate by Joint Sealants.

J. ASTM C1521 - Standard Practice for Evaluating Adhesion of Installed Weatherproofing Sealant Joints.

K. ASTM D2240 - Standard Test Method for Rubber Property--Durometer Hardness.

L. SCAQMD 1168 - Adhesive and Sealant Applications.

1.03 SUBMITTALS

A. See Section 01 40 00 - Quality Requirements for submittal procedures.

B. Product Data: Submit manufacturer's technical datasheets for each product to be used; include the following:
   1. Physical characteristics, including movement capability, VOC content, hardness, cure time, and color availability.
   2. List of backing materials approved for use with the specific product.
   3. Backing material recommended by sealant manufacturer.
   4. Substrates that product is known to satisfactorily adhere to and with which it is compatible.
   5. Substrates the product should not be used on.

C. Product Data for Accessory Products: Submit manufacturer's technical data sheet for each product to be used, including physical characteristics, installation instructions, and recommended tools.

D. Color Cards for Selection: Where sealant color is not specified, submit manufacturer's color cards showing standard colors available for selection.

E. Preconstruction Laboratory Test Reports: Submit at least four weeks prior to start of installation.

F. Preinstallation Field Adhesion Test Plan: Submit at least two weeks prior to start of installation.

G. Field Quality Control Plan: Submit at least two weeks prior to start of installation.

H. Preinstallation Field Adhesion Test Reports: Submit filled out Preinstallation Field Adhesion Test Reports log within 10 days after completion of tests; include bagged test samples and photographic records.

I. Field Quality Control Log: Submit filled-out log for each length or instance of sealant installed, within 10 days after completion of inspections/tests; include bagged test samples and photographic records, if any.

J. Executed warranty.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

B. Installer Qualifications: Company specializing in performing the work of this section and with at least three years of documented experience.

C. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

D. Preconstruction Laboratory Testing: Arrange for sealant manufacturer(s) to test each combination of sealant, substrate, backing, and accessories.
   1. Adhesion Testing: In accordance with ASTM C794.
   2. Compatibility Testing: In accordance with ASTM C1087.
   3. Allow sufficient time for testing to avoid delaying the work.
   4. Deliver sufficient samples to manufacturer for testing.
   5. Report manufacturer's recommended corrective measures, if any, including primers or techniques not indicated in product data submittals.

E. Preinstallation Field Adhesion Test Plan: Include destructive field adhesion testing of one sample of each combination of sealant type and substrate, except interior acrylic latex sealants, and include the following for each tested sample.
   1. Identification of testing agency.
   2. Preinstallation Field Adhesion Test Log Form: Include the following data fields, with known information filled out.
      a. Test date.
      b. Copy of test method documents.
      c. Age of sealant upon date of testing.
      d. Test results, modeled after the sample form in the test method document.
      e. Indicate use of photographic record of test.

F. Field Quality Control Plan:
   1. Field testing agency's qualifications.
   2. Field Quality Control Log Form: Show same data fields as on Preinstallation Field Adhesion Test Log, with known information filled out and lines for multiple tests per sealant/substrate combinations; include visual inspection and specified field testing; allow for possibility that more tests than minimum specified may be necessary.

G. Field Adhesion Test Procedures:
   1. Allow sealants to fully cure as recommended by manufacturer before testing.
   2. Have a copy of the test method document available during tests.
   3. Record the type of failure that occurred, other information required by test method, and the information required on the Field Quality Control Log.
   4. When performing destructive tests, also inspect the opened joint for proper installation characteristics recommended by manufacturer, and report any deficiencies.
   5. Deliver the samples removed during destructive tests in separate sealed plastic bags, identified with project, location, test date, and test results, to Owner.
   6. If any combination of sealant type and substrate does not show evidence of minimum adhesion or shows cohesion failure before minimum adhesion, report results to Architect.

H. Destructive Field Adhesion Test: Test for adhesion in accordance with ASTM C1521, using Destructive Tail Procedure.
   1. Sample: At least 18 inches long.
   2. Minimum Elongation Without Adhesive Failure: Consider the tail at rest, not under any elongation stress; multiply the stated movement capability of the sealant in percent by two; then multiply 1 inch by that percentage; if adhesion failure occurs before the 1-inch mark is that distance from the substrate, the test has failed.
   3. If either adhesive or cohesive failure occurs before minimum elongation, take necessary measures to correct conditions and retest; record each modification to products or installation procedures.

1.05 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty: Provide 5-year manufacturer warranty for installed sealants and accessories that fail to achieve a watertight seal, exhibit loss of adhesion or cohesion, or do not cure. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.01 JOINT SEALANTS - GENERAL

A. Sealants and Primers: Provide products having lower volatile organic compound (VOC) content than indicated in SCAQMD 1168.

2.02 NONSAG JOINT SEALANTS

A. General Purpose Exterior Sealant - Nonstaining Silicone Sealant: ASTM C920, Grade NS, Uses M, A, G, and O; not expected to withstand continuous water immersion or traffic.
   1. Movement Capability: Plus 100 percent and minus 50 percent, minimum.
   2. Nonstaining to Porous Stone: Nonstaining to light-colored natural stone when tested in accordance with ASTM C1248.
   3. Dirt Pick-Up: Reduced dirt pick-up compared to other silicone sealants.
   4. Hardness Range: 15 to 35, Shore A, when tested in accordance with ASTM C661.
   5. Color: To be selected by Architect from manufacturer's standard range.
   6. Cure Type: Single-component, neutral moisture curing.
   7. Applications:
      a. Wall expansion and contraction joints.
      b. Joints between door, window and other frames and adjacent construction.
      c. Joints between different exposed materials.
      d. Openings below ledge angles in masonry.
      e. Control, expansion, and soft joints in masonry.
      f. Joints between concrete and other materials.

B. Sanitary Sealant - Mildew-Resistant Silicone Sealant: ASTM C920, Grade NS, Uses M and A; single component, mildew resistant; not expected to withstand continuous water immersion or traffic.
   1. Color: White.
   2. Applications:
      a. Joints between plumbing fixtures and floor and wall surfaces.
      b. Joints between kitchen and bath countertops and wall surfaces.

C. Tamper-Resistant, Silyl-Terminated Polyurethane (STPU) Sealant: ASTM C920, Grade NS, Uses M and A; single component; not expected to withstand continuous water immersion or traffic.
   1. Movement Capability: Plus and minus 50 percent, minimum
   2. Hardness Range: 25 to 30, Shore A, when tested in accordance with ASTM C661.
   3. Color: To be selected by Architect from manufacturer's standard range.

4. Products:
    a. Dow: DOWSIL 995: www.dow.com.
    b. Pecora Corporation; DynaFlex SC (Security Sealant): www.pecora.com/#sle.
    c. Sika Corporation; SikaFlex 11FC: www.usa.sika.com
    d. Substitutions: See Section 01 60 00 - Product Requirements.
5. Applications: All areas indicated on the drawings to receive pick resistant sealant.
    a. Within the locations listed above, provide tamper resistant sealants a
        1) At all movement joints between dissimilar materials within 9'-0" above finished floor level.
        2) At all movement joints between similar materials within 9'-0" above finished floor level.
        3) Interior control and expansion joints in unit masonry.
        4) Joints around plumbing fixtures.
        5) At joints between precast concrete components.
    b. Joints are defined as any gap in which a razor blade can be inserted and which is not subject to movement.

D. Wet Area Floor Sealant - Nonsag Traffic-Grade Polyurethane Sealant: ASTM C920, Grade NS, Uses M and A; single or multi-component; explicitly approved by manufacturer for continuous water immersion and traffic without the necessity to recess sealant below traffic surface.
1. Movement Capability: Plus and minus 25 percent, minimum.
2. Hardness Range: 20 to 30, Shore A, when tested in accordance with ASTM C661.
3. Color: To be selected by Architect from manufacturer's standard range.
4. Applications:
    a. Interior control and expansion joints in concrete floors considered wet areas.

E. Security Sealant - Epoxy Sealant: ASTM C881/C881M, Type I and III, Grade 3, Class B and C; two-component.
1. Hardness Range: 65 to 75, Shore D, when tested in accordance with ASTM C661.
2. Color: To be selected by Architect from manufacturer's standard range.
3. Products:
    a. Pecora Corporation; DynaPoxy EP-1200 Two-Part Epoxy Security Sealant: www.pecora.com/#sle.
    b. Substitutions: See Section 01 60 00 - Product Requirements.

F. Acoustical Sealant - Acrylic-Urethane Sealant: ASTM C920, Grade NS, Uses M and A; single component; paintable; not expected to withstand continuous water immersion or traffic.
1. Movement Capability: Plus and minus 12-1/2 percent, minimum.
2. Hardness Range: 15 to 40, Shore A, when tested in accordance with ASTM C661.
3. Color: White.
4. Products:
5. Applications:
    a. In sound-rated wall assemblies, and where not indicated as fire-rated.
        1) gaps between top stud runner and structure, between bottom stud track and floor, between gypsum wall board and floor, and between gypsum wall board and structure.
        2) gaps at electrical outlets, wiring devices, piping, and other openings; between wall/ceiling and other construction; and other flanking sound paths.

G. General Purpose Interior Sealant - Acrylic Emulsion Latex: Water-based; ASTM C834, single component, nonstaining, nonbleeding, nonsagging; not intended for exterior use.
1. Color: To be selected by Architect from manufacturer's standard range.
2. Grade: ASTM C834; Grade NF.
3. Applications:
    a. Interior wall and ceiling control joints in non-wet areas.

b. Joints between door, window, and other frames and adjacent construction.
c. Other interior joints for which no other type of sealant is indicated.

H. Moving Joint Sealant - Noncuring Butyl Sealant: Solvent-based, single component, nonsag, nonskinning, nonhardening, nonbleeding; nonvapor permeable; intended for fully concealed applications.
1. Applications:
a. Lap Joints in Sheet Metal Fabrications.
b. Lap Joints between Manufacturerd Metal Panels.

2.03 SELF-LEVELING JOINT SEALANTS

A. Type - Exterior Pavement Sealant - Self-Leveling Polyurethane Sealant: ASTM C920, Grade P, Uses M and A; single or multicomponent; explicitly approved by manufacturer for traffic exposure; not expected to withstand continuous water immersion .
1. Movement Capability: Plus and minus 25 percent, minimum.
2. Hardness Range: 35 to 55, Shore A, when tested in accordance with ASTM C661.
3. Color: Gray.
4. Applications:
a. Control and Expansion Joints in Concrete Paving.

B. Interior Slabs (unpolished) - Semi-Rigid Self-Leveling Epoxy Joint Filler: Epoxy or epoxy/polyurethane copolymer; intended for filling cracks and control joints not subject to significant movement; rigid enough to support concrete edges under traffic.
1. Composition: Multicomponent, 100 percent solids by weight.
2. Durometer Hardness: Minimum of 85 for Type A or 35 for Type D, after seven days when tested in accordance with ASTM D2240.
3. Color: To be selected by Architect from manufacturer's standard colors.
4. Joint Width, Minimum: 1/8 inch.
5. Joint Width, Maximum: 1/4 inch.
6. Joint Depth: Provide product suitable for joints from 1/8 inch to 2 inches in depth including space for backer rod.

2.04 ACCESSORIES

A. Sealant Backing Materials, General: Materials placed in joint before applying sealants; assists sealant performance and service life by developing optimum sealant profile and preventing three-sided adhesion; type and size recommended by sealant manufacturer for compatibility with sealant, substrate, and application.

B. Backing Tape: Self-adhesive polyethylene tape with surface that sealant will not adhere to and recommended by tape and sealant manufacturers for specific application.

C. Masking Tape: Self-adhesive, nonabsorbent, nonstaining, removable without adhesive residue, and compatible with surfaces adjacent to joints and sealants.

D. Joint Cleaner: Noncorrosive and nonstaining type, type recommended by sealant manufacturer; compatible with joint forming materials.

E. Primers: Type recommended by sealant manufacturer to suit application; nonstaining.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that joints are ready to receive work.

B. Verify that backing materials are compatible with sealants.

C. Preinstallation Adhesion Testing: Install a sample for each test location indicated in the test plan.
1. Test each sample as specified in PART 1 under QUALITY ASSURANCE article.

2. Notify Architect of date and time that tests will be performed, at least seven days in advance.
3. Record each test on Preinstallation Adhesion Test Log as indicated.
4. If any sample fails, review products and installation procedures, consult manufacturer, or take other measures that are necessary to ensure adhesion; retest in a different location; if unable to obtain satisfactory adhesion, report to Architect.
5. After completion of tests, remove remaining sample material and prepare joints for new sealant installation.

3.02 PREPARATION

A. Remove loose materials and foreign matter that could impair adhesion of sealant.

B. Clean joints, and prime as necessary, in accordance with manufacturer's instructions.

C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.

D. Mask elements and surfaces adjacent to joints from damage and disfigurement due to sealant work; be aware that sealant drips and smears may not be completely removable.

E. Concrete Floor Joints That Will Be Exposed in Completed Work: Test joint filler in an inconspicuous area to verify that it does not stain or discolor slab.

3.03 INSTALLATION

A. Install this work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.

B. Provide joint sealant installations complying with ASTM C1193.

C. Install acoustical sealant application work in accordance with ASTM C919.

D. Measure joint dimensions and size joint backers to achieve the following, unless otherwise indicated:
   1. Width/depth ratio of 2:1.
   2. Neck dimension no greater than 1/3 of the joint width.
   3. Surface bond area on each side not less than 75 percent of joint width.

E. Install bond breaker backing tape where backer rod cannot be used.

F. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.

G. Do not install sealant when ambient temperature is outside manufacturer's recommended temperature range, or will be outside that range during the entire curing period, unless manufacturer's approval is obtained and instructions are followed.

H. Nonsag Sealants: Tool surface concave, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.

I. Concrete Floor Joint Filler: After full cure, shave joint filler flush with top of concrete slab.

3.04 FIELD QUALITY CONTROL

A. See Section 01 40 01 - Quality Requirements for additional requirements.

B. Perform field quality control inspection/testing as specified in PART 1 under QUALITY ASSURANCE article.

C. Remove and replace failed portions of sealants using same materials and procedures as indicated for original installation.

END OF SECTION

SECTION 08 11 13
HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Non-fire-rated hollow metal doors and frames.

B. Thermally insulated hollow metal doors with frames.

1.02 RELATED REQUIREMENTS

A. Section 08 71 00 - Door Hardware.

B. Section 08 80 00 - Glazing.

1.03 ABBREVIATIONS AND ACRONYMS

A. ANSI: American National Standards Institute.

B. NFPA: National Fire Protection Association.

C. SDI: Steel Door Institute.

D. UL: Underwriters Laboratories.

1.04 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design.

B. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors.

C. ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames.

D. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100).

E. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.

F. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

G. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable.

H. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.

I. ASTM C143/C143M - Standard Test Method for Slump of Concrete.

J. ASTM C476 - Standard Specification for Grout for Masonry.

K. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

L. BHMA A156.115 - Hardware Preparation in Steel Doors and Frames.

M. ICC A117.1 - Accessible and Usable Buildings and Facilities.

N. NAAMM HMMA 830 - Hardware Selection for Hollow Metal Doors and Frames.

O. NAAMM HMMA 831 - Hardware Locations for Hollow Metal Doors and Frames.

P. NAAMM HMMA 840 - Guide Specifications for Receipt, Storage and Installation of Hollow Metal Doors and Frames.

Q. NAAMM HMMA 861 - Guide Specifications for Commercial Hollow Metal Doors and Frames.

1.05 SUBMITTALS

A. See Section 01 40 00 - Quality Requirements for submittal procedures.

B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes; and one copy of referenced standards/guidelines.

C. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and any indicated finish requirements.

1.06 QUALITY ASSURANCE

A. Maintain at project site copies of reference standards relating to installation of products specified.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Comply with NAAMM HMMA 840 or ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.

B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion and adverse effects on factory applied painted finish.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Hollow Metal Doors and Frames:
   1. Ceco Door, an Assa Abloy Group company: www.assaabloydss.com/#sle.
   2. Curries, an Assa Abloy Group company: www.assaabloydss.com/#sle.
   3. Mesker, dormakaba Group: www.meskeropeningsgroup.com/#sle.
   4. Republic Doors, an Allegion brand: www.republicdoor.com/#sle.
   5. Steelcraft, an Allegion brand: www.allegion.com/#sle.
   6. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 PERFORMANCE REQUIREMENTS

A. Requirements for Hollow Metal Doors and Frames:
   1. Steel Sheet: Comply with one or more of the following requirements; galvannealed steel complying with ASTM A653/A653M, cold-rolled steel complying with ASTM A1008/A1008M, or hot-rolled pickled and oiled (HRPO) steel complying with ASTM A1011/A1011M, commercial steel (CS) Type B, for each.
   2. Accessibility: Comply with ICC A117.1 and ADA Standards.
   3. Door Top Closures: Flush end closure channel, with top and door faces aligned.
   4. Door Edge Profile: Beveled, both sides.
   5. Typical Door Face Sheets: Flush. Smooth, seamless, joints mitered, interlocked, welded and ground smooth .
   6. Hardware Preparations, Selections and Locations: Comply with NAAMM HMMA 830 and NAAMM HMMA 831 or BHMA A156.115 and ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
      a. Steel Frame Reinforcing:
         1) Minimum 12 gauge steel for all surface mounted hardware.
   7. Zinc Coating for Typical Interior and/or Exterior Locations: Provide metal components zinc-coated (galvanized) and/or zinc-iron alloy-coated (galvannealed) by the hot-dip process in accordance with ASTM A653/A653M, with manufacturer's standard coating thickness, unless noted otherwise for specific hollow metal doors and frames.
      a. Based on SDI Standards: Provide at least A40/ZF120 (galvannealed) when necessary, coating not required for typical interior door applications, and at least A60/ZF180 (galvannealed) for corrosive locations.

B. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with the specified requirements for each type; for instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.

2.03 HOLLOW METAL DOORS

A. Door Finish: Factory primed and field finished.

B. Exterior Doors: Thermally insulated.
   1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
      a. Level 4 - Maximum-duty.
      b. Physical Performance Level A, 1,000,000 cycles; in accordance with ANSI/SDI A250.4.
      c. Model 2 - Seamless.
      d. Door Face Metal Thickness: 14 gauge, 0.067 inch, minimum.
      e. Zinc Coating: A60/ZF180 galvannealed coating; ASTM A653/A653M.
   2. Door Core Material: Polyurethane, 1.8 lbs/cu ft minimum density.
      a. Foam Plastic Insulation: Manufacturer's standard board insulation with maximum flame spread index (FSI) of 75, and maximum smoke developed index (SDI) of 450 in accordance with ASTM E84, and completely enclosed within interior of door.
   3. Door Thermal Resistance: R-Value of 8.7, minimum, for installed thickness of polyurethane.
   4. U value: 0.352, measured in accordance with ASTM C1363/ NFRC 102-2014
   5. Air Infiltration: less than 0.1 cfm/sf measured in accordance with ASTM EE283/ NFRM 400-2014.
   6. Must use with thermally broken frame and thermal saddle to achieve above values.
   7. Door Thickness: 1-3/4 inches, nominal.
   8. Weatherstripping: See Section 08 71 00.

2.04 HOLLOW METAL FRAMES

A. Comply with standards and/or custom guidelines as indicated for corresponding door in accordance with applicable door frame requirements.
   1. ANSI A250.8 Level 3 door and Doors over 4’-0” wide: 14 gauge frames.
   2. Frames for Wood Doors and other doors: 16 gauge.

B. Frame Finish: Factory primed and field finished.

C. Exterior Door Frames: Full profile/continuously welded type.
   1. Galvanizing: Components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A653/A653M, with A60/ZF180 coating.
   2. Frame Metal Thickness: 12 gauge, 0.093 inch, minimum.
   3. Provide thermal anchors, and use with energy efficient door and thermal saddle.
   4. Weatherstripping: See Section 08 71 00.

2.05 FINISHES

A. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.

B. Bituminous Coating: Cold-applied asphalt mastic, compounded for 15 mil, 0.015 inch dry film thickness (DFT) per coat; provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.06 ACCESSORIES

A. Mechanical Fasteners for Concealed Metal-to-Metal Connections: Self-drilling, self-tapping, steel with electroplated zinc finish.

B. Grout for Frames: Mortar grout complying with ASTM C476 with maximum slump of 4 inches as measured in accordance with ASTM C143/C143M for hand troweling in place; plaster grout and thinner pumpable grout are prohibited.

C. Silencers: Resilient rubber, fitted into drilled hole; provide three on strike side of single door, three on center mullion of pairs, and two on head of pairs without center mullions.

D. Temporary Frame Spreaders: Provide for factory- or shop-assembled frames.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

C. Verify that finished walls are in plane to ensure proper door alignment.

3.02 INSTALLATION

A. Install doors and frames in accordance with manufacturer's instructions and related requirements of specified door and frame standards or custom guidelines indicated.

B. Coordinate frame anchor placement with wall construction.

C. Grout frames in masonry construction, using hand trowel methods; brace frames so that pressure of grout before setting will not deform frames.

D. Install door hardware as specified in Section 08 71 00.
   1. Comply with recommended practice for hardware placement of doors and frames in accordance with ANSI/SDI A250.6 or NAAMM HMMA 861.

E. Comply with glazing installation requirements of Section 08 80 00.

F. Coordinate installation of electrical connections to electrical hardware items.

G. Touch up damaged factory finishes.

3.03 TOLERANCES

A. Maximum Diagonal Distortion: 1/16 inch measured with straight edge, corner to corner.

3.04 ADJUSTING

A. Adjust for smooth and balanced door movement.

3.05 SCHEDULE

A. Refer to Door and Frame Schedule on the drawings.

END OF SECTION

SECTION 08 14 33
STILE AND RAIL WOOD DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wood doors, stile and rail design; non-fire rated.

1.02 RELATED REQUIREMENTS

A. Section 06 20 00 - Finish Carpentry: Wood door frames.

B. Section 08 71 00 - Door Hardware.

C. Section 08 80 00 - Glazing.

1.03 REFERENCE STANDARDS

A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials.

B. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition.

C. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards.

1.04 SUBMITTALS

A. See Section 01 40 00 - Quality Requirements for submittal procedures.

B. Product Data: Indicate stile and rail core materials and construction; veneer species, type and characteristics.

C. Shop Drawings: Illustrate door opening criteria, elevations, sizes, types, swings, undercuts required, special beveling, special blocking for hardware, factory machining criteria, factory finishing criteria, cutouts for glazing, and cutouts for louvers.

D. Samples: Submit two samples of door veneer, 8 by 8 inches in size illustrating wood grain, stain color, and sheen.

E. Certificate: Submit labels and certificates required by quality assurance and quality control programs.

F. Manufacturer's qualification statement.

G. Installer's qualification statement.

H. Warranty, executed in Owner's name.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section, with not less than three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Package, deliver, and store doors in accordance with quality standard specified.

B. Accept doors on site in manufacturer's packaging, and inspect for damage.

C. Protect doors with resilient packaging sealed with heat shrunk plastic; do not store in damp or wet areas or areas where sunlight might bleach veneer; seal top and bottom edges with tinted sealer if stored more than one week, and break seal on site to permit ventilation.

1.07 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

B. Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, and telegraphing core construction.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Stile and Rail Wood Doors:
   1. Forte Opening Solutions: www.forteopenings.com/#sle.
   2. **BASIS OF DESIGN:** TruStile Doors, LLC.
      a. Wood doors with frosted glass and muntins: FL800.
      b. 3 Panel door: TS3000.
      c. Open office door: FL100.

2.02 DOORS

A. Interior Doors: 1-3/4 inches thick unless otherwise indicated; veneer and lumber stile and rail construction; mortise and tenon joints. Transparent or opaque finish.

B. Wood veneer facing with factory transparent finish.

2.03 DOOR AND PANEL FACINGS

A. Veneer Facing for Transparent Finish: White Oak, veneer grade in accordance with quality standard indicated, rift cut (only in red and white oak), with book match between leaves of veneer, running match of spliced veneer leaves assembled on door or panel face.

B. Adhesive: Type I - Waterproof.

2.04 DOOR CONSTRUCTION

A. Vertical Exposed Edge of Stiles: Of same species as veneer facing.

B. Fit door edge trim to edge of stiles after applying veneer facing.

C. Bond edge banding to cores.

D. Panels: Flat.

E. Factory machine doors for finish hardware in accordance with hardware requirements and dimensions. Do not machine for surface hardware.

F. Factory fit doors for frame opening dimensions identified on shop drawings, with edge clearances in accordance with specified quality standard.

G. Factory install glazing in doors in compliance with quality standards specified, using manufacturer's standard elastomeric glazing sealant.

2.05 FINISHES

A. Finish work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 5 - Finishing for grade specified and as follows:
   1. Transparent:
      a. System - 11, Polyurethane, Catalyzed.
      b. Stain: Custom, as selected by Architect.
      c. Sheen: Flat.

2.06 ACCESSORIES

A. Wood Door Frames: See Section 06 20 00.

B. Glazed Openings:
   1. Laminated Safety Glass: Comply with 16 CFR 1201 test requirements for Category II.
   2. Glazing: Single vision units, 1/4 inch thick panes of glass.
   3. Tint: Frosted.

C. Panel or Glass Retention Molding: Wood of same species as door facing, flat bead stop, with butted corners; prepared for countersink style tamper proof screws.

D. Door Hardware: See Section 08 71 00.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

C. Do not install doors in frame openings that are not plumb or are out of tolerance for size or alignment.

3.02 INSTALLATION

A. Install doors in accordance with manufacturer's instructions and specified quality standards.

B. Factory-Finished Doors: Do not field cut or trim; if fit or clearance is not correct, replace door.

C. Machine cut for hardware.

D. Coordinate installation of doors with installation of frames and hardware.

E. Coordinate installation of glazing.

3.03 TOLERANCES

A. Comply with specified quality standard for fit, clearance, and joinery tolerances.

B. Maximum Width Distortion (Cup): 1/8 inch measured with straight edge or taut string, edge to edge, over an imaginary 36 by 84 inch surface area.

3.04 ADJUSTING

A. Adjust doors for smooth and balanced door movement.

3.05 SCHEDULE - SEE DRAWINGS

END OF SECTION

SECTION 08 31 00
ACCESS DOORS AND PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wall- and ceiling-mounted access units.

1.02 REFERENCE STANDARDS

A. ITS (DIR) - Directory of Listed Products.

B. UL (FRD) - Fire Resistance Directory.

1.03 SUBMITTALS

A. See Section 01 40 00 - Quality Requirements for submittal procedures.

B. Product Data: Provide sizes, types, finishes, hardware, scheduled locations, and details of adjoining work.

C. Schedule: List of wall or ceiling access doors required, per room, with quantity and sizes of each, and lock type.

D. Project Record Documents: Record actual locations of each access unit.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.05 COORDINATION

A. Verification: Determine specific locations and sizes for access doors needed to gain access to concealed equipment, and indicate on schedule specified in "Submittals" Article.

PART 2 PRODUCTS

2.01 ACCESS DOORS AND PANELS ASSEMBLIES

2.02 WALL- AND CEILING-MOUNTED ACCESS UNITS

A. Manufacturers:
   1. Activar Construction Products Group, Inc. - JL Industries: www.activarcpg.com/#sle.
   2. ACUDOR Products Inc: www.acudor.com/#sle.
   3. Babcock-Davis: www.babcockdavis.com/#sle.
   4. BAUCO Access Panel Solutions Inc: www.bauco.com/#sle.
   5. Best Access Doors: www.bestaccessdoors.com/#sle.
   6. Cendrex, Inc: www.cendrex.com/#sle.
   7. Karp Associates, Inc: www.karpinc.com/#sle.
   8. Nystrom, Inc: www.nystrom.com/#sle.
   9. The Williams Brothers Corporation of America: www.wbdoors.com/#sle.
   10. Substitutions: See Section 01 60 00 - Product Requirements.

B. Wall- and Ceiling-Mounted Units: Factory-fabricated door and frame, fully assembled units with corner joints welded, filled and ground flush; square and without rack or warp; coordinate requirements with type of installation assembly being used for each unit.
   1. Material: Steel.
   2. Style: Exposed frame with door surface flush with frame surface.
      a. Gypsum Board Mounting Criteria: Use drywall bead type frame.
   3. Door Style: Single thickness with rolled or turned in edges.
   4. Frames: 16-gauge, 0.0598-inch minimum thickness.
   5. Single Steel Sheet Door Panels: 16-gauge, 0,0625-inch minimum thickness.
   6. Units in Fire-Rated Assemblies: Fire rating as required by applicable code for fire-rated assembly that access doors are being installed.

a. Provide products listed by ITS (DIR) or UL (FRD) as suitable for purpose indicated.
b. Provide certificate of compliance from authorities having jurisdiction indicating approval of fire rated doors.

7. Steel Finish: Primed.
8. Primed and Factory Finish: Polyester powder coat; manufacturers standard white
9. Door/Panel Size: 16 x 16 inch minimum, or as required for access.
10. Hardware:
    a. Hardware for Fire-Rated Units: As required for listing.
    b. Hinges for Non-Fire-Rated Units: Concealed, constant force closure spring type, 175 degree with non-removable pin.
    c. Handle: No handle.
    d. Latch/Lock: Screw driver slot for quarter turn cam latch.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that rough openings are correctly sized and located.

B. Begin installation only after substrates have been properly prepared, and if the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

C. Advise installers of other work about specific requirements relating to access door and floor door installation, including sizes of openings to receive access door and frame, as well as locations of supports, inserts, and anchoring devices.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to proceeding with this work.

B. Prepare surfaces using methods recommended by manufacturer for applicable substrates in accordance with project conditions.

3.03 INSTALLATION

A. Install units in accordance with manufacturer's instructions.

B. Install frames plumb and level in openings, and secure units rigidly in place.

C. Install access doors in gypsum board walls before joints are taped and finished, or arrange for taping and mudding of access door flanges after installation.

D. Position units to provide convenient access to concealed equipment when necessary.

3.04 ADJUSTING

A. Adjust doors and hardware after installation for proper operation.

B. Remove and replace doors and frames that are warped, bowed, or otherwise damaged.

END OF SECTION

SECTION 08 43 13
ALUMINUM-FRAMED STOREFRONTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Aluminum-framed storefront, with vision glass.

B. Aluminum doors and frames.

C. Weatherstripping.

1.02 RELATED REQUIREMENTS

A. Section 08 71 00 - Door Hardware: Hardware items other than specified in this section.

B. Section 08 80 00 - Glazing: Glass and glazing accessories.

1.03 REFERENCE STANDARDS

A. AAMA CW-10 - Care and Handling of Architectural Aluminum from Shop to Site.

B. AAMA 609 & 610 - Cleaning and Maintenance Guide for Architecturally Finished Aluminum.

C. AAMA 1503 - Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections.

D. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures.

E. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

F. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric).

G. ASTM E283/E283M - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Skylights, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.

H. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.

I. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.

1.04 ADMINISTRATIVE REQUIREMENTS

1.05 SUBMITTALS

A. See Section 01 40 00 - Quality Requirements for submittal procedures.

B. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, glass and infill, and internal drainage details.

C. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related work, expansion and contraction joint location and details, and field welding required.

D. Samples: Submit two samples 12 x 12 inches in size illustrating finished aluminum surface, glass, glazing materials.

E. Field Quality Control Submittals: Report of field testing for water penetration and air leakage.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Handle products of this section in accordance with AAMA CW-10.

B. Protect finished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond to aluminum when exposed to sunlight or weather.

1.08 FIELD CONDITIONS

A. Do not install sealants when ambient temperature is less than 40 degrees F. Maintain this minimum temperature during and 48 hours after installation.

1.09 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

B. Provide twenty year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Aluminum-Framed Storefronts:
   1. Kawneer North America: www.kawneer.com/#sle.
   2. Manko Window Systems, Inc: www.mankowindows.com/#sle.
   3. Oldcastle BuildingEnvelope: www.oldcastlebe.com/#sle.
   4. Pittco Architectural Metals Inc: www.pittcometals.com/#sle.
   5. Tubelite, Inc: www.tubeliteinc.com/#sle.
   6. YKK AP America, Inc: www.ykkap.com/commercial/#sle.
   7. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 ALUMINUM-FRAMED STOREFRONT

A. Aluminum-Framed Storefront: Factory fabricated, factory finished aluminum framing members with infill, and related flashings, anchorage and attachment devices.
   1. Glazing Rabbet: For 1 inch insulating glazing.
   2. Glazing Position: Centered (front to back).
   3. Vertical Mullion Dimensions: 2 inches wide by 4-1/2 inches deep.
   4. Finish: .
      a. Factory finish all surfaces that will be exposed in completed assemblies.
      b. Coat concealed metal surfaces that will be in contact with cementitious materials or dissimilar metals with bituminous paint.
   5. Fabrication: Joints and corners flush, hairline, and weatherproof, accurately fitted and secured; prepared to receive anchors and hardware; fasteners and attachments concealed from view; reinforced as required for imposed loads.
   6. Construction: Eliminate noises caused by wind and thermal movement, prevent vibration harmonics, and prevent "stack effect" in internal spaces.
   7. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.
   8. Expansion/Contraction: Provide for expansion and contraction within system components caused by cycling temperature range of 170 degrees F over a 12 hour period without causing detrimental effect to system components, anchorages, and other building elements.
   9. Movement: Allow for movement between storefront and adjacent construction, without damage to components or deterioration of seals.
   10. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.
   11. Maintain continuous air barrier and/or vapor retarder seal throughout assembly, primarily in line with inside pane of glazing, and heel bead of glazing compound.

B. Performance Requirements

1. Wind Loads: Design and size components to withstand the specified load requirements without damage or permanent set, when tested in accordance with ASTM E330/E330M, using loads 1.5 times the design wind loads and 10 second duration of maximum load.
    a. Design Wind Loads: Comply with loads noted on structural drawings and requirements of ASCE 7.
    b. Member Deflection: Limit member deflection to flexure limit of glass in any direction, with full recovery of glazing materials.
2. Water Penetration Resistance on Manufactured Assembly: No uncontrolled water on interior face, when tested in accordance with ASTM E331 at pressure differential of 8 psf.
3. Air Leakage: 0.06 cfm/sq ft maximum leakage of storefront wall area when tested in accordance with ASTM E283/E283M at 1.57 psf pressure difference.
4. Condensation Resistance Factor of Framing: ___, minimum, measured in accordance with AAMA 1503.
5. Overall U-value Including Glazing: _____ Btu/(hr sq ft deg F), maximum.

2.03 COMPONENTS

A. Aluminum Framing Members: Tubular aluminum sections, drainage holes and internal weep drainage system.
    1. Framing members for interior applications need not be thermally broken.
    2. Glazing Stops: Flush.

B. Glazing: See Section 08 80 00.

C. Applied Muntins: Prefabricated simulated divided lite grid assembly with perimeter surround; designed to be adhered and fastened to storefront framing members and glazing.
    1. Material: Extruded aluminum.
    2. Profile: Manufacturer's standard, as detailed on drawings.
    3. Finish: Same as storefront.

D. Swing Doors: Glazed aluminum.
    1. Thickness: 1-3/4 inches.
    2. Top Rail: 4 inches wide.
    3. Vertical Stiles: 4-1/2 inches wide.
    4. Bottom Rail: 10 inches wide.
    5. Glazing Stops: Square.
    6. Finish: Same as storefront.

2.04 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M).

B. Fasteners: Stainless steel.

C. Concealed Flashings: Sheet aluminum, 26 gauge, 0.017 inch minimum thickness.

D. Sill Flashing Sealant: Elastomeric, silicone or polyurethane, compatible with flashing material.

E. Sealant for Setting Thresholds: Non-curing butyl type.

F. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.

G. Glazing Accessories: See Section 08 80 00.

H. Shims: plastic or non-ferrous metal, not wood.

2.05 FINISHES

A. Color: As indicated on drawings.

B. Touch-Up Materials: As recommended by coating manufacturer for field application.

2.06 HARDWARE

A. For each door, include weatherstripping.

B. Other Door Hardware: See Section 08 71 00.

C. Weatherstripping: Wool pile, continuous and replaceable; provide on all doors.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify dimensions, tolerances, and method of attachment with other work.

B. Verify that storefront wall openings and adjoining water-resistive and/or air barrier seal materials are ready to receive work of this section.

3.02 INSTALLATION

A. Install wall system in accordance with manufacturer's instructions.

B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.

C. Provide alignment attachments and shims to permanently fasten system to building structure.

D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.

E. Provide thermal isolation where components penetrate or disrupt building insulation.

F. Install sill flashings. Turn up ends and edges; seal to adjacent work to form water tight dam.

G. Where fasteners penetrate sill flashings, make watertight by seating and sealing fastener heads to sill flashing.

H. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

I. Install glass and infill panels using glazing method required to achieve performance criteria; see Section 08 80 00.

J. Install applied muntin grid assembly in accordance with manufacturer's instructions.

K. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

3.03 TOLERANCES

A. Maximum Variation from Plumb: 0.06 inch per 3 feet non-cumulative or 0.06 inch per 10 feet, whichever is less.

B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch.

3.04 ADJUSTING

A. Adjust operating hardware for smooth operation.

3.05 CLEANING

A. Remove protective material from pre-finished aluminum surfaces.

B. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths, and take care to remove dirt from corners and to wipe surfaces clean.

C. Upon completion of installation, thoroughly clean aluminum surfaces in accordance with AAMA 609 & 610.

3.06 PROTECTION

A. Protect installed products from damage until Date of Substantial Completion.

END OF SECTION

SECTION 08 52 00
CLAD WOOD WINDOWS AND DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Factory-fabricated clad wood windows.

B. Glazing.

C. Wood trim for exterior finishing.

1.02 RELATED REQUIREMENTS

A. Section 06 10 53 - Miscellaneous Rough Carpentry: Rough opening framing.

B. Section 07 27 00 - Air Barriers : Sealing frames to weather barrier installed on adjacent construction.

C. Section 07 92 00 - Joint Sealants: Sealing joints between frames and adjacent construction.

D. Section 09 91 23 - Interior Painting: Site finishing wood surfaces.

1.03 REFERENCE STANDARDS

A. AAMA/WDMA/CSA 101/I.S.2/A440 - North American Fenestration Standard/Specification for Windows, Doors, and Skylights.

B. AAMA 2603 - Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix).

C. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.

D. ASTM E1332 - Standard Classification for Rating Outdoor-Indoor Sound Attenuation.

E. ASTM E2112 - Standard Practice for Installation of Exterior Windows, Doors and Skylights.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week before starting work of this section.
   1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
   2. Review and discuss the finishing of aluminum windows that is required to be coordinated with the finishing of other aluminum work for color and finish matching.
   3. Review, discuss, and coordinate the interrelationship of aluminum windows with other exterior wall components. Include provisions for anchorage, flashing, sealing perimeters, and protecting finishes.
   4. Review and discuss the sequence of work required to construct a watertight and weathertight exterior building envelope.
   5. Inspect and discuss the condition of substrate and other preparatory work performed by other trades.

1.05 SUBMITTALS

A. See Section 01 40 00 - Quality Requirements for submittal procedures.

B. Product Data: Show component dimensions, anchorage and fasteners, glass, and internal drainage details.

C. Shop Drawings: Indicate opening dimensions, framed opening tolerances, affected related work, and installation requirements.

D. Samples: Two samples 12 by 12 inch in size illustrating window frame section, screen and frame, factory finished surfaces, glazing, and glazing materials.

E. Operating Hardware: Two samples of each type of operating hardware.

F. Grade Substantiation: Prior to submitting shop drawings or starting fabrication, submit one of the following showing compliance with specified grade:
   1. Evidence of AAMA Certification; label or other documentation.
   2. Evidence of WDMA Certification.

G. Test Reports: Prior to submitting shop drawings or starting fabrication, submit test report(s) by independent testing agency showing compliance with performance requirements in excess of those prescribed by specified grade.

H. Specimen warranty.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with not less than three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Protect factory finished surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond when exposed to sunlight or weather.

1.08 FIELD CONDITIONS

A. Do not install sealants when ambient temperature is less than 40 degrees F.

B. Maintain this minimum temperature during and after installation of sealants.

PART 2 PRODUCTS

2.01 CLAD WOOD WINDOWS

A. Wood Windows: Wood frame and sash, factory fabricated and assembled.
   1. Exterior Finish: Metal clad, painted.
   2. Interior Finish: Unfinished, for opaque finish.
   3. Configuration: As indicated on drawings.
   4. Window Product Types: C - Casement window, FW - Fixed window, and H (VS) - Hung window (Vertical sliding window), in accordance with AAMA/WDMA/CSA 101/I.S.2/A440.
   5. Factory glazed; dry glazing method.
   6. Wood Species: Clear pine, preservative treated using treatment type suitable for required finish.
   7. Frame and Sash Members: Mortise and tenon joints. Glue and steel pin joints to hairline fit, weather tight.
   8. Metal Cladding: Formed aluminum, factory finished, factory fit to profile of wood members.
   9. Transparent Finish: Finger joints not permitted in units intended for transparent finish.
   10. Weather Stop Flange: Continuous at perimeter of unit.
   11. Clearances and Shim Spacing: Minimum required for installation and dynamic movement of perimeter seal.
   12. Fasteners: Concealed from view.
   13. Internal Drainage of Glazing Spaces to Exterior: Weep holes.
   14. Insect Screens: Not required (since units are fixed)

2.02 COMPONENTS

A. Glazing: Double glazed, clear, Low-E coated, argon filled, with glass thicknesses as recommended by manufacturer for specified wind conditions.

B. Sills: Extruded aluminum, with 0.125 inch nominal thickness; sloped for positive drainage; fits under sash and projects at least 1/2 inch beyond exterior face of wall; single piece full width of opening.

C. Stools: 0.125 inch nominal thickness, wood; fit under sash to project 1/2 inch beyond interior wall face; one piece full width of opening.

D. Muntins/Grilles: Grilles permanently installed between panes of insulating glass.
   1. Pattern: Custom design, see drawings.
   2. Color: Match interior and exterior of frame.

E. Fasteners: Stainless steel.

F. Sealant and Backing Materials: See Section 07 92 00 of types as indicated.

G. Wood for Casings and Trim: Clear pine, clear preservative treated, of type suitable for required finish.
   1. Brick mould casing as indicated in Drawings.
   2. Finger joints not permitted in transparent finished exposed surfaces.
   3. Scarf joints permitted in transparent finished exposed surfaces only if color and grain texture match.

H. Flashing: Provide related flashings, with necessary anchors and attachment devices.

I. Sealant for Setting Sills, Stools, Aprons, and Sill Flashing: Non-curing butyl type.

2.03 PERFORMANCE REQUIREMENTS

A. Comply with AAMA/WDMA/CSA 101/I.S.2/A440 requirements for the specific window type in accordance with the following:
   1. Performance Class (PC): AW.
   2. Performance Grade (PG): Equivalent to design wind load.

B. Design Pressure (DP): In accordance with applicable codes.

C. Overall Thermal Transmittance (U-value): 0.28, maximum, including glazing, measured on window sizes required for this project.

2.04 ALUMINUM FINISHES

A. Pigmented Organic Coatings: AAMA 2603, polyester or acrylic baked enamel finish.

B. Touch-Up Materials: As recommended by coating manufacturer for field application.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify wall openings and adjoining water-resistive barrier materials are ready to receive wood windows; see Section 072700.

3.02 INSTALLATION

A. Install windows in accordance with manufacturer's instructions.

B. Install windows in accordance with ASTM E2112.

C. Attach window frame and shims to perimeter opening to accommodate construction tolerances and other irregularities.

D. Align window plumb and level, free of warp or twist. Maintain dimensional tolerances and alignment with adjacent work.

E. Install sills and stools.

F. Provide thermal isolation where components penetrate or disrupt building insulation. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

G. Install operating hardware.

3.03 TOLERANCES

A. Maximum Variation from Level or Plumb: 1/16 inch per 3 ft non-cumulative or 1/8 inch per 10 ft, whichever is less.

3.04 ADJUSTING

A. Adjust hardware for smooth operation and secure weathertight closure.

3.05 CLEANING

A. Remove protective material from factory finished surfaces.

B. Wash surfaces by method recommended and acceptable to window manufacturer; rinse and wipe surfaces clean.

C. Remove excess glazing sealant by moderate use of mineral spirits or other solvent acceptable to sealant manufacturer.

END OF SECTION

SECTION 087100
DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes commercial door hardware for the following:

1. Swinging doors.
2. Other doors to the extent indicated.

B. Door hardware includes, but is not necessarily limited to, the following:

1. Mechanical door hardware.
2. Electromechanical door hardware.
3. Automatic operators.
4. Cylinders specified for doors in other sections.

C. Related Sections:

1. Division 01 Section "General Conditions”.
2. Division 06 Section “Rough Carpentry”.
3. Division 06 Section “Finish Carpentry”.
4. Division 08 Section “Operations and Maintenance”.
5. Division 08 Section “Hollow Metal Doors and Frames”.
6. Division 08 Section “Flush Wood Doors”.
7. Division 08 Section “Aluminum-Framed Entrances and Storefronts”.
8. Division 08 Section “Automatic Door Operators”.
9. Division 26 Section "Electrical”

D. Codes and References: Comply with the version adopted by the Authority Having Jurisdiction.

1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
2. ICC/IBC - International Building Code.
3. NFPA 70 - National Electrical Code.
4. NFPA 80 - Fire Doors and Windows.
5. NFPA 101 - Life Safety Code.
6. NFPA 105 - Installation of Smoke Door Assemblies.
7. UL/ULC and CSA C22.2 - Standards for Automatic Door Operators Used on Fire and Smoke Barrier Doors and Systems of Doors.
8. State Building Codes, Local Amendments.

E. Standards: All hardware specified herein shall comply with the following industry standards as applicable. Any undated reference to a standard shall be interpreted as referring to the latest edition of that standard:

1. ANSI/BHMA Certified Product Standards - A156 Series.
2. UL10C - Positive Pressure Fire Tests of Door Assemblies.
3. ANSI/UL 294 - Access Control System Units.
4. UL 305 - Panic Hardware.
5. ANSI/UL 437- Key Locks.

1.3 SUBMITTALS

A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.

B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing, fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.
3. Content: Include the following information:

    a. Type, style, function, size, label, hand, and finish of each door hardware item.
    b. Manufacturer of each item.
    c. Fastenings and other pertinent information.
    d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
    e. Explanation of abbreviations, symbols, and codes contained in schedule.
    f. Mounting locations for door hardware.
    g. Door and frame sizes and materials.
    h. Warranty information for each product.

4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.

C. Shop Drawings: Details of electrified access control hardware indicating the following:

1. Wiring Diagrams: Upon receipt of approved schedules, submit detailed system wiring diagrams for power, signaling, monitoring, communication, and control of the access control system electrified hardware. Differentiate between manufacturer-installed and field-installed wiring. Include the following:

    a. Elevation diagram of each unique access controlled opening showing location and interconnection of major system components with respect to their placement in the respective door openings.
    b. Complete (risers, point-to-point) access control system block wiring diagrams.
    c. Wiring instructions for each electronic component scheduled herein.

2. Electrical Coordination: Coordinate with related sections the voltages and wiring details required at electrically controlled and operated hardware openings.

D. Keying Schedule: After a keying meeting with the owner has taken place prepare a separate keying schedule detailing final instructions. Submit the keying schedule in electronic format. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores.

E. Informational Submittals:

1. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.

1.4 CLOSEOUT SUBMITTALS

A. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Procedures.

1.5 QUALITY ASSURANCE

A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum 5 years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.

B. Certified Products: Where specified, products must maintain a current listing in the Builders Hardware Manufacturers Association (BHMA) Certified Products Directory (CPD).

C. Installer Qualifications: A minimum 3 years documented experience installing both standard and electrified door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

D. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum 5 years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor by the manufacturers of the primary materials with a warehousing facility in Project's vicinity. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.

E. Source Limitations: Obtain each type and variety of door hardware specified in this section from a single source unless otherwise indicated.

1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.
2. Provide electromechanical door hardware from the same manufacturer as mechanical door hardware, unless otherwise indicated.

F. Each unit to bear third party permanent label indicating compliance with the referenced testing standards.

G. Keying Conference: Conduct conference to comply with requirements in Division 01 Section "Project Meetings." Keying conference to incorporate the following criteria into the final keying schedule document:

1. Function of building, purpose of each area and degree of security required.
2. Plans for existing and future key system expansion.
3. Requirements for key control storage and software.
4. Installation of permanent keys, cylinder cores and software.
5. Address and requirements for delivery of keys.

H. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.

1. Prior to installation of door hardware, conduct a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products. Product training to be attended by installers of door hardware (including electromechanical hardware) for aluminum, hollow metal and wood doors. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.
2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
3. Review sequence of operation narratives for each unique access controlled opening.
4. Review and finalize construction schedule and verify availability of materials.
5. Review the required inspecting, testing, commissioning, and demonstration procedures

I. At completion of installation, provide written documentation that components were applied according to manufacturer's instructions and recommendations and according to approved schedule.

1.6 DELIVERY, STORAGE AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.

B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.

C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.7 COORDINATION

A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.

B. Door and Frame Preparation: Doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

1.8 WARRANTY

A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:

1. Structural failures including excessive deflection, cracking, or breakage.
2. Faulty operation of the hardware.
3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
4. Electrical component defects and failures within the systems operation.

C. Warranty Period: Unless otherwise indicated, warranty shall be one year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Hardware shall not have any visible manufacturer names on exposed materials, except cylinders, when the door is in a closed position.

2.2 BUTT HINGES

A. Hinges: ANSI/BHMA A156.1 butt hinges with number of hinge knuckles and other options as specified in the Door Hardware Sets.

1. Quantity: Provide the following hinge quantity:

   a. Two Hinges: For doors with heights up to 60 inches.
   b. Three Hinges: For doors with heights 61 to 90 inches.
   c. Four Hinges: For doors with heights 91 to 120 inches.
   d. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.

2. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:

   a. Widths up to 3’0”: 4-1/2” standard or heavy weight as specified.
   b. Sizes from 3’1” to 4’0”: 5” standard or heavy weight as specified.

3. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:

a. Exterior Doors: Heavy weight, non-ferrous, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate standard weight.
b. Interior Doors: Standard weight, steel, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate heavy weight.

4. Hinge Options: Comply with the following:

a. Non-removable Pins: With the exception of electric through wire hinges, provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for all out-swinging lockable doors.

5. Manufacturers:

a. McKinney (MK) - TA/T4A Series, 5-knuckle.

2.3 CONTINUOUS HINGES

A. Continuous Geared Hinges: ANSI/BHMA A156.26 Grade 1-600 continuous geared hinge. with minimum 0.120-inch thick extruded 6063-T6 aluminum alloy hinge leaves and a minimum overall width of 4 inches. Hinges are non-handed, reversible and fabricated to template screw locations. Factory trim hinges to suit door height and prepare for electrical cut-outs.

1. Manufacturers:.

a. Pemko (PE).

2.4 POWER TRANSFER DEVICES

A. Concealed Quick Connect Electric Power Transfers: Provide concealed wiring pathway housing mortised into the door and frame for low voltage electrified door hardware. Furnish with Molex™ standardized plug connectors and sufficient number of concealed wires (up to 12) to accommodate the electrified functions specified in the Door Hardware Sets. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Wire nut connections are not acceptable.

1. Manufacturers:

a. Pemko (PE) - EL-CEPT Series.
b. Securitron (SU) - EL-CEPT Series.

B. Electric Door Wire Harnesses: Provide electric/data transfer wiring harnesses with standardized plug connectors to accommodate up to twelve (12) wires. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Provide sufficient number and type of concealed wires to accommodate electric function of specified hardware. Provide a connector for through-door electronic locking devices and from hinge to junction box above the opening. Wire nut connections are not acceptable. Determine the length required for each electrified hardware component for the door type, size and construction, minimum of two per electrified opening.

1. Provide one each of the following tools as part of the base bid contract:

a. McKinney (MK) - Electrical Connecting Kit: QC-R001.
b. McKinney (MK) - Connector Hand Tool: QC-R003.

2. Manufacturers:

    a. McKinney (MK) - QC-C Series.

2.5 DOOR OPERATING TRIM

A. Flush Bolts and Surface Bolts: Provide products conforming to ANSI/BHMA A156.3 and A156.16, Grade 1.

1. Flush bolts to be furnished with top rod of sufficient length to allow bolt retraction device location approximately six feet from the floor.
2. Furnish dust proof strikes for bottom bolts.
3. Surface bolts to be minimum 8” in length and U.L. listed for labeled fire doors and U.L. listed for windstorm components where applicable.
4. Provide related accessories (mounting brackets, strikes, coordinators, etc.) as required for appropriate installation and operation.
5. Manufacturers:

    a. Rockwood (RO).

B. Door Push Plates and Pulls: ANSI/BHMA A156.6 door pushes and pull units of type and design specified in the Hardware Sets. Coordinate and provide proper width and height as required where conflicting hardware dictates.

1. Push/Pull Plates: Minimum .050 inch thick, size as indicated in hardware sets, with beveled edges, secured with exposed screws unless otherwise indicated.
2. Door Pull and Push Bar Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door unless otherwise indicated.
3. Offset Pull Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door and offset of 90 degrees unless otherwise indicated.
4. Pulls shall be provided with a 10” clearance from the finished floor on the push side to accommodate wheelchair accessibility.
5. Fasteners: Provide manufacturer's designated fastener type as indicated in Hardware Sets. When through-bolt fasteners are in the same location as a push plate, countersink the fasteners flush with the door face allowing the push plate to sit flat against the door.
6. Manufacturers:

    a. Rockwood (RO).

2.6 CYLINDERS AND KEYING

A. General: Cylinder manufacturer to have minimum (10) years experience designing secured master key systems and have on record a published security keying system policy.

1. Manufacturers:

    a. Sargent Manufacturing (SA).
    b. No Substitution – Facility Standard.

B. Cylinder Types: Original manufacturer cylinders able to supply the following cylinder formats and types:

1. Threaded mortise cylinders with rings and cams to suit hardware application.
2. Rim cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
3. Bored or cylindrical lock cylinders with tailpieces as required to suit locks.
4. Tubular deadlocks and other auxiliary locks.
5. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes.
6. Keyway: Match Facility Standard.

C. Keying System: Each type of lock and cylinders to be factory keyed.

1. Supplier shall conduct a "Keying Conference" to define and document keying system instructions and requirements.
2. Furnish factory cut, nickel-silver large bow permanently inscribed with a visual key control number as directed by Owner.
3. Existing System: Field verify and key cylinders to match Owner's existing system.

D. Key Quantity: Provide the following minimum number of keys:

1. Change Keys per Cylinder: Two (2)
2. Master Keys (per Master Key Level/Group): Five (5).
3. Construction Keys (where required): Ten (10).

E. Construction Keying: Provide construction master keyed cylinders.

F. Key Registration List (Bitting List):

1. Provide keying transcript list to Owner's representative in the proper format for importing into key control software.
2. Provide transcript list in writing or electronic file as directed by the Owner.

2.7 KEY CONTROL

A. Key Control Cabinet: Provide a key control system including envelopes, labels, and tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet. Key control cabinet shall have expansion capacity of 150% of the number of locks required for the project.

1. Manufacturers:

a. Lund Equipment (LU).
b. MMF Industries (MM).
c. Telkee (TK).

2.8 MORTISE LOCKS AND LATCHING DEVICES

A. Mortise Locksets, Grade 1 (Heavy Duty): Provide ANSI/BHMA A156.13, Series 1000, Operational Grade 1 Certified Products Directory (CPD) listed mortise locksets. Listed manufacturers shall meet all functions and features as specified herein.

1. Manufacturers:

a. Sargent Manufacturing (SA) - 8200 Series.
b. No Substitution.

2.9 CYLINDRICAL LOCKS AND LATCHING DEVICES

A. Cylindrical Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.2, Series 4000, Operational Grade 1 Certified Products Directory (CPD) listed cylindrical locksets. Listed manufacturers shall meet all functions and features as specified herein.

1. Manufacturers:

a. Sargent Manufacturing (SA) - 10X Line.
b. No Substitution.

2.10 LOCK AND LATCH STRIKES

A. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:

1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
3. Aluminum-Frame Strike Box: Provide manufacturer's special strike box fabricated for aluminum framing.
4. Double-lipped strikes: For locks at double acting doors. Furnish with retractable stop for rescue hardware applications.

B. Standards: Comply with the following:

1. Strikes for Mortise Locks and Latches: BHMA A156.13.
2. Strikes for Bored Locks and Latches: BHMA A156.2.
3. Strikes for Auxiliary Deadlocks: BHMA A156.36.
4. Dustproof Strikes: BHMA A156.16.

2.11 ELECTRIC STRIKES

A. Standard Electric Strikes: Electric strikes conforming to ANSI/BHMA A156.31, Grade 1, for use on non-rated or fire rated openings. Strikes shall be of stainless steel construction tested to a minimum of 1500 pounds of static strength and 70 foot-pounds of dynamic strength with a minimum endurance of 1 million operating cycles. Provide strikes with 12 or 24 VDC capability, fail-secure unless otherwise specified. Where specified provide latchbolt and latchbolt strike monitoring indicating both the position of the latchbolt and locked condition of the strike.

1. Manufacturers:

a. HES (HS) - 1500/1600 Series.

B. Provide electric strikes with in-line power controller and surge suppressor by the same manufacturer as the strike with the combined products having a five year warranty.

2.12 CONVENTIONAL EXIT DEVICES

A. General Requirements: All exit devices specified herein shall meet or exceed the following criteria:

1. Exit devices shall have a five-year warranty.
2. At doors not requiring a fire rating, provide devices complying with NFPA 101 and listed and labeled for "Panic Hardware" according to UL305. Provide proper fasteners as required by manufacturer including sex nuts and bolts at openings specified in the Hardware Sets.
3. Where exit devices are required on fire rated doors, provide devices complying with NFPA 80 and with UL labeling indicating "Fire Exit Hardware". Provide devices with the proper fasteners for installation as tested and listed by UL. Consult manufacturer's catalog and template book for specific requirements.
4. Except on fire rated doors, provide exit devices with hex key dogging device to hold the pushbar and latch in a retracted position. Provide optional keyed cylinder dogging on devices where specified in Hardware Sets.
5. Devices must fit flat against the door face with no gap that permits unauthorized dogging of the push bar. The addition of filler strips is required in any case where the door light extends behind the device as in a full glass configuration.
6. Lever Operating Trim: Where exit devices require lever trim, furnish manufacturer's heavy duty escutcheon trim with threaded studs for thru-bolts.

    a. Lock Trim Design: As indicated in Hardware Sets, provide finishes and designs to match that of the specified locksets.
    b. Where function of exit device requires a cylinder, provide a cylinder (Rim or Mortise) as specified in Hardware Sets.

7. Vertical Rod Exit Devices: Where surface or concealed vertical rod exit devices are used at interior openings, provide as less bottom rod (LBR) unless otherwise indicated. Provide dust proof strikes where thermal pins are required to project into the floor.
8. Narrow Stile Applications: At doors constructed with narrow stiles, or as specified in Hardware Sets, provide devices designed for maximum 2" wide stiles.
9. Dummy Push Bar: Nonfunctioning push bar matching functional push bar.
10. Rail Sizing: Provide exit device rails factory sized for proper door width application.
11. Through Bolt Installation: For exit devices and trim as indicated in Door Hardware Sets.

B. Conventional Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 Certified Products Directory (CPD) listed exit devices. Listed manufacturers shall meet all functions and features as specified herein.

1. Electromechanical exit devices shall have the following functions and features:

    a. Universal Molex plug-in connectors that have standardized color-coded wiring and are field configurable in fail safe or fail secure and operate from 12vdc to 24vdc regulated.
    b. EcoFlex or equivalent technology that reduces energy consumption up to 92% as certified by GreenCircle.
    c. Options to be available for request-to-exit or enter signaling, latchbolt and touchbar monitoring.
    d. Field configurable electrified trim to fail-safe or fail-secure that operates from 12-24VDC.
    e. Five-year limited warranty for electromechanical features.

2. Manufacturers:

    a. Sargent Manufacturing (SA) - 80 Series.
    b. No Substitution.

2.13 SURFACE DOOR CLOSERS

A. All door closers specified herein shall meet or exceed the following criteria:

1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers.
2. Standards: Closers to comply with UL-10C for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.
3. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Where closers are indicated for doors required to be accessible to the Americans with Disabilities Act, provide units complying with ANSI ICC/A117.1.
4. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.
5. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.
6. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates as required for proper installation. Provide through-bolt and security type fasteners as specified in the hardware sets.

B. Door Closers, Surface Mounted (Large Body Cast Iron): ANSI/BHMA A156.4, Grade 1 Certified Products Directory (CPD) listed surface mounted, heavy duty door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron body construction, with adjustable backcheck and separate non-critical valves for closing sweep and latch speed control.

1. Large body cast iron surface mounted door closers shall have a 30-year warranty.
2. Manufacturers:

    a. Sargent Manufacturing (SA) - 281 Series.
    b. No Substitution.

2.14 ELECTROMECHANICAL DOOR OPERATORS

A. Electromechanical Door Operators (High Traffic): Provide ANSI/BHMA A156.19 Certified Products Directory (CPD) listed low energy operators that are UL325/991 and UL10C certified and comply with requirements for the Americans with Disabilities Act (ADA). Operators shall accommodate openings up to 250 pounds and 48” wide. Provide accessories such as custom templates, special mounting brackets, spacers and drop plates as needed for proper installation. Operators shall accommodate openings up to 200 pounds and 48” wide. Listed manufacturers shall meet all functions and features as specified herein.

1. Provide operators with features as follows:

    a. Non-handed with push and pull side mounting.
    b. Activation by push button, hands-free or radio frequency devices.
    c. Adjustable opening force and closing power.
    d. Two-year limited warranty.
    e. Wi-Fi interface where the operator is a secure, password protected WiFi hot spot with no connection to building’s IT required.
        1) Simple setup with no app required.

2) View status and make adjustments without removing the cover.
3) Built-in logic to support single use restroom applications with no external relay boards, logic modules, position switches required.

f. Mounting backplate to simplify and speed up installation.
g. Integration with access control systems.

2. Operators shall have the following functionality:

a. Adjustable Hold Open: Amount of time a door will stay in the full open position after an activation.
b. Blow Open for Smoke Ventilation: Door opens when signal is received from alarm system allowing air or smoke to flow through opening. Door will stay open until signal from alarm system is stopped.
c. Emergency Interface Relay: Door closes and ignores any activation input until signal is discontinued.
d. Infinite Hold Open: Door will hold open at set position until power is turned off.
e. Latch Assist: At closed position, after an activation, the door is pulled in. After the door has closed, the door is pulled in to assist with latch release/engagement.
f. Obstruction Detection: Door closes if it hits an obstruction while opening; door will reverse to open position if it hits an obstruction while closing. Door will stop once it hits an obstruction and will rest against the obstruction until removed.
g. Open Delay: Delays operator opening for locking hardware.
h. Outside Wall Switch Disable: When contact is closed, outside wall switch is disabled.
i. Power Assist: Senses the door is being opened manually and applies small amount of power to assist the user in opening the door with force less than 5 lbs. The door opens only as far as it is moved manually, then closes once released.
j. Power Close: Additional force to assist door closing between 7° and 2°.
k. Presence Detector Input: Input for external sensor to detect presence at door open or close position only.
l. Push & Go: As the door is manually opened, the operator "senses" movement and opens door to the full-open position.
m. Selector Mode Switch: Off disables the signal inputs unless Blow Open is activated, on activates the signal inputs, hold open activates the unit (unless Blow Closed is activated) to the hold open position.
n. Vestibule Delay: When the wall switch is pressed, first door in vestibule will open. Second door will open once vestibule door delay has expired. Delay is adjustable.
o. Executive Mode Feature: When the door receives an activation signal it opens and remains open until either a second signal is received, or the door is manually moved in closing direction.

3. Manufacturers:

a. Horton Automatics (HO) - 4000 Series.
b. No Substitution – Facility Standard.

2.15 SURFACE MOUNTED CLOSER HOLDERS

A. Electromagnetic Door Holders: ANSI A156.15, Grade 1 electromagnetic door holder/releases with a minimum 25 to 40 pounds holding power and fail-safe operation; power failure releases door to close.

1. Manufacturers:

a. Norton Rixson (NO) - 900 Series.

2.16 ARCHITECTURAL TRIM AND ACCESSORIES

A. Door, Frame and Wall Protective Trim: ANSI/BHMA A156.6, protective products as specified in the hardware sets. Door protection plates shall be not more than 2" less than door width on stop side and 1” less door width on the pull side or on stop side of pairs of doors. Listed manufacturers shall meet all functions and features as specified herein.

1. Provide protective trim with functions and features as follows:

a. Meets ADA requirements for smooth bottom door surfaces.
b. UL Classified options for use on fire-rated doors up to 3 hours.
c. Fabricated from stainless steel, brass, bronze, aluminum, or high-impact plastic.
d. Available in a variety of sizes, finishes, and profiles to suit aesthetic and functional requirements.
e. Designed to protect doors, frames, and adjacent walls from damage due to impact, abrasion, or traffic.
f. Fasteners included; adhesive-backed options available for select models.
g. Ten-year limited warranty.

2. Manufacturers:

a. Rockwood (RO).

2.17 DOOR STOPS AND HOLDERS

A. Door Stops and Bumpers: ANSI/BHMA A156.16, Grade 1 door stops and wall bumpers. Provide wall bumpers, either convex or concave types with anchorage as indicated, unless floor or other types of door stops are specified in Hardware Sets. Do not mount floor stops where they will impede traffic. Where floor or wall bumpers are not appropriate, provide overhead type stops and holders.

1. Manufacturers:

a. Rockwood (RO).

B. Overhead Door Stops and Holders: ANSI/BHMA A156.8, Grade 1 Certified Products Directory (CPD) listed overhead stops and holders to be surface or concealed types as indicated in Hardware Sets. Track, slide, arm and jamb bracket to be constructed of extruded bronze and shock absorber spring of heavy tempered steel. Provide non-handed design with mounting brackets as required for proper operation and function.

1. Manufacturers:

a. Norton Rixson (NO).
b. Sargent Manufacturing (SA).

2.18 ARCHITECTURAL SEALS

A. General: Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and

provide smoke, light, or sound gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners and elsewhere where indicated.

B. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing according to UL 1784.

1. Provide smoke labeled perimeter gasketing at all smoke labeled openings.

C. Fire Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UL-10C.

1. Provide intumescent seals as indicated to meet UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, and NFPA 252, Standard Methods of Fire Tests of Door Assemblies.

D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated.

1. Provide acoustic seals as indicated in hardware groups.

E. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.

F. Manufacturers:

1. Pemko (PE).

2.19 ELECTRONIC ACCESSORIES

A. Door Position Switches: Door position magnetic reed contact switches specifically designed for use in commercial door applications. On recessed models the contact and magnetic housing snap-lock into a 1" diameter hole. Surface mounted models include wide gap distance design complete with armored flex cabling. Provide SPDT, N/O switches with optional Rare Earth Magnet installation on steel doors with flush top channels.

1. Manufacturers:

a. Securitron (SU) - DPS Series.

B. Intelligent Switching Power Supplies: Provide the least number of power supplies at the appropriate amperage level sufficient to exceed the required total draw for the specified electrified hardware and access control equipment.

1. Power supplies shall meet all functions and features as specified herein.

a. UL listed dual voltage 12 or 24 VDC field selectable continuous output.
b. Dedicated fast charger to prolong battery life with low battery cutoff to protect batteries from deep discharge.
c. Enhanced surge immunity for input/output protection
d. Separate, dedicated battery charging circuit to keep locks cooler.

e. Dual-color LED visual notification to prevent applying incorrect voltages to the power supply.
f. Instant auto-switch to battery on AC loss.
g. Expandable up to 16 outputs in the standard enclosure
h. Integrated fire alarm interface to allow main output shutdown or disconnect on a per output basis when using an R8 output module.
i. Network ready and remotely manage locks and connected devices when using an M8 managed output module on network models.
j. Lifetime replacement, no-fault, no questions asked warranty.

2. Manufacturers:

a. Securitron (SU) - AQL Series.

2.20 FABRICATION

A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.

2.21 FINISHES

A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.

B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware

C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.

B. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 PREPARATION

A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.

B. Wood Doors: Comply with ANSI/DHI A115-W series.

3.3 INSTALLATION

A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.

1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.

B. Paint prime coated mullions to match frames.

C. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:

1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
2. DHI TDH-007-20: Installation Guide for Doors and Hardware.
3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.

D. Retrofitting: Install door hardware to comply with manufacturer's published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.

E. Push Plates and Door Pulls: When through-bolt fasteners are in the same location as a push plate, countersink the fasteners flush with the door face allowing the push plate to sit flat against the door.

F. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."

G. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

3.4 FIELD QUALITY CONTROL

A. Field Inspection (Punch Report): Reference Division 01 Sections “Closeout Procedures”. Produce project punch report for each installed door opening indicating compliance with approved submittals and verification hardware is properly installed, operating and adjusted. Include list of items to be completed and corrected, indicating the reasons or deficiencies causing the Work to be incomplete or rejected.

1. Organization of List: Include separate Door Opening and Deficiencies and Corrective Action Lists organized by Mark, Opening Remarks and Comments, and related Opening Images and Video Recordings.

3.5 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

3.6 CLEANING AND PROTECTION

A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.

B. Clean adjacent surfaces soiled by door hardware installation.

C. Clean operating items as necessary to restore proper finish. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

3.7 DEMONSTRATION

A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

3.8 DOOR HARDWARE SETS

A. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.

1. Quantities listed are for each pair of doors, or for each single door.
2. The supplier is responsible for handing and sizing all products.
3. Where multiple options for a piece of hardware are given in a single line item, the supplier shall provide the appropriate application for the opening.
4. At existing openings with new hardware the supplier shall field inspect existing conditions prior to the submittal stage to verify the specified hardware will work as required. Provide alternate solutions and proposals as needed.

B. Manufacturer’s Abbreviations:

1. MK - McKinney
2. PE - Pemko
3. SU - Securitron
4. SA - SARGENT
5. RO - Rockwood
6. HS - HES

7. NO - Norton Rixson
8. HO - Horton Automatics
9. OT – Other
10. LO - Lorient

Hardware Sets

Set: 1.0

Doors: 100A

1	Continuous Hinge	KDFMxxx-HD1 PT		PE
1	Electric Power Transfer	EL-CEPT	613E	SU
1	Rim Exit Device, Storeroom	55 56 AD8504 LESS PULL	US10B	SA
1	Offset Door Pull	RM3311-36 Mtg-Type 1XHD	US10B	RO
1	Door Operator (Single)	4000 Series	690	HO
1	Rain Guard	346D		PE
1	Sweep	3452DNB		PE
1	Threshold	253x3DFG		PE
1	ElectroLynx Harness	QC-C1500P (Frame - EPT to Power/Controller)		MK
1	Card Reader	BY SECURITY CONTRACTOR		OT
1	ElectroLynx Harness	QC-CxxxP (Door - EPT to Elec. Exit Device)		MK
2	Door Switch	503		NO
1	Position Switch	DPS-M / W		SU
1	Power Supply	AQL SERIES (BY AMPERAGE REQUIRED)		SU
1	Gasketing	PROVIDED BY ALUMINUM DOOR MANUFACTURER		OT
1	Wiring Diagram	ELEVATION AND POINT TO POINT AS SPECIFIED		OT

Notes: Door normally closed, latched and secured.
Entry by valid card read or by key override.
Entry by pull when exit device is electrically dogged open by access control system during business hours.
Entry by actuator as programmed by access control system.
Door monitored for ajar or forced open.
Free egress at all times.

Set: 2.0

Doors: 107, A136

3	Hinge, Full Mortise, Hvy Wt	T4A3786 4-1/2" x 4-1/2"	US10B	MK
1	Rim Exit Device, Storeroom	8804 ETMW	US10B	SA

1 Parallel Surface Closer w/ Stop Arm	281 CPS	EB	SA
1 Kick Plate	K1050 10" X 2" LDW CSK BEV	US10B	RO
1 Gasketing	2891DPK		PE
1 Rain Guard	346D		PE
1 Sweep	3452DNB		PE
1 Threshold	253x3DFG		PE

Notes: Door normally closed, latched and secured.
Entry by key override.
Free egress at all times.

Install gasketing prior to soffit mounted hardware. Do not notch gasketing for soffit mounted hardware.

Existing door and frame to remain.
-Field verify existing conditions prior to ordering product(s).
-Field modify existing door and/or frame, as required, to accept new hardware specified.
-Immediately inform the Architect of product that may not work with the existing frame and/or door conditions.
-Use above new hardware, all other hardware to remain.

Set: 3.0

Doors: 129A

6 Hinge, Full Mortise, Hvy Wt	T4A3786 4-1/2" x 4-1/2"	US10B	MK
2 Electric Power Transfer	EL-CEPT	613E	SU
1 Surface Vert Rod Exit	55 56 NB-8706 ETMW	US10	SA
1 Surface Vert Rod Exit	55 NB-8710 ETMW	US10B	SA
2 Parallel Surface Closer	281 P10	EB	SA
2 Kick Plate	K1050 8" X 1" LDW CSK BEV	US10B	RO
2 Electromagnetic Holder	998M	690	NO
2 Silencer	608/609 RKW		RO
2 ElectroLynx Harness	QC-C1500P (Frame - EPT to Power/Controller)		MK
1 Card Reader	BY SECURITY CONTRACTOR		OT
2 ElectroLynx Harness	QC-CxxxP (Door - EPT to Elec. Exit Device)		MK
2 Position Switch	DPS-M / W		SU
1 Power Supply	AQL SERIES (BY AMPERAGE REQUIRED)		SU
1 Wiring Diagram	ELEVATION AND POINT TO POINT AS SPECIFIED		OT

Notes: Doors normally closed, latched and secured.
Entry by valid card read or key override on active leaf.
Door monitored for ajar or forced open.
Free egress at all times.

Set: 4.0

Doors: 104

3	Hinge, Full Mortise, Hvy Wt	T4A3786 4-1/2" x 4-1/2"	US10B MK
1	Storeroom/Closet Lock	10XG04 LMW	US10B SA
1	Standard Surface Closer	281 O	EB SA
1	Kick Plate	K1050 8" X 2" LDW CSK BEV	US10B RO
1	Wall Stop	400/403	US10B RO
3	Silencer	608/609 RKW	RO

Set: 5.0

Doors: 105

3	Hinge, Full Mortise, Hvy Wt	T4A3786 4-1/2" x 4-1/2"	US10B MK
1	Storeroom/Closet Lock	10XG04 LMW	US10B SA
1	SMART Pac Bridge Rectifier	2005M3	HS
1	Electric Strike	1600-CLB	613E HS
1	Parallel Surface Closer	281 P10	EB SA
1	Kick Plate	K1050 8" X 2" LDW CSK BEV	US10B RO
1	Wall Stop	400/403	US10B RO
3	Silencer	608/609 RKW	RO
1	Card Reader	BY SECURITY CONTRACTOR	OT
1	Position Switch	DPS-M / W	SU
1	Power Supply	AQL SERIES (BY AMPERAGE REQUIRED)	SU
1	Wiring Diagram	ELEVATION AND POINT TO POINT AS SPECIFIED	OT

Notes: Door normally closed, latched and secured.
Entry by valid card read or by key override.
Door monitored for ajar or forced open.
Free egress at all times.

Set: 6.0

Doors: 108, 109

3	Hinge, Full Mortise	TA2714-MCK 4-1/2" x 4-1/2"	US10B MK
1	Entry/Office Lock	10XG05 LMW	US10B SA
1	Wall Stop	400/403	US10B RO
3	Silencer	608/609 RKW	RO

Set: 7.0

Doors: 125A

3	Hinge, Full Mortise	TA2714-MCK 5" x 4-1/2"	US10B MK
1	Entry/Office Lock	10XG05 LMW	US10B SA
1	Wall Stop	400/403	US10B RO
3	Silencer	608/609 RKW	RO
1	Acoustic Seal	LAS1212	White LO

Set: 8.0

Doors: 128

3	Hinge, Full Mortise, Hvy Wt	T4A3786 5" x 4-1/2"	US10B MK
1	Entry/Office Lock	10XG05 LMW	US10B SA
1	Standard Surface Closer	281 O	EB SA
1	Kick Plate	K1050 8" X 2" LDW CSK BEV	US10B RO
1	Wall Stop	400/403	US10B RO
3	Silencer	608/609 RKW	RO

Set: 9.0

Doors: 126B

3	Hinge, Full Mortise, Hvy Wt	T4A3786 4-1/2" x 4-1/2"	US10B MK
1	Entry/Office Lock	10XG05 LMW	US10B SA
1	Parallel Surface Closer w/ Stop Arm	281 CPS	EB SA
1	Kick Plate	K1050 8" X 2" LDW CSK BEV	US10B RO
3	Silencer	608/609 RKW	RO

Set: 10.0

Doors: 120

3	Hinge, Full Mortise	TA2714-MCK 4-1/2" x 4-1/2"	US10B MK
1	Classroom Lock	10XG37 LMW	US10B SA
1	Wall Stop	400/403	US10B RO
3	Silencer	608/609 RKW	RO

Set: 11.0

Doors: 121

3	Hinge, Full Mortise, Hvy Wt	T4A3786 4-1/2" x 4-1/2"	US10B MK
1	Classroom Lock	10XG37 LMW	US10B SA
1	Parallel Surface Closer w/ Stop Arm	281 CPS	EB SA
1	Kick Plate	K1050 8" X 2" LDW CSK BEV	US10B RO

3 Silencer	608/609 RKW		RO

Set: 12.0

Doors: 103, 106, 122

3 Hinge, Full Mortise, Hvy Wt	T4A3786 4-1/2" x 4-1/2"	US10B	MK
1 Privacy Lock w/ Indicator	V21 EMB 8265 LNMW	US10B	SA
1 Standard Surface Closer	281 O	EB	SA
1 Kick Plate	K1050 8" X 2" LDW CSK BEV	US10B	RO
1 Wall Stop	400/403	US10B	RO
1 Gasketing	S88D		PE
1 Coat Hook	RM820	10BE	RO

Set: 13.0

Doors: 102

3 Hinge, Full Mortise, Hvy Wt	T4A3786 4-1/2" x 4-1/2"	US10B	MK
1 Privacy Lock w/ Indicator	V21 EMB 8265 LNMW	US10B	SA
1 Surface Overhead Holder/Stop	9-X36	690	NO
1 Standard Surface Closer	281 O	EB	SA
1 Kick Plate	K1050 8" X 2" LDW CSK BEV	US10B	RO
1 Gasketing	S88D		PE
1 Coat Hook	RM820	10BE	RO

Set: 14.0

Doors: A180

3 Hinge, Full Mortise	TA2714-MCK 5" x 4-1/2"	US10B	MK
1 Passage Latch	10XU15 LMW	US10B	SA
1 Wall Stop	400/403	US10B	RO
3 Silencer	608/609 RKW		RO
1 Acoustic Seal	LAS1212	White	LO

Set: 15.0

Doors: 127

6 Hinge, Full Mortise	TA2714-MCK 4-1/2" x 4-1/2"	US10B	MK
2 Roller Latch	594	US10B	RO
2 Dummy Trim	10XU94 LMW	US10B	SA
2 Surface Overhead Holder/Stop	9-X36	690	NO
2 Silencer	608/609 RKW		RO
1 Acoustic Seal	LAS1212	White	LO

Set: 16.0

Doors: 110, 114, 115, 116, 124, 126A

3 Hinge, Full Mortise	TA2714-MCK 4-1/2" x 4-1/2"	US10B	MK
1 Passage Latch	10XU15 LMW	US10B	SA
1 Surface Overhead Holder/Stop	9-X36	690	NO
3 Silencer	608/609 RKW		RO
1 Acoustic Seal	LAS1212	White	LO

Set: 17.0

Doors: 111, 112, 113, 117

3 Hinge, Full Mortise	TA2714-MCK 5" x 4-1/2"	US10B	MK
1 Passage Latch	10XU15 LMW	US10B	SA
1 Surface Overhead Holder/Stop	9-X36	690	NO
3 Silencer	608/609 RKW		RO
1 Acoustic Seal	LAS1212	White	LO

Set: 18.0

Doors: 100B

1 Continuous Hinge	KDFMxxx-HD1		PE
1 Offset Door Pull	RM3311-36 Mtg-Type 1XHD	US10B	RO
1 Push Bar	RM3122	US10B	RO
1 Door Operator (Single)	4000 Series	690	HO
2 Door Switch	503		NO
1 Gasketing	PROVIDED BY ALUMINUM DOOR MANUFACTURER		OT

Set: 19.0

Doors: 119

3 Hinge, Full Mortise, Hvy Wt	T4A3786 4-1/2" x 4-1/2"	US10B	MK
1 Classroom Lock	10XG37 LMW	US10B	SA

Notes: Existing door and frame to remain.
-Field verify existing conditions prior to ordering product(s).
-Field modify existing door and/or frame, as required, to accept new hardware specified.
-Immediately inform the Architect of product that may not work with the existing frame and/or door conditions.
-Use above new hardware, all other hardware to remain.

END OF SECTION

SECTION 08 80 00
GLAZING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Insulating glass units.

B. Glazing units.

C. Plastic films.

D. Glazing compounds.

1.02 RELATED REQUIREMENTS

A. Section 07 92 00 - Joint Sealants: Sealants for other than glazing purposes.

B. Section 08 43 13 - Aluminum-Framed Storefronts.

1.03 REFERENCE STANDARDS

A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials.

B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test.

C. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers.

D. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.

E. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass.

F. ASTM C1172 - Standard Specification for Laminated Architectural Flat Glass.

G. ASTM C1193 - Standard Guide for Use of Joint Sealants.

H. ASTM C1376 - Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass.

I. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings.

J. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation.

K. GANA (GM) - GANA Glazing Manual.

L. GANA (SM) - GANA Sealant Manual.

M. NFRC 100 - Procedure for Determining Fenestration Product U-factors.

N. NFRC 200 - Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence.

O. NFRC 300 - Test Method for Determining the Solar Optical Properties of Glazing Materials and Systems.

1.04 SUBMITTALS

A. See Section 01 40 00 - Quality Requirements for submittal procedures.

B. Product Data on Insulating Glass Unit and Glazing Unit Glazing Types: Provide structural, physical and environmental characteristics, size limitations, special handling and installation requirements.

1. On mirror glass: mastic, and edge trim (if indicated).

C. Product Data on Glazing Compounds and Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements, and identify available colors.

D. Samples: Submit two samples 12 by 12 inch in sizeof each type of insulated glass units showing coloration and thermal spacer design.

E. Environmental Product Declarations.

F. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Perform Work in accordance with GANA (GM) for glazing installation methods.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with documented experience.

C. Installer Qualifications: Company specializing in performing work of the type specified and approved by manufacturer.

1.06 FIELD CONDITIONS

A. Do not install glazing when ambient temperature is less than 40 degrees F.

B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

C. Store products in manufacturer's unopened packaging until ready for installation.

1.07 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

B. Insulating Glass Units: Provide a ten (10) year manufacturer warranty to include coverage for seal failure, interpane dusting or misting, including replacement of failed units.

C. Laminated Glass: Provide a five (5) year manufacturer warranty to include coverage for delamination, including providing products to replace failed units.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Glass Fabricators:
   1. Oldcastle; www.obe.com
   2. Viracon, Inc: www.viracon.com.
   3. Substitutions: See Section 01 60 00 - Product Requirements.

B. Float Glass Manufacturers:
   1. Cardinal Glass Industries: www.cardinalcorp.com/#sle.
   2. Guardian Glass, LLC: www.guardianglass.com.
   3. Pilkington North America Inc: www.pilkington.com/na/#sle.
   4. PPG Industries, Inc: www.ppgideascapes.com.
   5. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 PERFORMANCE REQUIREMENTS - EXTERIOR GLAZING ASSEMBLIES

A. Provide type and thickness of exterior glazing assemblies to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of glass.
   1. Design Pressures: see Structural Notes in Drawings.
   2. Comply with ASTM E1300 for design load resistance of glass type, thickness, dimensions, and maximum lateral deflection of supported glass.
   3. Provide glass edge support system sufficiently stiff to limit the lateral deflection of supported glass edges to less than 1/175 of their lengths under specified design load.
   4. Glass thicknesses listed are minimum.

B. Weather-Resistive Barrier Seals: Provide completed assemblies that maintain continuity of building enclosure water-resistive barrier, vapor retarder, and/or air barrier.
   1. In conjunction with weather barrier related materials described in other sections, as follows:

a. Air Barriers: See Section 07 27 00.

2. To utilize inner pane of multiple pane insulating glass units for continuity of vapor retarder and/or air barrier seal.
3. To maintain a continuous vapor retarder and/or air barrier throughout glazed assembly from glass pane to heel bead of glazing sealant.

C. Thermal and Optical Performance: Provide exterior glazing products with performance properties as indicated. Performance properties are in accordance with manufacturer's published data as determined with the following procedures and/or test methods:
1. Center of Glass U-Value: Comply with NFRC 100 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 7 computer program.
2. Center of Glass Solar Heat Gain Coefficient (SHGC): Comply with NFRC 200 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 7 computer program.
3. Solar Optical Properties: Comply with NFRC 300 test method.

2.03 GLASS MATERIALS

A. Float Glass: Provide float glass based glazing unless otherwise indicated.
1. Kind HS - Heat-Strengthened Type: Complies with ASTM C1048.
2. Kind FT - Fully Tempered Type: Complies with ASTM C1048.
3. Fully Tempered Safety Glass: Complies with ANSI Z97.1 or 16 CFR 1201 criteria for safety glazing used in hazardous locations.

B. Laminated Glass: Float glass laminated in accordance with ASTM C1172.
1. Laminated Safety Glass: Complies with ANSI Z97.1 - Class A or 16 CFR 1201 - Category II impact test requirements.

2.04 INSULATING GLASS UNITS

A. Manufacturers:
1. Viracon, Apogee Enterprises, Inc: www.viracon.com.
2. Vitro Architectural Glass: www.vitroglazings.com.
3. Substitutions: See Section 01 60 00 - Product Requirements.

B. Insulating Glass Units: Types as indicated.
1. Durability: Certified by an independent testing agency to comply with ASTM E2190.
2. Coated Glass: Comply with requirements of ASTM C1376 for pyrolytic (hard-coat) or magnetic sputter vapor deposition (soft-coat) type coatings on flat glass; coated vision glass, Kind CV; coated overhead glass, Kind CO; or coated spandrel glass, Kind CS.
3. Glass Edges: Seamed, no exceptions.
4. Warm-Edge Spacers: Low conductivity thermoplastic and stainless steel.
a. Spacer Width: As required for specified insulating glass unit.
b. Spacer Height: Manufacturer's standard.
c. Products:
1) Technoform Glass Insulation; TGI-Spacer: www.glassinsulation.us/#sle.
2) Substitutions: See Section 01 60 00 - Product Requirements.
5. Spacer Color: Black.
6. Edge Seal:
a. Dual-Sealed System: Provide polyisobutylene sealant as primary seal applied between spacer and glass panes, and silicone, polysulfide, or polyurethane sealant as secondary seal applied around perimeter.
b. Single-Sealed Systems prohibited
7. Color: Black.
8. Purge interpane space with dry air, hermetically sealed.

C. Insulating Glass Units: Vision glass, double glazed.
1. Applications: Exterior glazing unless otherwise indicated.
2. Space between lites filled with air.

3. Outboard Lite: Fully tempered float glass, 1/4 inch thick, minimum.
    a. Tint: Clear.
    b. Coating: Low-E (passive type), on #2 surface.
4. Inboard Lite: Fully tempered float glass, 1/4 inch thick, minimum.
    a. Tint: Clear.
5. Total Thickness: 1 inch.
6. Thermal Transmittance (U-Value), Winter - Center of Glass: 0.29, minimum.
7. Solar Heat Gain Coefficient (SHGC): 38 percent, nominal.
8. Visible Light Reflectance, Outside: 11 percent, nominal.
9. Glazing Method: Dry glazing method, gasket glazing.
10. **BASIS OF DESIGN:** 1/4" Guardian SunGuard SuperNeutral 68 on Clear

D. Safety Insulating Glass Units: Safety glazing.
1. Applications:
    a. Glazed lites in exterior doors.
    b. Glazed sidelights and panels next to doors.
    c. Other locations required by applicable federal, state, and local codes and regulations.
2. Glass Type: Same as typical IGU except use fully tempered float glass for inboard lite.

2.05 GLAZING UNITS

A. Type _____ - Monolithic Interior Vision Glazing: non-fire-rated.
1. Applications: Interior glazing unless otherwise indicated.
2. Glass Type: Fully tempered float glass.
3. Tint: Clear.
4. Thickness: 1/4 inch, nominal.
5. Glazing Method: Dry glazing method, gasket glazing.

2.06 PLASTIC FILMS

A. Plastic Film: polyester type.
1. Location: Door 105 refer to drawings.
2. Thickness: ___
3. Manufacturers:
    a. 3M Window Films; Fasara: solutions.3m.com/wps/portal/3M/en_US/Window_Film/Solutions/.
    b. Lashier Graphics & Signs
    c. Solyx
    d. Substitutions: See Section 01 60 00 - Product Requirements.

2.07 GLAZING COMPOUNDS

A. Butyl Sealant: Single component; ASTM C920 Grade NS, Class 12-1/2, Uses M and A, Shore A hardness of 10 to 20; black color.

B. Manufacturers:
1. Bostik Inc: www.bostik-us.com.
2. Dow Corning Corporation: www.dowcorning.com/construction.
3. Momentive Performance Materials, Inc: www.momentive.com.
4. Pecora Corporation: www.pecora.com.
5. GE Plastics: www.geplastics.com.
6. Substitutions: See Section 01 60 00 - Product Requirements.

2.08 ACCESSORIES

A. Setting Blocks: Silicone, with 80 to 90 Shore A durometer hardness; ASTM C864 Option II. Length of 0.1 inch for each square foot of glazing or minimum 4 inch x width of glazing rabbet space minus 1/16 inch x height to suit glazing method and pane weight and area.

B. Glazing Gaskets: Resilient silicone extruded shape to suit glazing channel retaining slot; ASTM C864 Option I; color black.

C. Glazing Channels: clear anodized aluminum, sizes as detailed.

D. Glazing Clips: Manufacturer's standard type.

2.09 FABRICATION

A. Mirror Edge Treatment: Flat polished. Seal edges of mirrors with edge sealer after edge treatment to prevent chemical or atmospheric penetration of glass coating.

B. Fabricate glass and other glazing products in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with recommendations of product manufacturer and reference glazing standard as required to comply with system performance requirements.

PART 3 EXECUTION

3.01 VERIFICATION OF CONDITIONS

A. Verify that openings for glazing are correctly sized and within tolerances, including those for size, squareness, and offsets at corners.

B. Verify that the minimum required face and edge clearances are being provided.

C. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and support framing is ready to receive glazing system.

D. Verify that sealing between joints of glass framing members has been completed effectively.

E. Proceed with glazing system installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Clean contact surfaces with appropriate solvent and wipe dry immediately before glazing. Remove coatings that are not tightly bonded to substrates.

B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.

C. Prime surfaces scheduled to receive sealant where required for proper sealant adhesion.

3.03 INSTALLATION, GENERAL

A. Install glazing in compliance with written instructions of glass, gaskets, and other glazing material manufacturers, unless more stringent requirements are indicated, including those in glazing referenced standards.

B. Install glazing sealants in accordance with ASTM C1193, GANA (SM), and manufacturer's instructions.

C. Do not exceed edge pressures around perimeter of glass lites as stipulated by glass manufacturer.

D. Set glass lites of system with uniform pattern, draw, bow, and similar characteristics.

E. Set glass lites in proper orientation so that coatings face exterior or interior as indicated.

F. Prevent glass from contact with any contaminating substances that may be the result of construction operations such as, and not limited to the following; weld splatter, fire-safing, plastering, mortar droppings, and paint.

3.04 INSTALLATION - DRY GLAZING METHOD (GASKET GLAZING)

A. Application - Exterior and/or Interior Glazed: Set glazing infills from either the exterior or the interior of the building.

B. Place setting blocks at 1/4 points with edge block no more than 6 inch from corners.

C. Rest glazing on setting blocks and push against fixed stop with sufficient pressure on gasket to attain full contact.

D. Install removable stops without displacing glazing gasket; exert pressure for full continuous contact.

3.05 CLEANING

A. Remove excess glazing materials from finish surfaces immediately after application using solvents or cleaners recommended by manufacturers.

B. Remove nonpermanent labels immediately after glazing installation is complete.

C. Clean glass and adjacent surfaces after sealants are fully cured.

D. Clean glass on both exposed surfaces not more than 4 days prior to Date of Substantial Completion in accordance with glass manufacturer's written recommendations.

3.06 PROTECTION

A. After installation, mark pane with an 'X' by using removable plastic tape or paste; do not mark heat absorbing or reflective glass units.

B. Remove and replace glass that is damaged during construction period prior to Date of Substantial Completion.

END OF SECTION

SECTION 09 05 61
COMMON WORK RESULTS FOR FLOORING PREPARATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. This section applies to floors identified in Contract Documents that are receiving the following types of floor coverings:
   1. Resilient flooring.
   2. Carpet tile.
   3. Thin-set ceramic tile and stone tile.

B. Preparation of new and existing concrete floor slabs for installation of floor coverings.

C. Testing of concrete floor slabs for moisture and alkalinity (pH).

D. Remediation of concrete floor slabs due to unsatisfactory moisture or alkalinity (pH) conditions.
   1. Contractor shall perform all specified remediation of concrete floor slabs. If such remediation is indicated by testing agency's report and is due to a condition not under Contractor's control or could not have been predicted by examination prior to entering into the contract, a contract modification will be issued.

E. Alternate flooring adhesive.

F. Remedial floor coatings.

1.02 RELATED REQUIREMENTS

A. Section 01 40 01 - Quality Requirements: Additional requirements relating to testing agencies and testing.

B. Structural Drawings: Limitations on curing requirements for new concrete floor slabs.

1.03 DEFINITIONS

A. MVE: Moisture Vapor Emission.

B. MVER: Moisture Vapor Emission Rate; measured in lbs per1000 ft2 / 24 hours.

C. RH: Relative Humidity; measured in percentage.

D. VOC: Volatile Organic Compound; measured in grams/liter.

E. CSP: Concrete Surface Profile defined by ICRI.

1.04 REFERENCE STANDARDS

A. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.

B. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.

C. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes.

D. ASTM F3010 - Standard Practice for Two-Component Resin Based Membrane-Forming Moisture Mitigation Systems for Use Under Resilient Floor Coverings;2018.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Coordinate scheduling of cleaning and testing, so that preliminary cleaning has been completed for at least 24 hours prior to testing.

B. Pre-Installation Meeting:
   1. Convene minimum two weeks prior to starting work of this section.
   2. Discuss contract document requirements, moisture tests, manufacturer recommendations, installer's recommendations, scheduling, and protection of work from damage by other trades.

3. Attendance required by: Contractor, Floor Installer, Manufacturer's Representative, Independent testing agency, Concrete Subcontractor, Ready Mix supplier.
4. Objective of conference is:
    a. Review methods and procedures.
    b. Tour job site representative areas to inspect and discuss condition of substrate.
    c. Review concrete finishing requirements.
    d. Review and finalize construction schedule to ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.
    e. Review required inspections, testing, certifications, material usage procedures.
    f. Review environmental restrictions and forecasts.
    g. Confirm compatibility of MVE control coatings with other concrete chemicals specified.
    h. Record content of conference including attendance and topics.
5. Furnish record of pre-installation conference to all parties who are affected by MVE control systems work.

1.06 SUBMITTALS

A. See Section 01 40 00 - Quality Requirements for submittal procedures.

B. Floor Covering and Adhesive Manufacturers' Product Literature: For each specific combination of substrate, floor covering, and adhesive to be used; showing:
1. Moisture and alkalinity (pH) limits and test methods.
2. Manufacturer's required bond/compatibility test procedure.

C. Remedial Materials Product Data: Manufacturer's published data on each product to be used for remediation.
1. Certificate: Manufacturer's certification of compatibility with types of flooring applied over remedial product.
2. Test reports indicating compliance with specified performance requirements, performed by nationally recognized independent testing agency.
3. Specimen Warranty: Copy of warranty to be issued by coating manufacturer and certificate of underwriter's coverage of warranty.

D. Testing Agency's Report:
1. Description of areas tested; include floor plans and photographs if helpful.
2. Summary of conditions encountered.
3. Moisture and alkalinity (pH) test reports.
4. Copies of specified test methods.
5. Recommendations for remediation of unsatisfactory surfaces.
6. Product data for recommended remedial coating.
7. Submit report to Architect.
8. Submit report not more than two business days after conclusion of testing.

E. Adhesive Bond and Compatibility Test Report.

1.07 QUALITY ASSURANCE

A. Supply all components of MVE Control System from single source manufacturer.

B. Moisture and alkalinity (pH) testing shall be performed by an independent testing agency employed and paid by Contractor.

C. Testing Agency Qualifications: Independent testing agency experienced in the types of testing specified.
1. Submit evidence of experience consisting of at least 3 test reports of the type required, with project Owner's project contact information.

D. Contractor's Responsibility Relating to Independent Agency Testing:
1. Provide access for and cooperate with testing agency.

2. Confirm date of start of testing at least 10 days prior to actual start.
3. Allow at least 4 business days on site for testing agency activities.
4. Achieve and maintain specified ambient conditions.
5. Notify Architect when specified ambient conditions have been achieved and when testing will start.

E. Remedial Coating Installer Qualifications: Company specializing in performing work of the type specified in this section, trained by or employed by coating manufacturer, and able to provide at least 3 project references showing at least 3 years' experience installing moisture emission coatings.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, handle, and protect products in accordance with manufacturer's instructions and recommendations.

B. Deliver materials in manufacturer's packaging; include installation instructions.

C. Keep materials from freezing.

1.09 FIELD CONDITIONS

A. Maintain ambient temperature in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 65 degrees F or more than 85 degrees F.

B. Maintain relative humidity in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 40 percent and not more than 60 percent.

PART 2 PRODUCTS

2.01 MATERIALS

A. Alternate Flooring Adhesive: Floor covering manufacturer's recommended product, suitable for the moisture and pH conditions present; low-VOC. In the absence of any recommendation from flooring manufacturer, provide a product recommended by adhesive manufacturer as suitable for substrate and floor covering and for conditions present.

B. Remedial Floor Coating, Two-Component: Single-layer coating resistant to water vapor transmission meeting flooring manufacturer's emission limits, resistant to alkalinity (pH) level found, and suitable for flooring adhesion without further treatment.
1. Material: Comply with ASTM F3010.
2. Thickness: As required for application and in accordance with manufacturer's installation instructions.
3. Products:
   a. Allied Construction Technologies, Inc; ACTECH 2170 FC Interior: www.actechperforms.com/#sle.
   b. ARDEX Engineered Cements; ARDEX MC RAPID: www.ardexamericas.com/#sle.
   c. Custom Building Products; TechMVC Moisture Vapor and Alkalinity Barrier: www.custombuildingproducts.com/#sle.
   d. Koster American Corporation; Koster VAP 1 2000: www.kosterusa.com/#sle.
   e. LATICRETE International, Inc; LATICRETE VAPOR BAN E: www.laticrete.com/#sle.
   f. Mapei Corporation; Planiseal VS or Paniseal VS Fast: www.mapei.com/#sle.
   g. Maxxon Corporation; Maxxon MVP Two-Part Epoxy: www.maxxon.com/#sle.
   h. TEC, an H.B. Fuller Construction Products Brand; TEC LiquiDam with TEC Level Set 200 SLU: www.tecspecialty.com.
   i. Tnemec Company, Inc; Series 208 Epoxoprime MVT: www.tnemec.com.
   j. UZIN UTZ NORTH AMERICA, INC; UZIN PE 460 with UZIN PE 280: https://us.uzin.com/#sle.
   k. Substitutions: See Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.01 CONCRETE SLAB PREPARATION

A. Perform following operations in the order indicated:
   1. Preliminary cleaning.
   2. Moisture vapor emission tests; 3 tests in the first 1000 square feet and one test in each additional 1000 square feet, unless otherwise indicated or required by flooring manufacturer.
   3. Internal relative humidity tests; in same locations as moisture vapor emission tests, unless otherwise indicated.
   4. Alkalinity (pH) tests; in same locations as moisture vapor emission tests, unless otherwise indicated.
   5. Specified remediation, if required.
   6. Patching, smoothing, and leveling, as required.
   7. Other preparation specified.
   8. Adhesive bond and compatibility test.
   9. Protection.

B. Remediations:
   1. Active Water Leaks or Continuing Moisture Migration to Surface of Slab: Correct this condition before doing any other remediation; re-test after correction.
   2. Excessive Moisture Emission or Relative Humidity: If an adhesive that is resistant to the level of moisture present is available and acceptable to flooring manufacturer, use that adhesive for installation of the flooring; if not, apply remedial floor coating or remedial sheet membrane over entire suspect floor area.
   3. Excessive Alkalinity (pH): If remedial floor coating is necessary to address excessive moisture, no additional remediation is required; if not, if an adhesive that is resistant to the level present is available and acceptable to the flooring manufacturer, use that adhesive for installation of the flooring; otherwise, apply a skim coat of specified patching compound over entire suspect floor area.

3.02 PRELIMINARY CLEANING

A. Clean floors of dust, solvents, paint, wax, oil, grease, asphalt, residual adhesive, adhesive removers, film-forming curing compounds, sealing compounds, alkaline salts, excessive laitance, mold, mildew, and other materials that might prevent adhesive bond.

B. Do not use solvents or other chemicals for cleaning.

3.03 MOISTURE VAPOR EMISSION TESTING

A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.

B. Where this specification conflicts with the referenced test method, comply with the requirements of this section.

C. Test in accordance with ASTM F1869 and as follows.

D. Plastic sheet test and mat bond test may not be substituted for the specified ASTM test method, as those methods do not quantify the moisture content sufficiently.

E. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if test values exceed 3 pounds per 1000 square feet per 24 hours.

F. Report: Report the information required by the test method.

3.04 INTERNAL RELATIVE HUMIDITY TESTING

A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.

B. Where this specification conflicts with the referenced test method, comply with the requirements of this section.

C. Test in accordance with ASTM F2170 Procedure A and as follows.

D. Testing with electrical impedance or resistance apparatus may not be substituted for the specified ASTM test method, as the values determined are not comparable to the ASTM test values and do not quantify the moisture content sufficiently.

E. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if any test value exceeds 75 percent relative humidity.

F. Report: Report the information required by the test method.

3.05 ALKALINITY TESTING

A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.

B. The following procedure is the equivalent of that described in ASTM F710, repeated here for the Contractor's convenience.
   1. Use a wide range alkalinity (pH) test paper, its associated chart, and distilled or deionized water.
   2. Place several drops of water on a clean surface of concrete, forming a puddle approximately 1 inch in diameter. Allow the puddle to set for approximately 60 seconds, then dip the alkalinity (pH) test paper into the water, remove it, and compare immediately to chart to determine alkalinity (pH) reading.
   3. Use of a digital pH meter with probe is acceptable; follow meter manufacturer's instructions.

C. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if alkalinity (pH) test value is over 10.

3.06 PREPARATION

A. See individual floor covering section(s) for additional requirements.

B. Comply with requirements and recommendations of floor covering manufacturer.

C. Fill and smooth surface cracks, grooves, depressions, control joints and other non-moving joints, and other irregularities with patching compound.

D. Do not fill expansion joints, isolation joints, or other moving joints.

3.07 ADHESIVE BOND AND COMPATIBILITY TESTING

A. Comply with requirements and recommendations of floor covering manufacturer.

3.08 APPLICATION OF REMEDIAL FLOOR COATING

A. Comply with requirements and recommendations of coating manufacturer.

3.09 PROTECTION

A. Cover prepared floors with building paper or other durable covering.

END OF SECTION

SECTION 09 21 16
GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Performance criteria for gypsum board assemblies.

B. Acoustic insulation.

C. Gypsum sheathing.

D. Gypsum wallboard.

E. Joint treatment and accessories.

1.02 RELATED REQUIREMENTS

A. Section 06 10 53 - Miscellaneous Rough Carpentry: Wood blocking product and execution requirements.

B. Section 07 92 00 - Joint Sealants: Sealing acoustical gaps in construction other than gypsum board or plaster work.

1.03 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.

B. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.

C. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.

D. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board.

E. ASTM C954 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness.

F. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.

G. ASTM C1047 - Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base.

H. ASTM C1396/C1396M - Standard Specification for Gypsum Board.

I. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.

J. ASTM E413 - Classification for Rating Sound Insulation.

K. GA-216 - Application and Finishing of Gypsum Panel Products.

1.04 SUBMITTALS

A. See Section 01 40 00 - Quality Requirements for submittal procedures.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Store gypsum products and accessories indoors and keep above freezing. Elevate boards above floor, on nonwicking supports, in accordance with manufacturer's recommendations.

PART 2 PRODUCTS

2.01 GYPSUM BOARD ASSEMBLIES

Provide completed assemblies complying with ASTM C840 and GA-216.

1. See PART 3 for finishing requirements.

A. Interior Partitions, Indicated as Acoustic: Provide completed assemblies with the following characteristics:
   1. Acoustic Attenuation: STC as indicated calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.

2.02 BOARD MATERIALS

A. Manufacturers - Gypsum-Based Board:
   1. American Gypsum Company: www.americangypsum.com/#sle.
   2. CertainTeed Corporation: www.certainteed.com/#sle.
   3. Georgia-Pacific Gypsum: www.gpgypsum.com/#sle.
   4. National Gypsum Company[<>]: www.nationalgypsum.com.
   5. PABCO Gypsum: www.pabcogypsum.com/#sle.
   6. USG Corporation: www.usg.com/#sle.
   7. Substitutions: See Section 01 60 00 - Product Requirements.

B. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
   1. Application: Use for vertical surfaces and ceilings, unless otherwise indicated.
   2. Thickness:
      a. Vertical Surfaces: 5/8 inch.
      b. Ceilings: 1/2 inch.
      c. Multi-Layer Assemblies: Thicknesses as indicated on drawings.
   3. Paper-Faced Products:
      a. American Gypsum Company; FireBloc Type X Gypsum Wallboard: www.americangypsum.com/#sle.
      b. CertainTeed Corporation; Type X Drywall: www.certainteed.com/#sle.
      c. Georgia-Pacific Gypsum; ToughRock Fireguard X: www.gpgypsum.com/#sle.
      d. USG Corporation; Sheetrock Brand EcoSmart Panels Firecode X 5/8 in. (15.9 mm): www.usg.com/#sle.
      e. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 GYPSUM BOARD ACCESSORIES

A. Acoustic Insulation: ASTM C665; preformed mineral-fiber, friction fit type, unfaced; thickness as required for STC.

B. Acoustic Sealant: Acrylic emulsion latex or water-based elastomeric sealant; do not use solvent-based non-curing butyl sealant.

C. Beads, Joint Accessories, and Other Trim: ASTM C1047, rigid plastic, galvanized steel, or rolled zinc, unless noted otherwise.
   1. Corner Beads: Low profile, for 90 degree outside corners.
      a. Products:
         1) CertainTeed Corporation; No-Coat Drywall Corner: www.certainteed.com/#sle.
         2) Trim-Tex, Inc; Tear-Away Beads: www.trim-tex.com/#sle.
         3) Amico "Zip Strip" preferred where applicable.
         4) Substitutions: See Section 01 60 00 - Product Requirements.
   2. Expansion Joints:
      a. Type: V-shaped PVC with tear away fins.
      b. Products:
         1) Phillips Manufacturing Co; 093 Expansion Control Joint: www.phillipsmfg.com/#sle.
         2) Trim-Tex, Inc; Fire Rated 093V Expansion Bead: www.trim-tex.com/#sle.
         3) Substitutions: See Section 01 60 00 - Product Requirements.

D. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.

1. Fiberglass Tape: 2 inch wide, coated glass fiber tape for joints and corners, except as otherwise indicated.
2. Joint Compound: Drying type, vinyl-based, ready-mixed.
3. Joint Compound: Setting type, field-mixed.

E. Screws for Fastening of Gypsum Panel Products to Cold-Formed Steel Studs Less than 0.033 inches in Thickness and Wood Members: ASTM C1002; self-piercing tapping screws, corrosion-resistant.

F. Screws for Fastening of Gypsum Panel Products to Steel Members from 0.033 to 0.112 inch in Thickness: ASTM C954; steel drill screws, corrosion-resistant.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that project conditions are appropriate for work of this section to commence.

3.02 ACOUSTIC ACCESSORIES INSTALLATION

A. Acoustic Insulation: Place tightly within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions.

B. Acoustic Sealant: Install in accordance with manufacturer's instructions.
1. Place one bead continuously on substrate before installation of perimeter framing members.
2. Place continuous bead at perimeter of each layer of gypsum board.

3.03 BOARD INSTALLATION

A. Comply with ASTM C840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.

B. Single-Layer Nonrated: Install gypsum board in most economical direction, with ends and edges occurring over firm bearing.

C. Exposed Gypsum Board in Interior Wet Areas: Seal joints, cut edges, and holes with water-resistant sealant.

3.04 INSTALLATION OF TRIM AND ACCESSORIES

A. Control Joints: Place control joints consistent with lines of building spaces and as indicated.
1. Not more than 30 feet apart on walls and ceilings over 50 feet long.

B. Corner Beads: Install at external corners, using longest practical lengths.

C. Edge Trim: Install at locations where gypsum board abuts dissimilar materials.

3.05 JOINT TREATMENT

A. Paper Faced Gypsum Board: Use paper joint tape, embed with drying type joint compound and finish with drying type joint compound.

B. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
1. Level 5: Walls and ceilings to receive semi-gloss or gloss paint finish and other areas specifically indicated.
   a. Walls to receive wall covering.
2. Level 4: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated.
3. Level 2: In utility areas, behind cabinetry, and on backing board to receive tile finish.
4. Level 1: Wall areas above finished ceilings, whether or not accessible in the completed construction.
5. Level 0: Temporary partitions.

C. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.

1. Feather coats of joint compound so that camber is maximum 1/32 inch.
2. Taping, filling, and sanding are not required at base layer of double-layer applications.

D. Where Level 5 finish is indicated, spray apply high build drywall surfacer over entire surface after joints have been properly treated; achieve a flat and tool mark-free finish.

3.06 TOLERANCES

A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet in any direction.

END OF SECTION

SECTION 09 30 00
TILING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Tile for floor applications (FT-1).

B. Tile for wall applications (WT-1).

C. Non-ceramic trim.

1.02 RELATED REQUIREMENTS

A. Section 09 05 61 - Common Work Results for Flooring Preparation: Concrete slab moisture and alkalinity testing and remediation procedures.

1.03 REFERENCE STANDARDS

A. ANSI A108/A118/A136 - American National Standard Specifications for the Installation of Ceramic Tile (Compendium).

B. ANSI A108.19 - American National Standard Specifications for Interior Installation of Gauged Porcelain Tiles and Gauged Porcelain Tile Panels/Slabs by the Thin-Bed Method Bonded with Modified Dry-Set Cement Mortar or Improved Modified Dry-Set Cement Mortar.

C. ANSI A108.20 - American National Standard Specifications for Exterior Installation of Gauged Porcelain Tiles and Gauged Porcelain Tile Panels/Slabs.

D. ANSI A118.4 - American National Standard Specifications for Modified Dry-Set Cement Mortar.

E. ANSI A118.7 - American National Standard Specifications for High Performance Cement Grouts for Tile Installation.

F. ANSI A118.12 - American National Standard Specifications for Crack Isolation Membranes for Thin-Set Ceramic Tile and Dimension Stone Installation.

G. ANSI A137.1 - American National Standard Specifications for Ceramic Tile.

H. ASTM C373 - Standard Test Methods for Determination of Water Absorption and Associated Properties by Vacuum Method for Pressed Ceramic Tiles and Glass Tiles and Boil Method for Extruded Ceramic Tiles and Non-tile Fired Ceramic Whiteware Products.

I. TCNA (HB) - Handbook for Ceramic, Glass, and Stone Tile Installation.

J. TCNA (HB-GP) - Handbook for Gauged Porcelain Tiles and Gauged Porcelain Tile Panels/Slabs Installation.

1.04 SUBMITTALS

A. See Section 01 40 00 - Quality Requirements for submittal procedures.

B. Product Data: Provide manufacturers' data sheets on tile, mortar, grout, and accessories. Include instructions for using grouts and adhesives.

C. Shop Drawings: Indicate tile layout, patterns, color arrangement, perimeter conditions, junctions with dissimilar materials, control and expansion joints, thresholds, ceramic accessories, and setting details.

D. Samples: Mount tile and apply grout on two plywood panels, minimum 18 by 18 inches in size illustrating pattern, color variations, and grout joint size variations.

E. Maintenance Data: Include recommended cleaning methods, cleaning materials, and stain removal methods.

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.
   2. Extra Tile: 5 percent of each size, color, and surface finish combination, but not less than one carton of each type.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the types of products specified in this section, with minimum five years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.

1.07 FIELD CONDITIONS

A. Do not install solvent-based products in an unventilated environment.

B. Maintain ambient and substrate temperature above 50 degrees F and below 100 degrees F during installation and curing of setting materials.

PART 2 PRODUCTS

2.01 TILE

A. Porcelain Tile: ANSI A137.1 standard grade.
   1. Moisture Absorption: 0 to 0.5 percent as tested in accordance with ASTM C373.
   2. Size: As indicated in Finish Schedule.
   3. Color(s): As indicated.
   4. Pattern: As indicated in Finish Schedule.
   5. Trim Units: Matching wall base shapes in sizes coordinated with field tile.

2.02 TRIM AND ACCESSORIES

A. Non-Ceramic Trim: Color as indicated in Finish Schedule, style and dimensions as indicated on drawings, set with tile mortar or adhesive.
   1. Applications:
      a. Transition between floor finishes of different heights.
   2. Products:
      a. Dural: us.dural.com.
      b. Genesis APS International: www.genesis-aps.com/#sle.
      c. Profilitec: www.profilitec.com/en/products.html.
      d. Schluter-Systems: www.schluter.com/#sle.
         1) Indec: profile with square recessed reveal for outside corners of tiled walls, integrated trapezoid-perforated anchoring leg.
      e. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 SETTING MATERIALS

A. Provide setting and grout materials from same manufacturer.

B. Latex-Portland Cement Mortar Bond Coat: ANSI A118.4.
   1. Applications: Use this type of bond coat where indicated, and where no other type of bond coat is indicated.

C. Mortar Bed Materials: Pre-packaged mix of Portland cement, sand, latex additive, and water.

2.04 GROUTS

A. Provide setting and grout materials from same manufacturer.

B. High Performance Polymer Modified Grout: ANSI A118.7 polymer modified cement grout.
   1. Applications: Use where indicated on drawings and where no other type of grout is indicated.
   2. Use sanded grout for joints 1/8 inch wide and larger; use unsanded grout for joints less than 1/8 inch wide.
   3. Color: As indicated on Finish Schedule.
   4. Products:
      a. ARDEX Engineered Cements: www.ardexamericas.com/#sle.
      b. TEC Specialty Products LLC: www.tecspecialty.com/#sle.

c. LATICRETE International, Inc: www.laticrete.com/#sle.
d. Mapei Corporation: www.mapei.com/#sle.
e. Merkrete, by Parex USA, Inc: www.merkrete.com/#sle.
f. Substitutions: See Section 01 60 00 - Product Requirements.

2.05 ACCESSORY MATERIALS

A. Concrete Floor Slab Crack Isolation Membrane: Material complying with ANSI A118.12; not intended as waterproofing.
1. Crack Resistance: No failure at 1/8 inch gap, minimum.
2. Fluid or Trowel Applied Type:
a. Material: Synthetic rubber or Acrylic.
b. Thickness: 20 mils, maximum.
c. Products:
1) TEC Specialty Products LLC: www.tecspecialty.com/#sle.
2) LATICRETE International, Inc: www.laticrete.com/#sle.
3) Mapei Corporation: www.mapei.com/#sle.
4) Substitutions: See Section 01 60 00 - Product Requirements.
3. Bonded Sheet Membrane Type:
a. Material: Polyethylene sheet membrane with polyester fleece laminated to underside, 20 mils thick.
b. Products:
1) Schluter-Systems; DITRA: www.schluter.com/#sle.
2) Substitutions: See Section 01 60 00 - Product Requirements.
4. Peel-and-Stick Sheet Type:
a. Thickness: 20 mils, maximum.
b. Products:
1) LATICRETE International, Inc: www.laticrete.com/#sle.
2) Mapei Corporation; Mapeguard CI: www.mapei.com/#sle.
3) Sika Corp: www.sika.com/#sle.
4) Substitutions: See Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify subfloor surfaces are smooth and flat within tolerances specified for that type of work and are ready to receive tile.

B. Verify wall surfaces are smooth and flat within tolerances specified for that type of work, are dust-free, and are ready to receive tile.

C. Verify that subfloor surfaces are dust free and free of substances that could impair bonding of setting materials to subfloor surfaces.

D. Cementitious Subfloor Surfaces: Verify that substrates are ready for tiling installation by testing for moisture and alkalinity (pH).
1. Test in accordance with Section 09 05 61.
2. Obtain instructions if test results are not within limits recommended by tiling material manufacturer and setting material manufacturer.
3. Follow moisture and alkalinity remediation procedures in Section 09 05 61.

E. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

A. Vacuum clean surfaces and damp clean.

B. Seal substrate surface cracks with filler.

3.03 INSTALLATION - GENERAL

A. Install tile and grout in accordance with applicable requirements of ANSI A108/A118/A136, manufacturer's instructions, and TCNA (HB) or TCNA (HB-GP) recommendations, as applicable.

B. Lay tile to pattern indicated on drawings. Do not interrupt tile pattern through openings.

C. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly. Align floor joints.

D. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make grout joints without voids, cracks, excess mortar or excess grout, or too little grout.

E. Form internal angles square and external angles bullnosed.

F. Install non-ceramic trim in accordance with manufacturer's instructions.

G. Sound tile after setting. Replace hollow sounding units.

H. Keep control and expansion joints free of mortar, grout, and adhesive.

I. Prior to grouting, allow installation to completely cure; minimum of 48 hours.

J. Grout tile joints unless otherwise indicated on drawings. Use standard grout unless otherwise indicated on drawings.

K. At changes in plane and tile-to-tile control joints, use tile sealant instead of grout, with either bond breaker tape or backer rod as appropriate to prevent three-sided bonding.

3.04 INSTALLATION - FLOORS - THIN-SET METHODS

A. Over interior concrete substrates, install in accordance with TCNA (HB) Method F113, dry-set or latex-Portland cement bond coat, on ground, with standard grout, unless otherwise indicated on drawings.

1. Use uncoupling membrane under tile unless other underlayment is indicated on drawings.

B. Install tile-to-tile floor movement joints in accordance with TCNA (HB) Method EJ171F.

3.05 CLEANING

A. Clean tile and grout surfaces.

END OF SECTION

SECTION 09 51 00
ACOUSTICAL CEILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Suspended metal grid ceiling system.

B. Acoustical units (ACT-1).

1.02 REFERENCE STANDARDS

A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

B. ASTM C635/C635M - Standard Specification for Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.

C. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels.

D. ASTM E580/E580M - Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions.

E. ASTM E1264 - Standard Classification for Acoustical Ceiling Products.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Sequence work to ensure acoustical ceilings are not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead work is completed, tested, and approved.

B. Do not install acoustical units until after interior wet work is dry.

1.04 SUBMITTALS

A. See Section 01 40 00 - Quality Requirements for submittal procedures.

B. Product Data: Provide data on suspension system components and acoustical units.

C. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.
   2. Extra Acoustical Units: Quantity equal to 5 percent of total installed.

1.05 QUALITY ASSURANCE

A. Suspension System Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

B. Acoustical Unit Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.06 FIELD CONDITIONS

A. Maintain uniform temperature of minimum 60 degrees F, and maximum humidity of 40 percent prior to, during, and after acoustical unit installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acoustic Tiles/Panels:
   1. Provide Basis of Design manufacturer listed in the Finish Schedule , or a pre-approved standard or custom product from another manufacturer with equivalent performance, material properties, features, general configuration, appearance, and warranty, approved prior to bid.
   2. Substitutions: See Section 01 60 00 - Product Requirements.

B. Suspension Systems:

1. Same as for acoustical units.
2. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 ACOUSTICAL UNITS

A. Acoustical Units - General: ASTM E1264, Class A.

B. Acoustical Tiles: Mineral fiber with membrane-faced overlay, with the following characteristics:
   1. Classification: ASTM E1264 Type A.
      a. Form: A2.2, wet formed.
      b. Pattern: E - lightly textured.
   2. Size: 24 by 24 inches.
   3. Thickness: 3/4 inch.
   4. Light Reflectance: 88 percent, in accordance with ASTM E1264.
   5. Noise Reduction Coefficient (NRC): 0.75 minimum, in accordance with ASTM E1264.
   6. Ceiling Attenuation Class (CAC): 0.35 minimum, in accordance with ASTM E1264.
   7. Tile Edge: Beveled.
   8. Color: White.
   9. Suspension System: Concealed grid.
   10. Products:
      a. **BASIS OF DESIGN:** Armstrong World Industries, Inc; Ultima: www.armstrongceilings.com/#sle.
      b. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 SUSPENSION SYSTEMS

A. Metal Suspension Systems - General: Complying with ASTM C635/C635M; die cut and interlocking components, with perimeter moldings, hold-down clips, stabilizer bars, clips, and splices as required.
   1. Materials:
      a. Steel Grid: ASTM A653/A653M, G30 coating, unless otherwise indicated.

B. Exposed Suspension System: Hot-dip galvanized steel grid and cap.
   1. Structural Classification: Intermediate-duty, when tested in accordance with ASTM C635/C635M.
   2. Profile: Tee; 15/16 inch face width.
   3. Finish: Baked enamel.
   4. Products:
      a. Armstrong World Industries, Inc; Prelude: www.armstrongceilings.com/#sle.
      b. USG Corporation: www.usg.com/#sle.
      c. Substitutions: See Section 01 60 00 - Product Requirements.

2.04 ACCESSORIES

A. Support Channels and Hangers: Galvanized steel; size and type to suit application, seismic requirements, and ceiling system flatness requirement specified.

B. Hanger Wire: 12 gauge, 0.08 inch galvanized steel wire.

C. Hold-Down Clips: Manufacturer's standard clips to suit application.

D. Perimeter Moldings: Same metal and finish as grid.
   1. Angle Molding: L-shaped, for mounting at same elevation as face of grid.
   2. Acoustical Sealant For Perimeter Moldings: Non-hardening, non-skinning, for use in conjunction with suspended ceiling system.

E. Touch-up Paint: Type and color to match acoustical and grid units.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that layout of hangers will not interfere with other work.

3.02 PREPARATION

A. Install after major above-ceiling work is complete.

B. Coordinate the location of hangers with other work.

3.03 INSTALLATION - SUSPENSION SYSTEM

A. Install suspension system in accordance with ASTM C636/C636M, ASTM E580/E580M, and manufacturer's instructions, as supplemented in this section.

B. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.

C. Locate system on room axis according to reflected plan.

D. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
   1. Use longest practical lengths.

E. Suspension System, Non-Seismic: Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.

F. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.

G. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.

H. Support fixture loads using supplementary hangers located within 6 inches of each corner, or support components independently.

I. Do not eccentrically load system or induce rotation of runners.

3.04 INSTALLATION - ACOUSTICAL UNITS

A. Install acoustical units in accordance with manufacturer's instructions.

B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.

C. Fit border trim neatly against abutting surfaces.

D. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.

E. Cutting Acoustical Units:
   1. Make field cut edges of same profile as factory edges.
   2. Double cut and field paint exposed reveal edges.

F. Install hold-down clips on panels within 20 ft of an exterior door.

3.05 TOLERANCES

A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.

B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

END OF SECTION

SECTION 09 65 00
RESILIENT FLOORING AND BASE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Resilient tile flooring (LVT-1).

B. Resilient base (WB-2).

C. Installation accessories.

1.02 RELATED REQUIREMENTS

A. Section 09 05 61 - Common Work Results for Flooring Preparation: Removal of existing floor coverings, cleaning, and preparation.

1.03 REFERENCE STANDARDS

A. ASTM F1700 - Standard Specification for Solid Vinyl Floor in Modular Format such as Tile(s) or Plank(s).

B. ASTM F1861 - Standard Specification for Resilient Wall Base.

1.04 SUBMITTALS

A. See Section 01 40 00 - Quality Requirements for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.

C. Shop Drawings: Indicate seaming plans and floor patterns.

D. Verification Samples: Submit two samples, 7 by 48 inch in size illustrating color and pattern for each resilient flooring product specified.

E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.
   2. Extra Flooring Material: 5 percent (but not less than 1 carton) of each type and color
   3. Turn over to owner, for storage on-site or off-site.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing specified flooring with minimum three years documented experience.

B. Installer Qualifications: Company specializing in installing specified flooring with minimum three years documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Upon receipt, immediately remove any shrink-wrap and check materials for damage and the correct style, color, quantity and run numbers.

B. Store all materials off of the floor in an acclimatized, weather-tight space.

C. Maintain temperature in storage area between 55 degrees F and 90 degrees F.

D. Protect roll materials from damage by storing on end.

E. Do not double stack pallets.

1.07 FIELD CONDITIONS

A. Provide installation area that is weather tight and maintained either permanently or temporarily at ambient service temperature and humidity of 68°F ± 5° F and 50% ± 10% relative humidity, for at least 48 hours prior to, during and 72 hours after the application of the flooring is required.

B. Store materials for not less than 48 hours prior to installation in area of installation at a temperature of 70 degrees F to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F.

PART 2 PRODUCTS

2.01 TILE FLOORING

A. Vinyl Tile: Printed film type, with transparent or translucent wear layer; acoustic interlayer or backing.
   1. Minimum Requirements: Comply with ASTM F1700, Class III.
   2. Plank Tile Size: as indicated in Finish Schedule.
   3. Wear Layer Thickness: 0.020 inch.
   4. Pattern: as indicated in Finish Schedule.
   5. Color: As indicated in Finish Shcedule.

2.02 RESILIENT BASE

A. Resilient Base: ASTM F1861, Type TS, rubber, vulcanized thermoset; style as scheduled.
   1. Height: 4 inches.
   2. Thickness: 0.125 inch.
   3. Top Set Style:
      a. Coved; locations as indicated in Finish Schedule.
   4. Finish: Satin.
   5. Length: Roll.
   6. Color: As indicated in Finish Schedule.

2.03 ACCESSORIES

A. Subfloor Filler: White premix latex; type recommended by adhesive material manufacturer.

B. Primers, Adhesives, and Seam Sealer: Waterproof; types recommended by flooring manufacturer.

C. Moldings, Transition and Edge Strips: Same material as flooring.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.

B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive resilient base.

C. Cementitious Subfloor Surfaces: Verify that substrates are ready for resilient flooring installation by testing for moisture and alkalinity (pH).
   1. Test in accordance with Section 09 05 61.
   2. Obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.

D. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

A. Prepare floor substrates as recommended by flooring and adhesive manufacturers.

B. Remove subfloor ridges and bumps. Fill minor low spots, cracks, joints, holes, and other defects with subfloor filler to achieve smooth, flat, hard surface.

C. Prohibit traffic until filler is fully cured.

D. Apply primer as required to prevent "bleed-through" or interference with adhesion by substances that cannot be removed.

3.03 INSTALLATION - GENERAL

A. Starting installation constitutes acceptance of subfloor conditions.

B. Install in accordance with manufacturer's written instructions.

C. Adhesive-Applied Installation:
   1. Spread only enough adhesive to permit installation of materials before initial set.
   2. Fit joints and butt seams tightly.
   3. Set flooring in place, press with heavy roller to attain full adhesion.

D. Where type of floor finish, pattern, or color are different on opposite sides of door, terminate flooring under centerline of door.

E. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated.

F. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.

3.04 INSTALLATION - TILE FLOORING

A. Mix tile from container to ensure shade variations are consistent when tile is placed, unless otherwise indicated in manufacturer's installation instructions.

3.05 INSTALLATION - RESILIENT BASE

A. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches between joints.

B. Install base on solid backing. Bond tightly to wall and floor surfaces.

3.06 CLEANING

A. Remove excess adhesive from floor, base, and wall surfaces without damage.

B. Clean in accordance with manufacturer's written instructions.

3.07 PROTECTION

A. Prohibit traffic on resilient flooring for 48 hours after installation.

END OF SECTION

SECTION 09 68 13
TILE CARPETING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Carpet tile, fully adhered (CPT-1).

B. Walk Off Carpet (WO-1).

1.02 RELATED REQUIREMENTS

A. Section 09 05 61 - Common Work Results for Flooring Preparation: Removal of existing floor coverings, cleaning, and preparation.

B. Section 09 05 61 - Common Work Results for Flooring Preparation: Concrete slab moisture and alkalinity testing and remediation procedures.

1.03 REFERENCE STANDARDS

1.04 SUBMITTALS

A. See Section 01 40 00 - Quality Requirements, for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns, colors available, and method of installation.

C. Shop Drawings: Indicate layout of joints, direction of carpet pile, and location of edge moldings.

D. Samples: Submit two carpet tiles illustrating color and pattern design for each carpet color selected.

E. Operation and Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning.

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.
   2. Extra Carpet Tiles: Quantity equal to 5 percent of total installed of each color and pattern installed.
   3. Turn over to owner, for storage on-site or off-site.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing specified carpet tile with minimum three years documented experience.

B. Installer Qualifications: Company specializing in installing carpet tile with minimum three years documented experience and approved by carpet tile manufacturer.

1.06 FIELD CONDITIONS

A. Store materials in area of installation for minimum period of 24 hours prior to installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Tile Carpeting:
   1. Provide Basis of Design manufacturer listed in the Finish Schedule , or a pre-approved standard or custom product from another manufacturer with equivalent performance, material properties, features, general configuration, appearance, and warranty, approved prior to bid.
   2. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 MATERIALS

A. Tile Carpeting: Tufted, manufactured in one color dye lot.
   1. Tile Size: As indicated in Finish Schedule.

2. Color: As indicated in Finish Schedule.

B. Walk Off Carpet: Heterogenous construction of needlebond hobnail pet polyester; anti-microbial.
   1. Tile Size: As indicated in Finish Schedule
   2. Color: As indicated in Finish Schedule

2.03 ACCESSORIES

A. Subfloor Filler: White premix latex; type recommended by flooring material manufacturer.

B. Edge Strips: Embossed aluminum, silver color.

C. Adhesives:
   1. Compatible with materials being adhered; maximum VOC content of 50 g/L; CRI (GLP) certified; in lieu of labeled product, independent test report showing compliance is acceptable.

D. Carpet Tile Adhesive: Recommended by carpet tile manufacturer; releasable type.

E. Transition Strips: See 09 65 00 - Resilient Flooring and Base.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that subfloor surfaces are smooth and flat within tolerances specified for that type of work and are ready to receive carpet tile.

B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive carpet tile.

C. Verify that subfloor surfaces are dust-free and free of substances that could impair bonding of adhesive materials to subfloor surfaces.

D. Cementitious Subfloor Surfaces: Verify that substrates are ready for flooring installation by testing for moisture and alkalinity (pH).
   1. Test in accordance with Section 09 05 61.
   2. Obtain instructions if test results are not within limits recommended by flooring material manufacturer and adhesive materials manufacturer.

E. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

A. Prepare floor substrates as recommended by flooring and adhesive manufacturers.

B. Remove subfloor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with subfloor filler.

C. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Prohibit traffic until filler is cured.

D. Vacuum clean substrate.

3.03 INSTALLATION

A. Starting installation constitutes acceptance of subfloor conditions.

B. Install carpet tile in accordance with manufacturer's instructions.

C. Blend carpet from different cartons to ensure minimal variation in color match.

D. Cut carpet tile clean. Fit carpet tight to intersection with vertical surfaces without gaps.

E. Lay out carpet and locate seams in accordance with shop drawings.
   1. Locate seams in area of least traffic, out of areas of pivoting traffic, and parallel to main traffic.
   2. Do not locate seams perpendicular through door openings.

3. Align run of pile in same direction as anticipated traffic and in same direction on adjacent pieces.
4. Locate change of color or pattern between rooms under door centerline.
5. Provide monolithic color, pattern, and texture match within any one area.

F. Fully adhere carpet tile to substrate.

G. Trim carpet tile neatly at walls and around interruptions.

H. Complete installation of edge strips, concealing exposed edges.

3.04 CLEANING

A. Remove excess adhesive without damage, from floor, base, and wall surfaces.

B. Clean and vacuum carpet surfaces.

END OF SECTION

SECTION 09 72 00
WALL COVERINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface preparation.

B. Wall coverings, including:
   1. Vinyl wall coverings

C. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 09 21 16 - Gypsum Board Assemblies : Substrate for wall covering.

1.03 REFERENCE STANDARDS

A. ASTM D1308 - Standard Test Method for Effect of Household Chemicals on Clear and Pigmented Coating Systems.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

C. ASTM F793/F793M - Standard Classification of Wall Coverings and Ceiling Coverings by Use Characteristics.

1.04 SUBMITTALS

A. See Section 01 40 00 - Quality Requirements for submittal procedures.

B. Product Data: Manufacturer's data sheets for wall covering and adhesive. Indicate compliance with specified flame spread and smoke developed ratings.

C. Shop Drawings: Indicate wall elevations with seaming layout.

D. Samples: Submit two samples of wall covering, 18 by 18 inch in size illustrating color, finish, and texture.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with minimum 3 years of documented experience.

B. Installer Qualifications: Company specializing in performing work of type specified, with minimum 3 years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Inspect roll materials for damage upon arrival.

B. Protect packaged adhesive from temperature cycling and cold temperatures.

C. Do not store roll goods on end.

1.07 FIELD CONDITIONS

A. Maintain adhesive and wall covering manufacturer's recommended temperature ranges 24 hours before, during, and after installation.

B. Provide lighting level of 80 fc measured mid-height at substrate surfaces.

PART 2 PRODUCTS

2.01 WALL COVERINGS

A. Performance Requirements:
   1. Surface Burning Characteristics: Flame spread index of 25, maximum, and smoke developed index of 50, maximum, when tested in accordance with ASTM E84.
   2. Chemical and Stain Resistance: No visible staining or discoloration and no damage to surface texture when tested in accordance with ASTM D1308.

B. Manufacturers:
   1. Provide Basis of Design manufacturer listed in the Finish Schedule , or a pre-approved standard or custom product from another manufacturer with equivalent performance, material properties, features, general configuration, appearance, and warranty, approved prior to bid.

C. Wall Covering: Fabric-backed vinyl roll stock.
   1. Comply with ASTM F793/F793M, Category V, Type II.
   2. Width: As indicated in Finish Schedul
   3. Overcoating: Manufacturer's standard coating for stain resistance.
   4. Manufacturer/Style/Pattern/Color: As indicated in Finish Schedule.

2.02 ACCESSORIES

A. Adhesive: Type recommended by wall covering manufacturer.

B. Substrate Filler: As recommended by adhesive and wall covering manufacturers; compatible with substrate.

C. Substrate Primer and Sealer: Manufacturer's recommended type.
   1. For vinyl wall coverings:
      a. Required for Level 5 painted gypsum board and unpainted MDF substrates.
      b. Follow with pigmented primer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify substrate surfaces are prime painted and meet manufacturer's requirements to receive work, and comply with requirements of wall covering manufacturer.
   1. Verity walls were constructed with a Level 5 finish.

B. Measure moisture content of substrates with electronic moisture meter. Do not apply wall coverings if moisture content of substrate exceeds level recommended by wall covering manufacturer.

C. Verify flatness tolerance of surfaces does not vary more than 1/8 inch in 10 feet or at rate greater than 1/16 inch/ft.

D. Notify Architect of detrimental conditions affecting wall covering installation.

E. Correct detrimental conditions before starting installation.

3.02 PREPARATION

A. Remove wall plates and accessories impeding wall covering installation.

B. Substrate Priming and Preparation:
   1. Fill cracks in substrate and correct irregularities with filler; sand smooth.
   2. For marks capable of bleeding through surface finishes, seal with shellac.
   3. Apply one coat of primer sealer to substrate surfaces. Allow to dry. Lightly sand smooth.

C. Wash impervious surfaces with tetra-sodium phosphate; rinse and neutralize; wipe dry.

D. Surface Appurtenances: Remove or mask electrical plates, hardware, light fixture trim, escutcheons, and fittings before preparing surfaces or finishing.

E. Correct surface defects affecting work of this section and clean surfaces. Remove existing coatings exhibiting loose surface defects.

F. Vacuum surfaces to remove loose particles.

G. Acclimatize wall-covering materials by removing them from packaging in the installation areas not less than 24 hours before installation.

3.03 INSTALLATION

A. Apply adhesive and wall covering in accordance with manufacturer's instructions.

B. Apply adhesive to wall immediately before applying wall covering.

C. Use wall covering in roll number sequence.

D. Razor trim edges of wall covering. Do not razor trim on gypsum board surfaces.

E. Smoothly apply wall covering without wrinkles, gaps, or overlaps. Eliminate air pockets and ensure full bond to substrate surface.

F. Butt edges tightly.

G. Horizontal seams are not permitted.

H. Do not seam within 2 inches of internal corners or within 6 inches of external corners.

I. Install wall covering before installing bases and items attached to, abutting, or located within 1 inch of wall surface.

J. Do not install wall covering more than 1/4 inch below top of resilient base.

K. Cover spaces above and below windows and above doors in pattern sequence from roll.

L. Where wall covering tucks into reveals, metal wallboard, or plaster stops, use contact adhesive within 6 inches of wall covering termination. Ensure complete contact bond.

M. Remove excess adhesive from seams while wet and before proceeding to next wall covering sheet.

N. Reinstall wall plates and accessories removed to accommodate work of this section.

3.04 CLEANING

A. See Section 01 70 00 - Execution and Closeout Requirements for additional requirements.

B. Clean wall coverings of dust, dirt, excess adhesive, and other contaminants.

3.05 PROTECTION

A. Protect installed products from damage until Date of Substantial Completion.

END OF SECTION

SECTION 09 91 13
EXTERIOR PAINTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints (PT-#).

C. Scope: Finish exterior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated.

D. Do Not Paint or Finish the Following Items:
   1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
   2. Items indicated to receive other finishes.
   3. Items indicated to remain unfinished.
   4. Fire rating labels, equipment serial number and capacity labels, and operating parts of equipment.
   5. Stainless steel, anodized aluminum, bronze, terne-coated stainless steel, zinc, and lead.
   6. Floors, unless specifically indicated.
   7. Glass unit masonry, architectural concrete, cast stone, integrally colored plaster and stucco.
   8. Glass.
   9. Concealed pipes, ducts, and conduits.

1.02 RELATED REQUIREMENTS

A. Section 09 91 23 - Interior Painting.

1.03 DEFINITIONS

A. Comply with ASTM D16 for interpretation of terms used in this section.

1.04 REFERENCE STANDARDS

A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency.

B. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications.

C. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual.

1.05 SUBMITTALS

A. See Section 01 40 00 - Quality Requirements, for submittal procedures.

B. Product Data: Provide complete list of products to be used, with the following information for each:
   1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
   2. Cross-reference to specified paint system(s) product is to be used in; include description of each system.

C. Samples: Submit two paper "draw down" samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.
   1. Where sheen is specified, submit samples in only that sheen.
   2. Where sheen is not specified, discuss sheen options with Architect before preparing samples, to eliminate sheens not required.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum five years documented experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum three years experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.08 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the paint product manufacturer's temperature ranges.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Do not apply exterior paint and finishes during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.

D. Minimum Application Temperatures for Latex Paints: 50 degrees F for exterior; unless required otherwise by manufacturer's instructions.

E. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Provide paints and finishes from the same manufacturer to the greatest extent possible.
   1. If a single manufacturer cannot provide specified products, minor exceptions will be permitted provided approval by Architect is obtained using the specified procedures for substitutions.
   2. Substitution of other products by the same manufacturer is preferred over substitution of products by a different manufacturer.
   3. Substitution of a different paint system using MPI-approved products by the same manufacturer will be considered.

B. Paints:
   1. Benjamin Moore & Co: www.benjaminmoore.com.
   2. Diamond Vogel Paints: www.diamondvogel.com/#sle.
   3. PPG Paints: www.ppgpaints.com/#sle.
   4. Sherwin-Williams Company: www.sherwin-williams.com/#sle.

C. Primer Sealers: Same manufacturer as top coats.

D. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 PAINTS AND FINISHES - GENERAL

A. Paints and Finishes: Ready-mixed, unless required to be a field-catalyzed paint.
   1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
   2. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
   3. For opaque finishes, tint each coat including primer coat and intermediate coats, one-half shade lighter than succeeding coat, with final finish coat as base color.

4. Supply each paint material in quantity required to complete entire project's work from a single production run.
5. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is described explicitly in manufacturer's product instructions.

B. Volatile Organic Compound (VOC) Content:
1. Provide paints and finishes that comply with the most stringent requirements specified in the following:
   a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
   b. Architectural coatings VOC limits of the State in which the Project is located.
2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.

C. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.

D. Colors: As indicated in Color Schedule.
1. Allow for same number of colors indicated in Finish Schedule, plus three additional samples, without additional cost to Owner.
2. Extend colors to surface edges; colors may change at any edge as directed by Architect.

2.03 PAINT SYSTEMS - EXTERIOR

A. Masonry/Concrete, Opaque, Latex, 3 Coat:
1. One coat of block filler. Applied to result in a dry film thickness of not less than 8.0 mils.
   a. Benjamin Moore: Super Spec Masonry Interior/Exterior Hi-Build Block Filler 0206.
   b. Diamond Vogel: Dia-Pro Acrylic Block Filler.
   c. PPG Paints; 6-15 SpeedHide Interior/Exterior Masonry Latex Block Filler.
   d. Sherwin-Williams; Loxon Block Surfacer A24W00200.
2. One coat exterior concrete and masonry primer. Applied to result in a dry film thickness of not less than 1.5 mils.
   a. Benjamin Moore; Super Spec Masonry Interior/Exterior Acrylic Sealer No. N066.
   b. Diamond Vogel: Weather-Plate Acrylic Primer.
   c. PPG Paints; 4-603 Perma-Crete Acrylic Latex Alkali Resistant Primer:
   d. Sherwin-Williams; Loxon Masonry & Concrete Primer/Sealer A24W8300.
3. Semi-gloss: Two coats of latex enamel. Factory-formulated semigloss waterborne acrylic-latex enamel for exterior application. Applied to result in a dry film thickness of not less than 1.5 mils per coat.
   a. Benjamin Moore; Ultra Spec Exterior Semi-Gloss N449.
   b. Diamond Vogel: Permacryl Exterior 100% Acrylic Semi-Gloss Latex.
   c. PPG Paints; 6-900 Series SpeedHide Exterior House & Trim Semi-Gloss Acrylic Latex Paint.
   d. Sherwin-Williams; A-100 Latex Gloss A8 Series.

2.04 ACCESSORY MATERIALS

A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.

B. Patching Material: Latex filler.

C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin application of paints and finishes until substrates have been properly prepared.

B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

D. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

E. Test shop-applied primer for compatibility with subsequent cover materials.

F. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
   1. Fiber Cement Siding: 12 percent.
   2. Masonry, Concrete, and Concrete Masonry Units: 12 percent.

3.02 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces for finishing.

D. Seal surfaces that might cause bleed through or staining of topcoat.

E. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.

F. Fiber Cement Siding: Remove dirt, dust and other foreign matter with a stiff fiber brush. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.

3.03 APPLICATION

A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.

B. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".

C. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

D. Apply each coat to uniform appearance.

E. Dark Colors and Deep Clear Colors: Regardless of number of coats specified, apply additional coats until complete hide is achieved.

F. Sand metal surfaces lightly between coats to achieve required finish.

G. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

3.04 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.05 PROTECTION

A. Protect finishes until completion of project.

B. Touch-up damaged finishes after Substantial Completion.

END OF SECTION

SECTION 09 91 23
INTERIOR PAINTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints (PT-#).

C. Scope: Finish interior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated.
   1. Both sides and edges of plywood backboards for electrical and telecom equipment before installing equipment.
   2. Prime surfaces to receive wall coverings.
   3. Gypsum Board: Finish all surfaces exposed to view.
   4. Wood: Finish all surfaces exposed to view, except those indicated to prefinished and not specified to receive additional field finishing.
   5. Shop-Primed Metal Items: Finish all surfaces exposed to view.

D. Do Not Paint or Finish the Following Items:
   1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
   2. Items indicated to receive other finishes.
   3. Items indicated to remain unfinished.
   4. Fire rating labels, equipment serial number and capacity labels, bar code labels, and operating parts of equipment.
   5. Stainless steel, anodized aluminum, bronze, terne-coated stainless steel, and lead items.
   6. Marble, granite, slate, and other natural stones.
   7. Floors, unless specifically indicated.
   8. Ceramic and other tiles.
   9. Brick, architectural concrete, cast stone, integrally colored plaster, and stucco.
   10. Glass.
   11. Acoustical materials, unless specifically indicated.
   12. Concealed pipes, ducts, and conduits.

1.02 RELATED REQUIREMENTS

A. Section 09 91 13 - Exterior Painting.

1.03 REFERENCE STANDARDS

A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency.

B. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials.

C. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual.

1.04 SUBMITTALS

A. See Section 01 40 00 - Quality Requirements, for submittal procedures.

B. Product Data: Provide complete list of products to be used, with the following information for each:
   1. Manufacturer's name, product name and/or catalog number, and general product category (e.g., "alkyd enamel").
   2. MPI product number (e.g., MPI #47).
   3. Cross-reference to specified paint system products to be used in project; include description of each system.

4. If proposal of substitutions is allowed under submittal procedures, explanation of substitutions proposed.

C. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.
   1. Where sheen is specified, submit samples in only that sheen.
   2. Where sheen is not specified, discuss sheen options with Architect before preparing samples, to eliminate sheens not required.

D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.
   2. Extra Paint and Finish Materials: 1 gal of each color; from the same product run, store where directed.
   3. Label each container with color in addition to the manufacturer's label.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum three years documented experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum three years experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.07 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Do not apply materials when relative humidity exceeds 85 percent, at temperatures less than 5 degrees F above the dew point, or to damp or wet surfaces.

D. Minimum Application Temperatures for Paints: 50 degrees F for interiors unless required otherwise by manufacturer's instructions.

E. Provide lighting level of 80 fc measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Provide paints and finishes from the same manufacturer to the greatest extent possible.
   1. If a single manufacturer cannot provide specified products; minor exceptions will be permitted provided approval by Architect is obtained using the specified procedures for substitutions.
   2. Substitution of other products by the same manufacturer is preferred over substitution of products by a different manufacturer.

B. Paints:
   1. Benjamin Moore & Co: www.benjaminmoore.com.
   2. Diamond Vogel Paints: www.diamondvogel.com/#sle.
   3. Pittsburgh Paints: www.pittsburghpaintsco.com/#sle.
   4. Sherwin-Williams Company: www.sherwin-williams.com/#sle.

C. Primer Sealers: Same manufacturer as top coats.

2.02 PAINTS AND FINISHES - GENERAL

A. Paints and Finishes: Ready-mixed, unless intended to be a field-catalyzed paint.
   1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
   2. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
   3. For opaque finishes, tint each coat including primer coat and intermediate coats, one-half shade lighter than succeeding coat, with final finish coat as base color.
   4. Supply each paint material in quantity required to complete entire project's work from a single production run.
   5. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.

B. Volatile Organic Compound (VOC) Content:
   1. Provide paints and finishes that comply with the most stringent requirements specified in the following:
      a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
      b. Architectural coatings VOC limits of the State in which the Project is located.
   2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.

C. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.

D. Colors: As indicated on drawings.
   1. Allow for same number of colors indicated in Finish Schedule, plus three additional samples, without additional cost to Owner.
   2. Extend colors to surface edges; colors may change at any edge as directed by Architect.

2.03 PAINT SYSTEMS - INTERIOR

A. Wood, Opaque, Latex, 3 Coat:
   1. Primer: One coat of latex primer sealer. Applied to result in a dry film thickness of not less than 1.5 mils.
      a. Products:
         1) Benjamin Moore; Fresh Start Multi-Purpose 100% Acrylic Primer
         2) Diamond Vogel; Assure Interior Latex Enamel.
         3) Pittsburg Paints; Seal G
         4) Sherwin-Williams; ProIndustrial Acrylic Enamel
         5) Substitutions: See Section 01 60 00 - Product Requirements
      b. Top Coat: Two coats of latex enamel. Applied to result in dry film thickness of not less than 1.6 mils per coat.
         1) Sheen: Semi-gloss.
         2) Products:
            (a) Benjamin Moore.
            (b) Diamond Vogel; Assure Interior Latex Enamel.
            (c) Pittsburg Paints.
            (d) Sherwin-Williams; ProIndustrial Acrylic Enamel
            (e) Substitutions: See Section 01 60 00 - Product Requirements

B. Gypsum Board/Plaster, Latex, 3 Coat: Walls and ceilings scheduled for painting, except those to receive epoxy or dry erase coatings.
   1. Primer: One coat of latex primer sealer. Applied to result in dry film thickness of not less than 1.5 mils.
      a. Products:
         1) Benjamin Moore; Eco Spec Interior - Primer.
         2) Diamond Vogel; PosiPrime Pro Interior Latex Primer.
         3) Pittsburgh Paints; Speedhide Zero VOC Interior Latex Primer/Sealer.
         4) Sherwin-Williams; ProMar 200 Zero VOC Interior Latex Primer.
         5) Substitutions: See Section 01 60 00 - Product Requirements
   2. Topcoat: Two coats of latex enamel topcoat. Applied to result in dry film thickness of not less than 1.5 mils.
      a. Sheen (walls): Eggshell.
      b. Sheen (ceilings): Flat
      c. Products:
         1) Benjamin Moore; Eco Spec Interior Paint.
         2) Diamon Vogel; Zero Plus Interior
         3) Pittsburgh Paints; Speedhide Interior Zero VOC Latex.
         4) Sherwin-Williams; ProMar 200 Zero VOC Interior Latex
         5) Substitutions: See Section 01 60 00 - Product Requirements

2.04 ACCESSORY MATERIALS

A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.

B. Patching Material: Latex filler.

C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin application of paints and finishes until substrates have been adequately prepared.

B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

D. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

E. Test shop-applied primer for compatibility with subsequent cover materials.

F. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces is below the following maximums:
   1. Gypsum Wallboard: 12 percent.
   2. Interior Wood: 15 percent, measured in accordance with ASTM D4442.

3.02 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.

D. Seal surfaces that might cause bleed through or staining of topcoat.

E. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.

F. Gypsum Board: Fill minor defects with filler compound. Spot prime defects after repair.

G. Wood Surfaces to Receive Opaque Finish: Wipe off dust and grit prior to priming. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats. Back prime concealed surfaces before installation.

3.03 APPLICATION

A. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".

B. Where adjacent sealant is to be painted, do not apply finish coats until sealant is applied.

C. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

D. Apply each coat to uniform appearance in thicknesses specified by manufacturer.

E. Dark Colors and Deep Clear Colors: Regardless of number of coats specified, apply as many coats as necessary for complete hide.

F. Sand wood and metal surfaces lightly between coats to achieve required finish.

G. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

H. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.04 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.05 PROTECTION

A. Protect finishes until completion of project.

B. Touch-up damaged finishes after Substantial Completion.

END OF SECTION

SECTION 10 21 23
CUBICLE CURTAINS AND TRACK

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Cubicle curtains.

1.02 RELATED REQUIREMENTS

A. Section 09 51 00 - Acoustical Ceilings: Suspended ceiling system to support track.

1.03 REFERENCE STANDARDS

A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

B. NFPA 701 - Standard Methods of Fire Tests for Flame Propagation of Textiles and Films.

1.04 SUBMITTALS

A. See Section 01 40 00 - Quality Requirements, for submittal procedures.

B. Product Data: Provide data for curtain fabric characteristicsand track (including hangers).

C. Shop Drawings: Indicate a reflected ceiling plan view of curtain track, hangers and suspension points, and attachment details.

D. Samples: Submit two fabric samples, 12 by 12 inch in size illustrating fabric color.

E. Samples: Submit 12 inch sample length of curtain track including typical splice, wall and ceiling hanger, and escutcheon.

F. Maintenance Data: Include recommended cleaning methods and materials and stain removal methods.

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.
   2. Extra Curtains: Six of each type and size, complete with curtain and mesh.
   3. Extra Carriers: 20.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Accept curtain materials on site and inspect for damage.

B. Store curtain materials on site and deliver to Owner for installation when requested.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Cubicle Track and Curtains:
   1. C/S General Cubicle: www.c-sgroup.com/cubicle-track-curtains.
   2. Imperial Fastener Co., Inc: www.imperialfastener.com.
   3. Inpro: www.inprocorp.com/#sle.
   4. On the Right Track Systems: www.ontherighttrack.com.
   5. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 TRACKS AND TRACK COMPONENTS

A. Tracks: Surface Mounted, Extruded aluminum sections; provide straight and bent sections as indicated on drawings.
   1. Mounting: Surface, clip to ceiling grid.
   2. Structural Performance: Capable of supporting vertical test load of 50 lbs without visible deflection of track or damage to supports, safely supporting moving loads, and sufficiently rigid to resist visible deflection and without permanent set.
   3. Track End Stop: To fit track section.

4. Track Bends: Minimum 12 inch radius; configuration as indicated; fabricated without deformation of track section or impeding movement of carriers.
5. Suspension Rods: Tubular aluminum sections, sized to support design loads and designed to receive attachment from track and ceiling support.
6. Escutcheons: Where suspension rod meets finished ceiling or structure, provide escutcheons to match rod finish.
7. Finish on Exposed Surfaces: White enamel finish.

B. Suspension Arm: Provide extensions for track mounted to acoustical ceiling grid, length to allow for track to run level from gypsum board soffits.

C. Installation Accessories: Types required for specified mounting method and substrate conditions.

2.03 CURTAINS

A. Curtain Materials:
1. Flame spread index of 25, maximum; smoke developed index of 450, maximum; when tested in accordance with ASTM E84.
2. Inherently flame resistant or flameproofed; capable of passing NFPA 701 test.
3. Material: Close weave polyester; anti-bacterial, self deodorizing, sanitized, and preshrunk.
4. Curtain: as indicated in Finish Schedule.
5. Open Mesh Cloth: #42 fine Open weave to permit air circulation; flameproof material.
   a. Color: as indicated in Finish Schedule.
6. Attachment of Curtain Fabric to Open Mesh Cloth: Manufacturer's standard sewn seam.

B. Curtain Fabrication:
1. Manufacture curtains of one piece, sized 10 percent wider than track length. Terminate curtain 12 inches from floor.
2. Include open mesh cloth at top 36 inches of curtain for room air circulation and to allow sprinkler coverage.
3. Curtain Heading: Fabric band matching curtain panel with curtain ring holes for attachment to track without separate hooks.
4. Seams and Hems: Manufacturer's standard fabrication method for securely sewn and finished seams and hems.

2.04 ACCESSORIES

A. Curtain Removal/Installation Device: Metal pole with horizontal extension at top designed to remove and reinstall curtains from floor level.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces and supports above ceiling are ready to receive work of this Section.

B. Verify that field measurements are as indicated on shop drawings.

3.02 INSTALLATION

A. Install curtain track to be secure, rigid, and true to ceiling line.

B. Secure track to ceiling system.

C. Install end cap and stop device.

D. Install curtains on track ensuring smooth operation.

END OF SECTION

SECTION 10 28 00
TOILET ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Commercial toilet accessories, including but not limited to:
   1. Toilet Paper Dispenser

B. Healthcare accessories.
   1. Hand Sanitizer Dispenser

1.02 RELATED REQUIREMENTS

A. Section 06 10 53 - Miscellaneous Rough Carpentry.

1.03 REFERENCE STANDARDS

A. ASTM B456 - Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the work with the placement of internal wall reinforcement, concealed ceiling supports, and reinforcement of toilet partitions to receive anchor attachments.

1.05 SUBMITTALS

A. See Section 01 40 00 - Quality Requirements, for submittal procedures.

B. Product Data: Submit data on accessories describing size, finish, details of function, and attachment methods.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Commercial Toilet, Shower, and Bath Accessories:
   1. AWJ Architectural Products: www.ajw.com.
   2. American Specialties, Inc: www.americanspecialties.com/#sle.
   3. Bradley Corporation: www.bradleycorp.com/#sle.
   4. Bobrick Washroom Equipment, Inc.: www.bobrick.com.
   5. Georgia-Pacific Professional: www.gppro.com/#sle.
   6. Kimberly-Clark Corporation: www.kcprofessional.com/#sle.
   7. Substitutions: Section 01 60 00 - Product Requirements.

B. See plans and elevations for quantities and locations.

2.02 MATERIALS

A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.
   1. Grind welded joints smooth.
   2. Fabricate units made of metal sheet of seamless sheets with flat surfaces.

B. Keys: Provide four keys for each accessory to Owner; master key lockable accessories.

2.03 FINISHES

A. Stainless Steel: Satin finish, unless otherwise noted.

B. Chrome/Nickel Plating: ASTM B456, SC 2, polished finish, unless otherwise noted.

2.04 COMMERCIAL TOILET ACCESSORIES

A. Toilet Paper Dispenser: Double roll, surface mounted, for cored type rolls.
   1. Products:
      a. Bradley; Model 523.

b. Substitutions: Section 01 60 00 - Product Requirements.

2.05 HEALTHCARE ACCESSORIES

A. Hand Sanitizer Dispenser: Steel construction.
   1. Finish: Matte Black.
   2. Products:
      a. Nova of California; Luxe Touchless Hand Sanitizer Dispenser.
      b. Substitutions: See Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify exact location of accessories for installation.

C. Verify that field measurements are as indicated on drawings.

D. See Section 06 10 53 - Miscellaneous Rough Carpentry for installation of blocking, reinforcing plates, and concealed anchors in walls and ceilings.

3.02 PREPARATION

A. Deliver inserts and rough-in frames to site for timely installation.

B. Provide templates and rough-in measurements as required.

3.03 INSTALLATION

A. Install accessories in accordance with manufacturers' instructions in locations indicated on drawings.

B. Install plumb and level, securely and rigidly anchored to substrate.

C. Mounting Heights: As required by accessibility regulations, unless otherwise indicated.

3.04 PROTECTION

A. Protect installed accessories from damage due to subsequent construction operations.

END OF SECTION

SECTION 10 31 00
MANUFACTURED FIREPLACES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Electric fireplaces.

1.02 RELATED REQUIREMENTS

A. Division 26 - Electrical: Wiring Connections.

1.03 REFERENCE STANDARDS

A. NFPA 70 - National Electrical Code.

B. UL (DIR) - Online Certifications Directory.

C. UL 2021 - Fixed and Location Dedicated Electric Room Heaters.

1.04 SUBMITTALS

A. See Section 01 40 00 - Quality Requirements for submittal procedures.

B. Product Data: Provide firebox cabinet dimensions, clearances required from adjacent dissimilar construction, applicable regulatory agency approvals, and electrical characteristics of fan.

C. Shop Drawings: Indicate layout, elevations, sections, firebox rough opening dimensions, rough opening sizes for chimney flue, required clearances, utility service requirements, attachments to other work, and fan size.

D. Executed warranty.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with at least three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.

1.06 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty: Provide 5-year manufacturer warranty for products and their component parts. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.01 ELECTRIC FIREPLACES

A. Manufacturers:
   1. Modern Flames, LLC: www.modernflames.com/#sle.
   2. **BASIS OF DESIGN:** SimpliFire; Inception Traditional Fireplace: www.simplifire.com/#sle.
   3. Substitutions: See Section 01 60 00 - Product Requirements.

B. Description:
   1. Location: Indoor.
   2. Fireplace Style: Recessed.
   3. Power Connection: Hardwired.
   4. Btu Rating: 5,000 btu heater.
   5. Built-in fireboxes.
   6. Wall-mounted fireplaces.

C. Design Criteria:
   1. Comply with UL 2021 for electric room heating equipment.

2.02 REGULATORY REQUIREMENTS - GENERAL

A. Products Requiring Electrical Connection: Listed and labeled by UL (DIR) or testing firm acceptable to authorities having jurisdiction as suitable for purpose specified and indicated.

2.03 COMPONENTS

A. Firebox: Formed insulated steel cabinet with rectangular-shaped interior.
   1. Viewable Opening: See drawings.

B. Exposed Cladding: Heat-resistant black enamel.

C. Firebox Closure: Fixed clear, tempered glass panel.

2.04 ACCESSORIES

A. Fasteners and Anchors: Galvanized steel.

B. Remote Control: Separate controls for on/off variable heat and variable flame, with independent flame and ember bed variable controls.

PART 3 EXECUTION

3.01 VERIFICATION OF CONDITIONS

A. Verify prepared openings are ready to receive work and opening dimensions are as indicated on drawings.

B. Verify proper power supply and fuel source are available.

3.02 INSTALLATION

A. Perform electrical work in accordance with NFPA 70.

B. Install unit assembly in accordance with manufacturer's instructions.

END OF SECTION

SECTION 10 44 00
FIRE PROTECTION SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fire extinguishers.

B. Fire extinguisher cabinets.

1.02 RELATED REQUIREMENTS

A. Section 06 10 53 - Miscellaneous Rough Carpentry: Wood blocking product and execution requirements.

1.03 REFERENCE STANDARDS

A. FM (AG) - FM Approval Guide.

B. NFPA 10 - Standard for Portable Fire Extinguishers.

C. UL (DIR) - Online Certifications Directory.

1.04 SUBMITTALS

A. See Section 01 40 00 - Quality Requirements for submittal procedures.

B. Product Data: Provide extinguisher operational features, extinguisher ratings and classifications, color and finish, anchorage details, and installation instructions.

C. Shop Drawings: Indicate locations of cabinets, cabinet physical dimensions, rough-in measurements for recessed cabinets, mounting measurements for wall bracket, and accessories required for complete installation.

D. Operation and Maintenance Data: Include test, refill, or recharge schedules and recertification requirements.

1.05 FIELD CONDITIONS

A. Do not install extinguishers when ambient temperature causes freezing of extinguisher ingredients.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Fire Extinguishers:
   1. Activar Construction Products Group, Inc. - JL Industries: www.activarcpg.com/#sle.
   2. Ansul, a Tyco Business: www.ansul.com/#sle.
   3. Kidde, a unit of United Technologies Corp: www.kidde.com/#sle.
   4. Nystrom, Inc.: www.nystrom.com.
   5. Potter-Roemer: www.potterroemer.com/#sle.
   6. Pyro-Chem, a Tyco Business: www.pyrochem.com/#sle.
   7. Substitutions: See Section 01 60 00 - Product Requirements.

B. Fire Extinguisher Cabinets and Accessories:
   1. Activar Construction Products Group, Inc. - JL Industries: www.activarcpg.com/#sle.
   2. Kidde, a unit of United Technologies Corp: www.kidde.com/#sle.
   3. Larsen's Manufacturing Co: www.larsensmfg.com/#sle.
   4. Nystrom, Inc.: www.nystrom.com.
   5. Potter-Roemer: www.potterroemer.com/#sle.
   6. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 FIRE EXTINGUISHERS

A. General Requirements: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.

1. Provide extinguishers labeled by UL (DIR) or FM (AG) for purpose specified and as indicated on drawings.

B. Multipurpose Dry-Chemical-Type Fire Extinguishers: Carbon steel tank, with pressure gauge.
   1. Class: A:B:C.
   2. Size: 5 pound.
   3. Finish: Baked polyester powder coat, red color.
   4. Temperature range: Minus 40 degrees F to 120 degrees F.

2.03 FIRE EXTINGUISHER CABINETS

A. Cabinet Construction: Non-fire rated.
   1. Formed primed steel sheet; 20-gauge, 0.036-inch thick base metal.

B. Cabinet Configuration: Semi-recessed type.
   1. Size to accommodate accessories.
   2. Projected Trim: Returned to wall surface, with 1/2-inch projection, and 2-inch wide face.
   3. Provide cabinet enclosure with right-angle inside corners and seams and with formed perimeter trim and door stiles.

C. Door: 20-gauge, 0.036-inch metal thickness, reinforced for flatness and rigidity with nylon catch. Hinge doors for 180-degree opening with two butt hinges.

D. Door Glazing: Acrylic plastic, clear, 1/8 inch thick, flat shape, and set in resilient channel glazing gasket.

E. Cabinet Mounting Hardware: Appropriate to cabinet, with predrilled holes for placement of anchors.

F. Fabrication: Weld, fill, and grind components smooth.

G. Finish of Cabinet Exterior Trim and Door: Baked enamel, white color.

H. Finish of Cabinet Interior: White colored enamel.

2.04 ACCESSORIES

A. Extinguisher Brackets: Formed steel, chrome-plated.

B. Cabinet Signage: Label or lettering, vertical on hinge side.
   1. Lettering: FIRE EXTINGUISHER text on decal or self-adhesive vinyl, prespaced black lettering in accordance with authorities having jurisdiction.
   2. Color: as selected by Architect.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify dimensions, tolerances, and interfaces with other work.

B. Verify substrate and site conditions for product installation are in accordance with manufacturer's written instructions.

C. Verify rough openings for cabinet are sized and located in accordance with manufacturer's written instructions.

D. Notify Architect in writing of conditions detrimental to completion of work. Do not proceed with installation until detrimental conditions are corrected.

3.02 INSTALLATION

A. Locate extinguishers as indicated in Drawings.

B. Install in accordance with manufacturer's instructions.

C. Install cabinets plumb and level in wall openings, 48 inches from finished floor to highest operable part.

D. Secure rigidly in place.

E. Place extinguishers and accessories in cabinets.

END OF SECTION

SECTION 10 51 29
PHENOLIC LOCKERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Phenolic lockers.

1.02 RELATED REQUIREMENTS

A. Section 07 92 00 - Joints Sealants.

1.03 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

C. ICC A117.1 - Accessible and Usable Buildings and Facilities.

1.04 SUBMITTALS

A. See Section 01 40 00 - Quality Requirements, for submittal procedures.

B. Product Data: Manufacturer's published data on locker construction, sizes and accessories.

C. Shop Drawings: Indicate locker plan layout, numbering plan and combination lock code.

D. Samples: Submit two samples 2 by 3 inches in size, of each color scheduled.

1.05 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions by field measurements before fabrication.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect locker finish and adjacent surfaces from damage.

B. Store products in manufacturer's unopened packaging until ready for installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Phenolic Lockers:
   1. American Specialties Inc.: Traditional
   2. **BASIS OF DESIGN:** Bradley Corporation
   3. Columbia Lockers, a division of PSiSC: www.psisc.com/#sle.
   4. Famous Lockers: www.famouslockers.com
   5. Hollman Lockers; www.hollman.com
   6. Ideal Products
   7. Spec-Rite Design, LLC: www.specritedesigns.com.
   8. Summit Lockers: www.summitlockers.com.
   9. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 LOCKER APPLICATIONS

A. Lockers: Phenolic lockers, wall mounted for base indicated on drawings.
   1. Accessibility: Comply with ICC A117.1 and ADA Standards.
   2. Width: 18 inches.
   3. Depth: 15 inches.
   4. Height: 72 inches.
   5. Locker Configuration: Z-tier (2 lockers each with a short and long compartment).
   6. Fittings: Size and configuration as indicated on drawings.
   7. Ventilation: By open space between the back of the door and locker body and by holes drilled in tops, bottoms, and intermediate shelves.
   8. Locking: Built-in digital keypad locks.

9. Provide sloped top.
10. Provide Accessible lockers in compliance with ICC/ANSI A 117.1, in the ratio of 1 per 6 lockers, but never less than 1 per room housing lockers.
    a. Locate bottom shelf no lower than 15 inches above the floor.
    b. Where hooks, coat rods, or additional shelves are provided, locate no higher than 46 inches above the floor.

2.03 PHENOLIC LOCKERS

A. Lockers: Factory assembled, made of phenolic core panels with mortise and tenon joints and stainless steel mechanical joint fasteners; fully finished inside and out; each locker capable of standing alone.
    1. Doors: Full overlay, covering full width and height of locker body; square edges.
    2. Panel Core Exposed at Edges: Machine polished, without chips or tool marks; square edge unless otherwise indicated.
    3. Where locker ends or sides are exposed, finish the same as fronts or provide extra panels to match fronts.
    4. Provide filler strips where indicated, securely attached to lockers.
    5. Door Color: As selected by Architect from manufacturer's standard colors.
    6. Body Color: Manufacturer's standard white or light color.
    7. Fasteners for Accessories and Locking Mechanisms: Tamperproof type.

B. Component Thicknesses:
    1. Doors: 1/2 inch minimum thickness.
    2. Locker Body: One of the following combinations:
        a. Tops, bottoms, and shelves 1/2 inch; sides 3/8 inch; backs 1/4 inch; minimum.
    3. End Panels and Filler Panels: 1/2 inch minimum thickness.
    4. Sloped Tops: 1/2 inch minimum thickness.
    5. Toe Kick Plates: 1/2 inch minimum thickness.

C. Phenolic Core Panels: Nonporous phenolic resin and paper core formed under high pressure, with natural colored finished edges, integral melamine surface, matte finish, and uniform surface appearance; glued laminated panels not acceptable.
    1. Surface Burning Characteristics: Flame spread index of 75 or less, and smoke developed index of 450 or less; when tested in accordance with ASTM E84.

D. Hinges: Stainless steel, satin finish; minimum of 180 degree opening; either exposed barrel 5-knuckle hinge attached to back of door and inside of body with tamperproof screws, or concealed cabinetwork style hinge attached with tamperproof screws.

E. Coat Hooks: Stainless steel or reinforced nylon; attached with tamperproof screws.

F. Built-In Mechanical Push Button Locks:
    1. Built-In Mechanical Push-Button Lock: Ten-digit keypad with input button for user-defined code; cam lever locking mechanism; control key override feature.

G. Lock Strike: Stainless steel, or black high impact ABS plastic strike plate attached to locker body with throughbolts.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that prepared bases are in correct position and configuration.

B. Verify bases and embedded anchors are properly sized.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Place and secure on prepared base.

C. Install lockers plumb and square.

D. Secure lockers with anchor devices to suit substrate materials. Minimum Pullout Force: 100 pounds.

E. Bolt adjoining locker units together to provide rigid installation.

F. Install end panels, filler panels, and sloped tops.

G. Install accessories.

H. Replace components that do not operate smoothly.

3.03 CLEANING

A. Clean locker interiors and exterior surfaces.

END OF SECTION

SECTION 12 22 16
DRAPERY TRACK AND ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Draperies.

1.02 ADMINISTRATIVE REQUIREMENTS

A. Coordinate location and installation of concealed blocking for support of tracks.

1.03 SUBMITTALS

A. See Section 01 40 00 - Quality Requirements, for submittal procedures.

B. Product Data: Provide product data for fabric, drapery rod/hardware, brackets and mounting accessories.

C. Shop Drawings: Indicate end track location, width of window opening, location of blocking for anchors, appurtenances and interferences, adjacent construction, operating hardware, and support bracket details.

D. Samples: Submit fabric and hardware for approval.

E. Maintenance Data: Include data for motor, shaft and gearing, lubrication frequency, control adjustments, spare part sources.

1.04 QUALITY ASSURANCE

A. Manufacturer: Company specializing in manufacturing the products specified in this section, with minimum three years of documented experience.

PART 2 PRODUCTS

2.01 DRAPERIES

A. Drapery Curtain:
   1. Custom fabrication with approximately 2-2.5x fullness.
   2. Drapery Fabric:
      a. Textile Treatments: Flame retardant, polymer type.
      b. Drapery Fabric: as selected by Architect. Include a $65/LF fabric allowance.
   3. Bottom Hem: 4 inches with weights.
   4. Sides: 2 inch bookend hem.

B. Provide drapery rod/hardware, brackets, mounting accessories as idnicated in drawings.

2.02 FINISHES

A. Exposed Surfaces: Baked enamel, as selected by Architect from manufacturers full range.

2.03 DRAPERY FABRICATION

A. Fabricate draperies in heading styles and fullnesses indicated. Fabricate headings to stand erect. If less than a full width of fabric is required to produce panel of specified fullness, use equal widths of not less than one-half width of fabric located at ends of panel.

B. Seams: Sew vertical seams with twin-needle sewing machine with selvage trimmed and overlocked. Join widths so that patterns match and vertical seams lay flat and straight without puckering. Horizontal seams are not acceptable.

C. Side Hems: Double-turned, 2-inch- wide hems consisting of three layers of fabric, and blindstitched so that stitches are not visible on face of drapery.

D. Bottom Hems: Double-turned, 4-inch- wide hems consisting of three layers of fabric, and weighted and blindstitched so that weights and stitches are not visible on face of drapery.
   1. Sew in weights at each seam and at panel corners.

E. Linings: Equal to widths of drapery fabric and joined to drapery fabric at top by inside invisible seam, and hand stitched at side hems and shadowed with 1-1/2-inch return of face fabric.
   1. Bottom Hem: Blind stitch to drapery fabric.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that concealed blocking and anchors are in correct position.

B. Verify that electrical service is correctly located and of proper characteristics.

3.02 INSTALLATION

A. Install drapery and rods in accordance with manufacturer's instructions.

B. Mount rod on solid backing. Where mounting location does not align with solid backing, provide expanding anchors for each screw hole location.

3.03 ADJUSTING

A. Adjust drapery hardware for smooth operation.

END OF SECTION

SECTION 12 24 00
WINDOW SHADES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Interior manual roller shades (WS).

1.02 RELATED REQUIREMENTS

A. Section 06 10 53 - Miscellaneous Rough Carpentry: Concealed wood blocking for attachment of headrail brackets.

1.03 REFERENCE STANDARDS

A. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.

B. NFPA 701 - Standard Methods of Fire Tests for Flame Propagation of Textiles and Films.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week prior to commencing work related to products of this section; require attendance of affected installers.

B. Sequencing:
   1. Do not fabricate shades until field dimensions for each opening have been taken with field conditions in place.
   2. Do not install shades until final surface finishes and painting are complete.

1.05 SUBMITTALS

A. Product Data: Provide manufacturer's standard catalog pages and data sheets, including materials, finishes, fabrication details, dimensions, profiles, mounting requirements, and accessories.

B. Shop Drawings: Include shade schedule indicating size, location and keys to details, head, jamb and sill details, mounting dimension requirements for each product and condition, and operation direction.

C. Selection Samples: Include fabric samples in full range of available colors and patterns.

D. Verification Samples: Minimum size 6 inches square, representing actual materials, color and pattern.

E. Operation and Maintenance Data: List of all components with part numbers, sources of supply, and operation and maintenance instructions; include copy of shop drawings.

F. Warranty: Submit sample of manufacturer's warranty and documentation of final executed warranty completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than five years of documented experience.

B. Installer Qualifications: Company specializing in performing work of this type with minimum five years of documented experience with shading systems of similar size and type.
   1. Manufacturer's authorized representative.
   2. Factory training and demonstrated experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver shades in manufacturer's unopened packaging, labeled to identify each shade for each opening.

B. Handle and store shades in accordance with manufacturer's recommendations.

1.08 FIELD CONDITIONS

A. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.09 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Provide manufacturer's warranty from Date of Substantial Completion, covering the following:
   1. Shade Hardware: Twenty-five years.
   2. Fabric: Twenty-five years.
   3. Aluminum and Steel Coatings: Five years.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Interior Manually Operated Roller Shades:
   1. Draper, Inc: www.draperinc.com/#sle.
   2. Hunter Douglas Architectural: www.hunterdouglasarchitectural.com/#sle.
   3. Lutron Electronics Co., Inc: www.lutron.com/#sle.
   4. MechoShade Systems LLC: www.mechoshade.com/#sle.
   5. SWFcontract, a division of Springs Window Fashions, LLC.: www.swfcontract.com/#sle.
   6. WT Shade: www.inprocorp.com.
   7. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 ROLLER SHADES

A. General:
   1. Provide shade system components that are easy to remove or adjust without removal of mounted shade brackets.
   2. Provide shade system that operates smoothly when shades are raised or lowered.

B. Roller Shades:
   1. Description - Interior Roller Shades: Single roller, manually operated fabric window shade system complete with mounting brackets, roller tubes, hembars, hardware, and accessories.
      a. Drop Position: Regular roll.
      b. Roll Direction: Roll down, closed position is at window sill.
      c. Mounting: Window jamb mounted - inside, between jambs. Field verify prior to ordering.
      d. Size: As indicated on drawings.
      e. Fabric: As indicated under Shade Fabric article.
   2. Brackets and Mounting Hardware: As recommended by manufacturer for mounting indicated and to accommodate shade fabric roll-up size and weight.
      a. Material: Stamped steel.
   3. Roller Tubes: As required for type of shade operation.
      a. Material: Extruded aluminum, clear anodized finish.
      b. Size: As recommended by manufacturer; selected for suitability for installation conditions, span, and weight of shades.
      c. Fabric Attachment: Utilize extruded channel in tube to accept vinyl spline welded to fabric edge.
      d. Take-Up Roller: Manufacturer's standard roller tube pretensioned for winding lift cable in bottom-up type shades.
   4. Hembars: Designed to maintain bottom of shade straight and flat.
      a. Style: Full wrap fabric covered bottom bar, flat profile with heat sealed closed ends.

2.03 SHADE FABRIC

A. Fabric: Nonflammable, color-fast, impervious to heat and moisture, and able to retain its shape under normal operation.
   1. Manufacturers: See Finish Schedule for Basis of Design.
      a. Lutron Electronics Co., Inc: www.lutron.com.
      b. MechoShade Systems LLC: www.mechoshade.com/#sle.
      c. Mermet Corporation: www.mermetusa.com/#sle.
      d. Phifer, Inc: www.phifer.com/#sle.
      e. Substitutions: See Section 01 60 00 - Product Requirements.
   2. Performance Requirements:
      a. Flammability: Pass NFPA 701 large and small tests.
      b. Fungal Resistance: No growth when tested in accordance with ASTM G21.
   3. Openness Factor: See Finish Schedule.
   4. Color: See Finish Schedule.
   5. Fabrication:
      a. Fabric Orientation: Railroaded, fabric is turned 90 degrees off the roll.
      b. If height of opening requires multiple panels of railroaded fabric, use manufacturer's standard sewn seams.

2.04 ROLLER SHADE FABRICATION

A. Field measure finished openings prior to ordering or fabrication.

B. Dimensional Tolerances: Fabricate shades to fit openings within specified tolerances.
   1. Vertical Dimensions: Fill openings from head to sill with 1/2 inch space between bottom bar and window stool.
   2. Horizontal Dimensions - Inside Mounting: Provide symmetrical light gaps on both sides of shade not to exceed 1/2 inch total.

C. At openings requiring continuous multiple shade units with separate rollers, locate roller joints at window mullion centers; butt rollers end-to-end.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine finished openings for deficiencies that may preclude satisfactory installation.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

C. Start of installation shall be considered acceptance of substrates.

3.02 PREPARATION

A. Prepare surfaces using methods recommended by manufacturer for achieving best result for substrate under the project conditions.

B. Coordinate with window installation and placement of concealed blocking to support shades.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions and approved shop drawings, using mounting devices as indicated.

B. Replace shades that exceed specified dimensional tolerances at no extra cost to Owner.

C. Adjust level, projection, and shade centering from mounting bracket. Verify there is no telescoping of shade fabric. Ensure smooth shade operation.

3.04 CLEANING

A. Clean soiled shades and exposed components as recommended by manufacturer.

B. Replace shades that cannot be cleaned to "like new" condition.

3.05 PROTECTION

A. Protect installed products from subsequent construction operations.

END OF SECTION

SECTION 12 36 00
COUNTERTOPS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Countertops for architectural cabinet work:
   1. Solid Surface (SS-1)
   2. Quartz (QTZ-1)

B. Wall-hung counters and vanity tops.

C. Sinks molded into countertops.

D. Solid surface window sills.

1.02 RELATED REQUIREMENTS

A. Section 06 10 53 - Miscellaneous Rough Carpentry: installation of concealed blocking.

B. Section 06 41 00 - Architectural Wood Casework: architectural cabinet work.

C. Division 22: Plumbing fixtures including undermount and drop in sinks, trim and connections.

1.03 REFERENCE STANDARDS

A. ANSI A208.2 - Medium Density Fiberboard (MDF) for Interior Applications.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

C. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition.

D. ISFA 2-01 - Classification and Standards for Solid Surfacing Material.

E. ISFA 3-01 - Classification and Standards for Quartz Surfacing Material.

F. NEMA LD 3 - High-Pressure Decorative Laminates.

G. NSI (DSDM) - Dimensional Stone Design Manual, Version VIII.

1.04 SUBMITTALS

A. See Section 01 40 00 - Quality Requirements for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Specimen warranty.

C. Shop Drawings: Complete details of materials and installation ; combine with shop drawings of cabinets and casework specified in other sections.

D. Selection Samples: For each finish product specified, color chips representing manufacturer's full range of available colors and patterns.

E. Verification Samples: For each finish product specified, minimum size 6 inches square, representing actual product, color, and patterns.

F. Test Reports: Chemical resistance testing, showing compliance with specified requirements.

G. Maintenance Data: Manufacturer's instructions and recommendations for maintenance and repair of countertop surfaces.

1.05 QUALITY ASSURANCE

A. Perform work in accordance with AWI Standards (latest edition) unless other quality is indicated for specific items.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver countertops until painting and similar operations that could damage countertops have been completed in installation areas.

B. Store products in manufacturer's unopened packaging until ready for installation.

C. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.07 FIELD 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.

B. Field Measurements: Where countertops are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

PART 2 PRODUCTS

2.01 COUNTERTOPS

A. Solid Surfacing Countertops: Solid surfacing sheet or plastic resin casting over continuous substrate.
   1. Flat Sheet Thickness: 1/2 inch, minimum.
   2. Solid Surfacing Sheet and Plastic Resin Castings: Complying with ISFA 2-01 and NEMA LD 3; acrylic or polyester resin, mineral filler, and pigments; homogenous, non-porous and capable of being worked and repaired using standard woodworking tools; no surface coating; color and pattern consistent throughout thickness.
      a. Manufacturers:
         1) as indicated in Finish Schedule.
         2) Substitutions: See Section 01 60 00 - Product Requirements.
      b. Surface Burning Characteristics: Flame spread index of 25, maximum; smoke developed index of 450, maximum; when tested in accordance with ASTM E84.
      c. NSF approved for food contact.
      d. Sinks and Bowls: Separate units for undercounter mounting; minimum 3/4 inch wall thickness.
      e. Finish on Exposed Surfaces: Matte, gloss rating of 5 to 20.
      f. Color and Pattern: As indicated on Finish Schedule.
   3. Other Components Thickness: 1/2 inch, minimum.
   4. Exposed Edge Treatment: Built up to minimum 1-1/4 inch thick; square edge.
   5. Back and End Splashes: Same sheet material, square top; minimum 4 inches high, unless otherwise indicated.
   6. Skirts: As indicated on drawings.
   7. Fabricate in accordance with AWI/AWMAC/WI (AWS), Section 11 - Countertops, Premium Grade.
   8. Solid Surfacing Window Sills: thickness as detailed, 1/4" overhang on interior, square with eased edges.

B. Natural Quartz and Resin Composite Countertops: Sheet or slab of natural quartz and plastic resin over continuous substrate.
   1. Natural Quartz and Resin Composite Sheets, Slabs and Castings: Complying with ISFA 3-01 and NEMA LD 3; orthophthalic polyester resin, mineral filler, and pigments; homogenous, non-porous and capable of being worked and repaired using standard stone fabrication tools; no surface coating; color and pattern consistent throughout thickness.
      a. Manufacturers:
         1) as indicated in Finish Schedule.
         2) Substitutions: See Section 01 60 00 - Product Requirements.
      b. Factory fabricate components to the greatest extent practical in sizes and shapes indicated; comply with NSI (DSDM).

c. Surface Burning Characteristics: Flame spread index of 25, maximum; smoke developed index of 450, maximum; when tested in accordance with ASTM E84.
d. Finish on Exposed Surfaces: Polished.
e. Color and Pattern: As indicated in Finish Schedule.

2. Other Components Thickness: 3/4 inch, minimum.
3. Back and End Splashes: Same sheet material, square top; minimum 4 inches high, unless indicated otherwise.
4. Skirts: As indicated on drawings.
5. Fabricate in accordance with AWI/AWMAC/WI (AWS), Section 11 - Countertops, Premium Grade.

2.02 MATERIALS

A. Wood-Based Components:
1. Wood fabricated from old growth timber is not permitted.

B. Medium Density Fiberboard for Supporting Substrate: ANSI A208.2.

C. Adhesives: Chemical resistant waterproof adhesive as recommended by manufacturer of materials being joined.

D. Joint Sealant: Mildew-resistant silicone sealant, clear.

2.03 ACCESSORIES

A. Low-Profile Countertop Support Brackets: Fixed, L-shaped, face-of-wall mounting.
1. Materials: Steel; T-shape cross-section.
a. Finish: Manufacturer's standard, factory-applied, field-painted to match adjacent wall finish unless noted otherwise.
2. Products:
a. A&M Hardware, Inc; Hybrid Brackets: www.aandmhardware.com/#sle.
b. Rakks/Rangine Corporation; EH Series Brackets: www.rakks.com/#sle.
c. Substitutions: See Section 01 60 00 - Product Requirements.

2.04 FABRICATION

A. Fabricate tops and splashes in the largest sections practicable, with top surface of joints flush.
1. Join lengths of tops using best method recommended by manufacturer.
2. Fabricate to overhang fronts and ends of cabinets 1 inch except where top butts against cabinet or wall.
a. Rout a 1/8 inch drip groove at underside of exposed overlapping edges, set back 1/2 inch from face of edge.
3. Prepare all cutouts accurately to size; replace tops having improperly dimensioned or unnecessary cutouts or fixture holes.

B. Provide back/end splash wherever counter edge abuts vertical surface unless otherwise indicated.
1. Secure to countertop with concealed fasteners and with contact surfaces set in waterproof glue.
2. Height: 4 inches, unless otherwise indicated.

C. Solid Surfacing: Fabricate tops up to 144 inches long in one piece; join pieces with adhesive sealant in accordance with manufacturer's recommendations and instructions.
1. Integral sinks: Shop-mount securely to countertop with adhesives, using flush configuration, as per manufacturer's instructions, and as detailed on drawings.

D. Wall-Mounted Counters: Provide skirts, aprons, brackets, and braces as indicated on drawings, finished to match.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

C. Verify that wall surfaces have been finished and mechanical and electrical services and outlets are installed in proper locations.

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 INSTALLATION

A. Securely attach countertops to cabinets using concealed fasteners. Make flat surfaces level; shim where required.

B. Seal joint between back/end splashes and vertical surfaces.

3.04 TOLERANCES

A. Variation From Horizontal: 1/8 inch in 10 feet, maximum.

B. Offset From Wall, Countertops: 1/8 inch maximum; 1/16 inch minimum.

C. Field Joints: 1/8 inch wide, maximum.

3.05 CLEANING

A. Clean countertops surfaces thoroughly.

3.06 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 22 05 00

PLUMBING COMMON WORK RESULTS

PART 1 - GENERAL

1.1 SCOPE

A. Perform all Work required to provide and install the equipment and systems indicated by the Contract Documents with supplementary items necessary for proper installation.

1.2 REFERENCES

A. Plumbing work shall comply with specification section 230500.

B. In addition to Division 22, Plumbing work shall comply with the following sections:

1. Section 230500 HVAC Common Work Results
2. Section 230529 Pipe Hangers and Supports
3. Section 230553 Mechanical Identification
4. Section 230593 Cleaning and Testing
5. Section 230594 Testing Adjusting and Balancing
6. Section 230719 Piping Insulation

1.3 SUBMITTALS

A. Submittals must be reviewed and approved by the Contractor before submitting them to the Engineer.

1.4 REGULATORY AND UTILITY REQUIREMENTS

A. Contractor is responsible for coordinating all required site inspections by authorities having jurisdiction. Contractor shall notify General Contractor of all scheduled inspections seven (7) working days prior to site visit.

B. Contractor is responsible for paying for all fees, permits, and inspections required to complete their work.

C. Contractor shall include all work required to install new and relocate utilities and meters as shown on drawings.

D. Utility work 5’-0” from outside of building is by others, unless shown otherwise.

E. Contractor shall notify Owner of any utility service shutdown 48 hours in advance. This includes water, sanitary, and storm systems.

1.5 SUBSTITUTIONS

A. All manufacturers listed as Acceptable Manufacturers in each specification section are considered equal to the basis of design. The basis of design is preferred and will take precedence. Any products from an alternate approved manufacturer need to meet the requirements and performance specified and shall be equal to the basis of design.

B. The Contractor may request permission for a substitution of any item (equipment or material), subject to the following conditions:

1. Submit substitution requests in writing to the Engineer, on a form supplied by the Engineer. A sample copy of this form is included at the end of this section. An electronic copy can also be provided to the Contractor by the Engineer.
2. Where equipment or accessories are used which differ in arrangement, configuration, dimensions, ratings, or engineering parameters from those indicated on the contractor 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 as well as any re-design costs incurred by the Architect or Engineer. The Contractor is also responsible for coordinating changes required by other trades.

3. Any requests for alternate manufacturers must be submitted to the Architect/Engineer at least ten (10) days prior to bid day. Incomplete substitution requests will not be considered.

C. Approval

1. No work involving requests for substitution shall commence without written approval on the provided form by the Engineer.

2. Any work started or material ordered/installed by the Contractor without written approval shall be removed/repaired at the sole expense of the Contractor. The Contractor will also be responsible for any costs incurred by the Owner for such rework.

PART 2 - PRODUCTS

2.1 PAINT

A. For indoor applications, use paints and primers that have a VOC content of 250 g/L or less when calculated according to the adopted version of the Green Seal Standard GC-03, Anti-Corrosive Paints.

PART 3 - EXECUTION

3.1 PAINTING

A. Contractor shall paint the following items with two (2) coats of exterior enamel over one (1) coat primer. Select paint to be compliant with material being used, i.e. metal, plastic, etc:

1. All exposed plumbing piping. Color to be coordinated with the Architect.

END OF SECTION

SECTION 22 05 23

PLUMBING VALVES

PART 1 - GENERAL

1.1 SCOPE

A. Perform all Work required to provide and install the following Plumbing Valves indicated by the Contract Documents with supplementary items necessary for proper installation.

B. Equipment Included in This Section
   1. All valves shown on the plumbing drawings.
   2. Valves to isolate all plumbing fixture groups.
   3. Valves to isolate water heaters and other plumbing equipment.
   4. Valves to isolate owner provided equipment.
   5. Valves for makeup water connections serving hydronic systems.

1.2 REFERENCES

A. Abbreviations
   1. IBBM: Iron body, bronze mounted.
   2. OS&Y: Outside screw and yoke.
   3. WOG: Water, oil, gas.
   4. WSP: Working steam pressure.

1.3 SUBMITTALS

A. Product Data: Catalog sheets, specifications and installation instructions for each valve type.

B. Operation and Maintenance Data: For valves, safety valves, pressure-reducing valves, air vents, vacuum breakers, and meters to include in emergency, operation, and maintenance manuals.

1.4 QUALITY ASSURANCE

A. Regulatory Requirements
   1. Comply with the most recent version following standards:
      a. Safe Drinking Water Act (SDWA) and the associated lead content requirements.

PART 2 - PRODUCTS

2.1 VALVES - GENERAL

A. Acceptable Manufacturers (unless specified otherwise)
   1. Apollo/Conbraco
   2. Crane
   3. Hammond
   4. HCI
   5. Milwaukee
   6. Nibco
   7. Stockham
   8. Victaulic
   9. Viega
   10. Watts

B. Valve Standardization: Valves from one or more manufacturers may be used, however valves supplied for each specific valve type shall be the product of one manufacturer.

C. Valves shall be first quality, free from all imperfections and defects, with body markings indicating manufacturer and rating.

D. Valve parts of same manufacturer, size and type shall be interchangeable.

E. Valves which use packing shall be capable of being packed when wide open and under full working pressure.

F. Size valves the same size as the piping in which they are installed, unless specified otherwise.

G. Provide extended shafts for all valves installed on insulated piping.

H. Coordinate the end connection type with the piping and other specialties in the systems. Refer to the piping usage schedule for additional requirement. The following are acceptable styles:
   1. Solder
   2. Mechanical press
   3. Threaded

I. Provide unions in the system as needed for installation or removal of valves and specialties.

2.3 CHECK VALVES

A. CK-1: 125 psig WSP; 200 psig WOG; bronze body; brass, bronze, or 304 stainless steel trim; Y-pattern; horizontal swing; renewable/regrindable bronze seat disc.

B. CK-2: 125 psig WSP; 200 psig WOG; bronze body; brass, bronze, or 304 stainless steel trim; Y-pattern; horizontal swing; renewable/regrindable PTFE seat disc.

C. CK-3: 125 psig WSP; 200 psig WOG; IBBM;; bolted bonnet; full port; horizontal swing regrindable/renewable cast bronze seat ring and disc. Discs on valves 4 inch size and larger may be cast iron with bronze face.

2.4 BALL VALVES

A. BV-1: 150 psig WSP, 600 psig WOG, two (2) piece bronze body, full-port, solid blow-out proof 316 stainless steel stem, PTFE seats, 316 stainless steel ball, PTFE seals, corrosion resistant steel lever handles with vinyl grips, and balancing stop.

2.5 BUTTERFLY VALVES

A. BF-1: Ductile iron body, flangeless wafer, grooved, or lugged type, (lug for each bolt hole, drilled and tapped for cap screws), with resilient PTFE or EPDM seats, ductile iron discs, stainless steel stems, and raised necks able to accommodate 2 inches of insulation.
   1. Pressure Ratings:
      a. 12 inch size and Less: 200 psig WOG at 275° F.
      b. 14 inch size and Up: 150 psig WOG at 275° F.

B. Operators
   1. 6 inch size and Less: Manual actuator handles with external indication of disc position, memory stop, and suitable means of locking actuator in any fixed position.
   2. 8 inch size and Up: Worm gear operator.

2.6 WATER PRESSURE REDUCING VALVES

A. Main Water Service
   1. Acceptable Manufacturers:
      a. Fisher
      b. Kieley
      c. Mueller
   2. Valve shall be an adjustable, direct acting, spring loaded, diaphragm operated, single seat, bottom guided type suitable for dead end service; guaranteed not to stick and shall maintain a constant discharge pressure which will not vary more than 1 psig for each 10 psig decrease in inlet pressure. Valves shall have cast iron, mild steel or bronze bodies.

Valve trim shall be of stainless steel with renewable composition disc. Parts subject to wear shall be renewable.

3. Material of diaphragm and disc shall be suitable for an operating temperature to 150° F. The control line, from diaphragm casing, shall be connected to the discharge piping at least ten (10) feet downstream from pressure reducing valve. Control line shall be of same material as adjoining piping. Valves shall be standard weight for inlet pressures up to 125 psig, and extra heavy weight for inlet pressures in excess of 125 psig.

B. Cold Water Make-Up Service for Hydronic Systems

1. Acceptable Manufacturers:
   a. Bell & Gossett
   b. Watts
   c. Wilkins

2. Adjustable direct acting, spring loaded, diaphragm operated, single seat type conforming to ASSE 1003 - Performance Requirements for Water Pressure Reducing Valves for Domestic Water Supply Systems.
   a. Body: Brass or bronze construction.
   b. Wetted Parts: Brass, bronze, stainless steel, or nickel alloy construction.
   c. Renewable seat and removable composition disc.
   d. Integral low inlet pressure check valve.
   e. Operating Temperature Range: 33-160° F.
   f. Maximum Working Pressure: 125 psi.

3. Pressure reducing valves with integral strainers may be substituted for approval, in lieu of separate valve and strainer, if integral strainer and valve meet individual valve and strainer specifications.

2.7 BALANCING VALVES

A. Manual Type

1. Acceptable Manufacturers:
   a. Bell & Gossett
   b. Conbraco
   c. Griswold
   d. Nexus
   e. Nibco
   f. Taco
   g. Victaulic

2. All valves to be of bronze body/stainless steel construction with glass and carbon filled TFE seat rings. Valves to have differential pressure read-out ports across valve seat area. Read-out ports to be fitted with internal EPT insert and check valve. Valve bodies to have 1/4 inch drain/purge port. Valves to have memory stop and calibrated nameplate.

3. Valves shall be leak-tight at full rated working pressure.
   a. 1/2 to 3 inch: 300 psig at 250° F.
   b. 1/2 to 2 inch: 200 psig at 250° F.

4.

2.8 SAFETY AND RELIEF VALVES

A. General Requirements: Valves shall be as specified by ASME Code governing manufacture of such valves within scope of their particular usage, i.e., Heating Boilers, Unfired Pressure Valves, etc., shall be tested, rated and listed, unless otherwise specified. Valves for

applications specified shall conform to the ASME Code, Section IV, Heating Boilers and the following:

1. Valves for combination domestic hot water heater and storage tanks shall conform to the requirements of ASME Code, Section IV and USA Standard Z21.22 and shall be NBB listed. Valves shall be of the temperature - pressure type. Thermostatic element shall, on rising temperature, cause the valve to open at 200° F and valve shall deliver its rated capacity at 210° F and close drip tight at 195° F. Valves shall be sized in accordance with Unfired Vessel Code.
2. End Connections: Unless otherwise specified, safety valves, relief valves and safety relief valves, in sizes 3/4 inch to 3 inches IPS inclusive, may be furnished with male or female pipe thread inlet and female pipe thread outlet; valves over 3 inches IPS must be furnished with 125 lb. or 250 lb. inlet and may be equipped with 125 lb. outlet.

2.9 GAUGE COCKS

A. Acceptable Manufacturers:
   1. Marsh Instrument Company
   2. Mueller Instruments Co.
   3. H.O. Trerice Co.
   4. Weksler Instruments Corp.

B. Gauge Cocks: All brass construction, “T” or lever handles, built for 300 psig hydraulic pressure.

2.2 STRAINERS

A. Acceptable Manufacturers:
   1. Zurn
   2. Watts

B. All strainers to be of constructed of lead free brass, bronze, or copper and shall be rated for use in potable water systems and shall meet the requirements of NSF/ANSI 372. Strainers shall include 20 mesh stainless steel strainer screen and tapped access cover and pipe plug.

PART 3 - EXECUTION

2.10 INSTALLATION

A. General: Install valves at locations noted on the drawings and as specified below:.
   1. Install isolation valves at branch takeoffs from mains.
   2. Install a common isolation valves for branch lines to each group of fixtures.
   3. Install isolation valves above ceiling (in an accessible location) for each fixture if fixture is not provided with integral stops.

2.11 VALVE APPLICATION SCHEDULE

A. Schedule of valve applications for the different services is as follows:

   1. Cold Water, Domestic Hot Water and Circulating (CW, HW, HWC) located inside building, 125 psig and Less:
      a. 3 inch and Less: BV-1, CK-1, CK-2.
      b. 4 inch and Up: BF-1, CK-3.

END OF SECTION

SECTION 22 11 00

PLUMBING PIPING

PART 1 - GENERAL

1.1 SCOPE

A. Perform all Work required to provide and install the following Plumbing Piping Systems indicated by the Contract Documents with supplementary items necessary for proper installation.

B. Equipment Included in this section:

1. Cold Water
2. Hot Water
3. Hot Water Recirculation
4. Sanitary
5. Vent
6. Storm
7. Water Service
8. Acid Waste & Vent

1.2 REFERENCES

A. All materials, installation and workmanship shall comply with the applicable requirements and standards addressed within the following references:

1. The adopted version of the International Uniform Plumbing Code shall be applicable to this Project unless identified by a specific edition date.

1.3 SUBMITTALS

A. Product Data

1. Material Schedule: Itemized pipe and fitting material list for each specified piping application in Pipe and Fittings Schedule as defined in Part 3 of this specification section. Where optional materials are specified indicate option selected.

B. Submit piping layout drawings as per specification section 230500 HVAC Common Work Results.

1.4 QUALITY ASSURANCE

A. Regulatory Requirements

1. Comply with the most recent version following standards:
   a. Safe Drinking Water Act (SDWA) and the associated lead content requirements.
2. Use only materials and methods allowed by applicable codes and authority having jurisdiction (AHJ). It is the contractor's responsibility to confirm if plastic piping is acceptable with the AHJ prior to installation.

B. Qualification of Brazers

1. Comply with the following: The persons performing the brazing and their supervisors shall be personally experienced in brazing procedures.

1.5 EXTRA MATERIALS

A. Provide new manual pipe cutting and crimp ring tools for PEX piping. Crimping tool shall be capable of crimping joints for all sizes of piping installed on job. Tools shall be same as pipe manufacturer. Tools shall include instructions.

PART 2 - PRODUCTS

2.1 STEEL PIPE AND FITTINGS

A. Steel Pipe for Threading: Standard weight, Schedule 40, black; ASTM A 53 or ASTM A 135.

B. Steel Pipe for Roll Grooving: Standard weight, Schedule 40, black; ASTM A 53, Grade B, Type F for sizes 3/4" to 1-1/2", and Type E or S for sizes 2" to 24", or ASTM A 135.

C. Malleable Iron, Steam Pattern Threaded Fittings

1. 150 lb Class: ASME B16.3.
2. 300 lb Class: ASME B16.3.

D. Cast Iron Fittings

1. Drainage Pattern, Threaded: ASME B16.12.
2. Steam Pattern, Threaded: ASME B16.4.
    a. Standard Weight: Class 125.
    b. Extra Heavy Weight: Class 250.
3. Flanged Fittings and Threaded Flanges: ASME B16.1.
    a. Standard Weight: Class 125.
    b. Extra Heavy: Class 250.

E. Unions: Malleable iron, 250 lb class, brass to iron or brass to brass seats.

F. Couplings: Same material and pressure rating as adjoining pipe, conforming to standards for fittings in such pipe. Use taper tapped threaded type in screwed pipe systems operating in excess of 15 psig.

G. Nipples: Same material and strength as adjoining pipe, except nipples having a length of less than one inch between threads shall be extra heavy.

2.2 COPPER AND BRASS PIPE, TUBING AND FITTINGS

A. Copper Tube, Types K and L: ASTM B 88.

B. Wrought Copper Tube Fittings, Solder Joint: ASME B16.22.

C. Cast Copper Alloy Tube Fittings, Solder Joint: ASME B16.18.

D. Drainage Tube, Type DWV: ASTM B 306.

E. Wrought Copper Drainage Tube Fittings, Solder Joint: ASME B16.29.

F. Cast Copper Alloy Drainage Fittings, Solder Joint: ASME B16.23.

G. Chrome Plated Grade A Red Brass Threaded Pipe, Standard Weight: ASTM B 43.

1. Plating: 0.02 mil chromium over 0.2 mil nickel plating, high polish finish.Unions: Cast bronze, 150 lb Class, bronze to bronze seats, threaded or solder joint.

I. Flared Tube Fittings

1. Water Tube Type: ASME B16.26.

J. Flanges: Conform to the Standards for fittings used in systems.

1. Brazing Flanges: ASME B16.24, hubs modified for brazing ends.

K. Mechanical Press Fittings

1. Copper with EPDM seals; ASME B16.51, NSF-61.

2.3 CAST IRON PIPE AND FITTINGS

A. Bell and Spigot Soil Pipe: Service Weight, Bitumin coated; ASTM A 74, CISPI/NSF. All pipes shall be marked with CISPI and NSF listing.

B. Bell and Spigot Soil Pipe Fittings: Service Weight, Bitumin coated; ASTM A 74, CISPI/NSF.

C. Bell and Spigot Soil Pipe Gaskets: ASTM C564

D. Hubless Pipe: Bitumin coated; CISPI Standard No. 301. All pipes shall be marked with CISPI and NSF listing.

E. Hubless Pipe Fittings: Drainage Pattern, Bitumin coated; CISPI No. 301.

F. Hubless Joint Couplings: Stainless steel shield and clamp assembly, and elastomer sealing sleeve; CISPI-310.

2.4 DUCTILE IRON PIPE AND FITTINGS

A. Water Pipe: Bitumin coated and cement-mortar lined; AWWA C151.

1. 3”- 4”: Class 51.
2. 6” and Over: Class 50.

B. Fittings: Bitumin coated and cement-mortar lined; AWWA C110.

2.5 COUPLINGS AND FITTINGS FOR GROOVED END PIPE

A. Couplings: Gruvlok Fig. 7401 or 74, or Victaulic Co.’s Style 07 or 107, having minimum pressure rating of:

1. 750 psi from 1-1/2” to 4”
2. 700 psi for 6”
3. 600 psi for 8”

B. Couplings: Gruvlok Fig. 7001, or Victaulic Co.’s Style 77, having pressure rating of:

1. 1000 psi for 3/4" to 6”
2. 800 psi for 8” to 12”
3. 300 psi for 14” to 24”

C. Fittings: By same manufacturer as couplings, having pressure ratings equal to or greater than couplings. Comply with the following standards:

1. Steel: ASTM A 53 or A 106, Grade B.
2. Malleable Iron: ASTM A 47.
3. Ductile Iron: ASTM A 536.

2.6 PEX PIPING AND FITTINGS

A. Acceptable Manufacturers:

1. Uponor
2. Rehau

B. Pipe: Pex-a (Engel Method Crosslinked Polyethylene Piping) for potable water use. Meets ASTM Standards F-876, F-877 and E84, NSF Standards 14, 61 & 372, PEX 5306.

1. Color: Piping may be white, red, or blue in color. If red/blue colored piping is used, red must be used for all hot water pipe and blue for cold water. Maintain color scheme throughout building.
2. Note: If using color coded tubing as described above, then labeling of these pipes may be omitted.

C. Fittings: All fittings used with crosslinked polyethylene (PEXa) water distribution pipe shall be cold-expansion fittings with PEXa reinforcing ring. Meets ASTM Standard F1960. Fittings same as pipe manufacturer. All fittings shall be completely brass or polymer. Use copper stub-outs for fixture rough-ins, PEX shall not be exposed out of the wall at fixture rough-ins.

1. Brass fittings to be lead-free ECO Brass UNS C69300
2. Polymer fittings in accordance to ASTM D 6394

D. Valves: Lead-free brass ball valve.

1. Manufacturer: valve from same manufacturer as piping system.
2. Ball valve: full-port, two-piece, positive stop shoulder, ASTM F1960 cold-expansion ends with PEXa reinforcing ring.

E. Accessories: Stub-out plates shall be used to support rough-in piping for fixture connections.

2.7 PVC PIPING AND FITTINGS

A. Pipe: Schedule 40 PVC , Type I, rated for 140° F, ASTM D2665

B. Fittings: Same as pipe manufacturer; ASTM D2466. Solvent welded using solvent approved by manufacturer.

2.8 CPVC ACID WASTE/VENT PIPE AND FITTINGS

A. Pipe: Schedule 40 CPVC, Type IV Grade I rated for 220° F at no pressure, ASTM D 2618, NSF. Minimum cell classification of 23447. All pipe, fittings and cement shall be supplied as a system by a single manufacturer and shall be certified by NSF International for use in corrosive waste drainage systems and shall bear the mark “NSF-cw”.

B. Fittings: Same as pipe manufacturer, complying with ASTM F438 socket types. Solvent welded using manufacturer provided solvent rated for laboratory chemical use, ASTM F493. Includes all piping starting at the fixture served until the piping leaves the building or discharges to an acid neutralization tank.

C. Fire Spread/Smoke Developed Rating of 25/50 or less based on ASTM E 84.

D. Buried pipe shall be installed in accordance with ASTM D 2321 and ASTM F 1668.

2.9 JOINING AND SEALANT MATERIALS

A. Thread Sealant

1. LA-CO Industries’, Slic-Tite Paste with Teflon.
2. Loctite Corp.’s No. 565 Thread Sealant.
3. Thread sealants for potable water shall be NSF approved.

B. Solder: Solid wire type conforming to the following:

1. Lead-free tin-silver solder (ASTM B 32 Alloy Grade E, AC, or HB)

C. Brazing Alloys

1. Type 1: AWS A5.8, Class BCuP-5, for brazing copper to brass, bronze, or copper.
2. Type 2: AWS A5.8, Class BAg-7, for brazing copper to steel or stainless steel.

D. Brazing Flux: FS O-F-499, Type B.

E. Gaskets For Use With Ductile Iron Water Pipe and Cast Iron Drainage Pipe: Synthetic rubber rings (molded or tubular): Clow Corp.’s Belltite, Tyler Pipe Industries Inc.’s Ty-Seal, or U.S. Pipe and Foundry Co.’s Tyton.

F. Flange Gasket Material

1. For Use With Cold Water: 1/16” thick rubber.

2. For Use With Hot Water, Air or Steam: Waterproofed non-asbestos ceramic or mineral fiber, or a combination of metal and water-proofed non-asbestos ceramic or mineral fiber, designed for the temperatures and pressures of the piping systems in which installed.

G. Gaskets For Use With Grooved End Pipe and Fittings: Type and materials as recommended and furnished by the fitting manufacturer, for the service of piping system in which installed.

H. Anti-Seize Lubricant: Bostik Inc.'s Never Seez or Dow Corning Corp.'s Molykote 1000.

2.10 PACKING MATERIALS FOR BUILDING CONSTRUCTION PENETRATIONS

A. Oiled Oakum: Manufactured by Nupak of New Orleans, Inc.

B. Mechanical Modular Seals: Thunderline Corp.'s Link Seal wall and floor seals designed for the service of piping system in which installed.

2.11 DIELECTRIC CONNECTORS

A. Use for all connections between piping connections of dissimilar materials.

B. Unions

1. Rated 250 psig at 180° F; ASME B16.39; Wilkins Model DU.
2. Rated 100 psig at 210° F; ASME B16.39; Wilkins Model DU with high temperature gasket.
3. Rated Above 100 psig and 210° F: Use Flange Electrical Insulation Kit specified below.

C. Flange Electrical Insulation Kit: Consisting of dielectric sleeves and washers, and dielectric gasket.

1. Rated 150 psi at 250° F: ANSI Class 150, full faced neoprene gasket with bolt holes, double phenolic washers, and Mylar sleeves; Model 150 by APS, Lafayette, LA.

2.12 PIPE SLEEVES

A. Install pipe sleeves as noted on the drawings or indicated in this specification section. The following piping material shall be used as noted in the installation section in this specification:

1. Type A: Schedule 40 steel pipe.
2. Type B: No. 16 gauge galvanized sheet steel.
3. Type C: Schedule 40 steel pipe with 1/4" steel collar continuously welded to pipe sleeve. Size steel collars as required to span a minimum of one (1) cell or corrugation, on all sides of the rough opening thru the metal deck.
4. Type D: No. 16 gauge galvanized sheet steel with 16 gauge sheet steel metal collar rigidly secured to sleeve. Size metal collars as required to span a minimum of one (1) cell or corrugation, on all sides of the rough opening thru the metal deck.

2.13 PIPING ESCUTCHEONS

A. Cast Brass: Polished chrome plated finish, with set screw.

B. Cast Iron: Solid type, unplated, with set screw; Model 395 by Grinnell Corp.

2.14 THERMOMETERS

A. Acceptable Manufacturers

1. Weiss Instruments
2. Prior Approval

B. Bi-Metal Thermometers

1. Body: Type 304 Stainless Steel, heavy glass face, and hermetically sealed.

2. Bimetallic Element: Bimetallic element calibrated to meet temperature standards of manufacturer and helix assembly with silicon dampening.
3. Stem: Stainless steel to match body and of a length to suit installation. Bare stem shall be used for hydronic systems in non-corrosive applications.
4. Connector: ¾ inch, with ASME B1.1 screw threads.
5. Accuracy: Plus or minus 1 percent of scale range or one scale division, to maximum of 1.5 percent of scale range.
6. See piping application schedule for thermometer range requirements based on system type.

C. Liquid in Glass Thermometers
1. Body: Molded plastic with variable angle mounting compliant with ASME B40.200.
2. Tube: Glass with magnifying lens, blue organic liquid, nonreflective aluminum with permanently etched scale markings graduated in deg F and deg C.
3. Stem: Aluminum or brass and of a length to suit installation. Bare stem shall be used for hydronic systems in non-corrosive applications.
4. Connector: ¾ inch, with ASME B1.1 screw threads.
5. Accuracy: Plus or minus 1 percent of scale range or one scale division, to maximum of 1.5 percent of scale range.
6. See piping application schedule for thermometer range requirements based on system type.

D. Digital Thermometer
1. Body: Molded plastic with variable angle mounting.
2. Stem: Aluminum or brass and of a length to suit installation. Bare stem shall be used for hydronic systems in non-corrosive applications.
3. Connector: ¾ inch, with ASME B1.1 screw threads.
4. Display: Digital
5. Accuracy: Plus or minus 2 deg F.
6. Provide thermowell compatible with thermometer based on pipe diameter and system of installation.
7. See piping application schedule for thermometer range requirements based on system type.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Piping shall be stored to prevent debris from entering the piping. This shall consist of piping caps or temporary covers.

B. Above or below grade piping that is roughed in shall have a temporary cap installed to prevent debris from entering the piping system. The cap shall be removed to allow for the final connection or continuation of piping to be installed.

C. Install piping at approximate locations indicated, and at maximum height.

D. Install piping clear of door swings, and above sash heads.

E. Make allowances for expansion and contraction.

F. Install expansion loops in PEX piping as recommended by manufacturer.

G. Allow for a minimum of 1” free air space around pipe or pipe covering, unless otherwise specified.

H. Install all underground piping outside the footprint of the building to meet the minimum cover and distance below the frost depth requirements listed below:

1. Sanitary and Storm – 48” minimum cover (below frost depth)
2. Domestic water service – 12” below frost depth of the local jurisdiction or 60” deep, whichever is greater.
3. Fire service - 12” below frost depth of the local jurisdiction or 72” deep, whichever is greater.

I. Fire service piping shall be installed to meet the cover requirements as noted in NFPA 13. Coordinate exact requirements for the project location with NFPA 13.

J. Install horizontal piping with a constant pitch, and without sags or humps.

1. Water Piping: Pitch 1/4" per 10 feet upward in direction of flow, unless otherwise noted. If it is not possible to maintain constant pitch, establish a new low point and continue. At the low point, provide a 1/2" drip leg and gate valve with a hose bibb end. Provide an air vent at the high point.
2. Sanitary Piping: Pitch piping 3” and Under 1/4" per foot downward, in direction of flow, unless otherwise noted. Pitch piping 4” and Over 1/8” per foot downward, in direction of flow, unless otherwise noted.
3. Grease Sanitary Piping: Pitch piping 1/4" per foot downward, in direction of flow, unless otherwise noted.
4. Storm Piping: Pitch piping 1/8 1/4" per foot downward, in direction of flow, unless otherwise noted.
5. Vent Piping: Pitch 1/8" per foot upward, unless otherwise noted.

K. Install vertical piping plumb.

L. Use fittings for offsets and direction changes, except for Type K soft annealed copper temper water tube, and mechanically extracted joints in Type L copper tubing.

M. Cut pipe and tubing ends square; ream before joining.

N. Threading: Use American Standard Taper Pipe Thread Dies.

1. Thread brass pipe with special brass threading dies.

O. PEX shall only be allowed individual branch or fixture piping, not mains connecting more than one (1) room.

1. PEX piping shall not be installed in rated walls or ceiling spaces being used as a return air plenum.
2. PEX piping shall not be installed where exposed, this includes mechanical rooms.

3.2 DRAINAGE SYSTEMS

A. Fittings

1. Long Sweep Fittings
   a. Long sweep fittings shall be those in the category where 4” diameter piping has a minimum R/D = 10.5”/4”.
   b. Use long sweep drainage pattern fittings for all fittings unless noted otherwise.
   c. Use of other fittings must be approved by Engineer in writing prior to use.

2. Short Sweep Fittings

a. Short sweep fittings shall be those in the category where 4” diameter piping has a minimum R/D = 7.5”/4”.

b. Short sweep drainage pattern fittings may be used for the following.

1) Vent piping.

2) Fixture connections.

3) Other locations as approved by the Engineer in writing.

3. Vertical Offsets: Make vertical offsets with 45° elbows, or 1/8 bends.

B. Cleanouts

1. Install cleanouts with sufficient side and end clearance to allow for the removal of the cleanout plug, and the use of cleaning tools.

2. Lubricate cleanout plugs with anti-seize lubricant.

3.3 DOMESTIC WATER PIPING SYSTEM

A. Connect branch lines to the upper quadrant of the main, and run upward at not less than 45° before extending laterally.

B. Make final connections to plumbing fixtures and equipment with unions, or flanges.

1. Do not use unions in ferrous piping larger than 3”.

2. Do not use unions in brass or copper piping larger than 2-1/2”.

3.4 PIPE JOINT MAKE-UP

A. Threaded Joint: Make up joint with a pipe thread compound applied in accordance with manufacturer’s printed application instructions for the intended service.

1. Chrome Plated Brass Pipe: Tighten joint with a strap or Parmalee wrench; do not mar pipe finish. Install piping so that no threads are visible.

B. Soldered Joint: Thoroughly clean tube end and inside of fitting with emery cloth, sand cloth, or wire brush. Apply flux to the pre-cleaned surfaces. Install fitting, heat to soldering temperature, and join the metals with type of solder specified. Remove residue.

C. Flanged Pipe Joint

1. Install threaded companion flanges on steel pipe; flanges on galvanized pipe are not required to be galvanized.

2. Provide a gasket for each joint.

a. Hot Water Pipe Gasket: Coat with a thin film of oil before making up joint.

3. Coat bolt threads and nuts with anti-seize lubricant before making up joint.

D. Caulked Joint: Pack hub with joint packing specified, and caulk. Run 12 ounces molten lead for each inch of pipe diameter. Caulk cooled lead ring and face off smoothly.

E. Rubber Ring Push-on Joint: Clean hub, bevel spigot, and make up joint with lubricated gasket in conformance with the manufacturer’s printed installation instructions.

F. Grooved Pipe Joint: Roll groove pipe ends, make up joint with grooved end fittings and couplings, in conformance with the manufacturer’s printed installation instructions.

1. Cut grooved end piping is not acceptable.

G. Hubless CI Pipe Joint: Make up joint with hubless fitting and couplings, in conformance with the manufacturer’s printed installation instructions.

H. Mechanical Press Joint: Install joint with tool approved by joint manufacturer. Installer shall be fully trained and have experience in installing this type of joint.

I. PEX Joint: Cut pipe and install joints with tool approved by joint manufacturer. Installer shall be fully trained and have experience in installing this type of joint.

J. Dissimilar Pipe Joint

1. Joining Bell and Spigot and Threaded Pipe: Install a half coupling on the pipe or tube end to form a spigot, and caulk into the cast iron bell.
2. Joining Dissimilar Threaded Piping: Make up connection with a threaded coupling or with companion flanges.
3. Joining Dissimilar Non-Threaded Piping: Make up connection with adapters recommended by the manufacturers of the piping to be joined.

3.5 PIPING PENETRATIONS

A. Install pre-manufactured flexible boots for vent terminations through roof. Use materials compatible with roof system.

B. Sleeve Schedule: Unless otherwise shown, comply with the following schedule for the type of sleeve to be used where piping penetrates wall or floor construction:

	CONSTRUCTION	SLEEVE TYPE
1.	Frame construction.	None Required
2.	Foundation walls.	A*
3.	Non-waterproof interior walls.	B*
4.	Non-waterproof interior floors on metal decks.	D*
5.	Non-waterproof interior floors not on metal decks.	B*
6.	Floors not on grade having a floor drain.	A
7.	Floors over mechanical equipment, steam service, machine, and boiler rooms.	A
8.	Floors finished or to be finished with latex composition or terrazzo, and on metal decks.	D*
9.	Floors finished or to be finished with latex composition or terrazzo, and not on metal decks.	A
10.	Earth supported concrete floors.	None Required
11.	Exterior concrete slabs on grade.	A
12.	Fixtures with floor outlet waste piping.	None Required
13.	Metal roof decks.	C
14.	Non-metal roof decks.	A

*Core drilling is permissible in lieu of sleeves where marked with asterisks.

C. Diameter of Sleeves and Core Drilled Holes

1. Unless otherwise specified, size holes thru floors and walls in accordance with the through penetration fire stopping system being used.

2. Size holes thru exterior walls or waterproofed walls above inside earth or finished floors, and exterior concrete slabs in accordance with the following:
    a. Uninsulated (Bare) Pipe: Inside diameter of sleeve or core drilled hole 1/2" greater than outside diameter of pipe, unless otherwise specified.
    b. Insulated Pipe: Inside diameter of sleeve or core drilled hole 1/2" greater than outside diameter of insulation, unless otherwise specified.
    c. Mechanical Modular Seals: Size holes in accordance with the manufacturer's recommendations.

D. Length of Sleeves (except as shown otherwise on Drawings)
1. Walls and Partitions: Equal in length to total finished thickness of wall or partition.
2. Floors, Finished: Equal in length to total finished thickness of floor and extending 1/2" above the finished floor level, except as follows:
    a. In furred spaces at exterior walls, extend sleeve 1" above the finished floor level.
3. Exterior Concrete Slabs: Equal in length to total thickness of slab and extending 1/2" above the concrete slab.
4. Roofs: Equal in length to the total thickness of roof construction, including insulation and roofing materials, and extending one inch above the finished roof level.

E. Packing of Sleeves and Core Drilled Holes
1. Unless otherwise specified, pack sleeves or cored drilled holes in accordance with Section 07 84 00 - FIRESTOPPING.

3.6 ESCUTCHEONS

A. Install plates for exposed uninsulated piping passing thru floors, walls, ceilings, and exterior concrete slabs as follows:
1. In Finished Spaces: chrome plated cast brass.
2. Unfinished Spaces (Including Exterior Concrete Slabs): unplated cast iron.
3. Fasten plates with set screws.
4. Plates are not required in pipe shafts or furred spaces.

3.7 PIPE AND FITTING SCHEDULE

A. Refer to Drawings for Piping Application Schedule.

B. Where options are given, choose only one (1) option for each piping service. No deviations from the selected option will be allowed.

END OF SECTION

SECTION 22 33 00

DOMESTIC WATER HEATERS

PART 1 - GENERAL

1.1 SCOPE

A. Perform all Work required to provide and install the following Domestic Water Heaters indicated by the Contract Documents with supplementary items necessary for proper installation.

1.2 REFERENCES

A. Water heater shall be UL listed and labeled.

B. Water heater shall bear the seal of the American Gas Association.

C. Comply with the Iowa State Energy Code.

D. Water heater performance shall meet the adopted version of ASHRAE 90.1.

E. Water heaters serving emergency fixtures shall meet all requirements of ANSI Z358.1 for tepid water.

1.3 SUBMITTALS

A. Product Data: Catalog sheets, specifications and installation instructions for each water heater, gas vent pipe, fittings, and accessories required for the vent system.

1.4 WARRANTY

A. Manufacturer's Warranty: Three (3) year warranty for the glass lined water heater tank. Provide a copy of the warranty as part of the closeout documents.

PART 2 - PRODUCTS

2.1 GAS WATER HEATER

A. Burner: Power burner, aluminized steel heat exchanger surface, self-adjusting air-gas mixture control.

B. Controls: Automatic, integrated solid-state temperature and ignition control device with integral diagnostics, graphic user interface, fault history display, and shall have digital temperature readout.

C. Outer Casing: Steel, with baked enamel or acrylic finish. Access door for servicing controls and burner. Approved for 0" clearance to combustibles.

D. Gas Vent System

1. Condensing Water Heaters:

a. Flue and Combustion Air: Schedule 40 CPVC. Piping shall be rated for use in a return air plenum

b. Accessories: Connectors, increasers, & concentric vent kit to be provided by the unit manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install the Work of this section in accordance with the manufacturer's printed installation instructions, unless otherwise specified.

B. Install the water heater on a level, firm base.

C. Install the pressure-temperature relief valve in the dedicated tank tapping. Pipe the relief valve blow-off to a point 6 inches above the floor, or as shown on drawings.

D. Install unions and shut-off valves on hot and cold water connections. Install dielectric unions if required.

E. Install the Work of this section in accordance with NFPA 54, NFPA 211, and the manufacturer's printed installation instructions, unless otherwise specified.

F. Install an AGA lubricated plug valve on the gas connection. Gas supply branch shall have a 6" dirt leg with a threaded cap.

G. Vent Piping

1. Support horizontal piping on five (5) foot centers, maximum spacing, support vertical piping at every floor or ten (10) foot intervals maximum.

2. Install manufacturer provided concentric vent kit.

END OF SECTION

SECTION 22 40 00

PLUMBING FIXTURES AND EQUIPMENT INSTALLATION

PART 1 - GENERAL

1.1 SCOPE

A. Perform all Work required to provide and install the following Plumbing Fixtures and Equipment indicated by the Contract Documents with supplementary items necessary for proper installation.

1.2 REFERENCES

A. Refer to the Plumbing Material Lists and Equipment Schedules for additional capacity and equipment requirements.

1.3 SUBMITTALS

A. Fixture and Equipment Data: Catalog sheets, specifications, rough-in dimensions, and installation instructions for each item specified except fasteners.

1.4 QUALITY ASSURANCE

A. Regulatory Requirements

1. Comply with the most recent version following standards:
    a. Safe Drinking Water Act (SDWA) and the associated lead content requirements.
    b. Applicable sections of ANSI/ASME A112 – Standards for Plumbing Equipment
2. Materials and installations designated as handicapped accessible shall conform with the following:
    a. ANSI A117.1 - Buildings and Facilities - Providing Accessibility and Usability for Physically Handicapped People.
    b. The Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities (ADAAG), (Appendix A to 28 CFR Part 36).
3. Each fixture carrier support shall be listed by model number in the fixture support manufacturer's Fixture Support Selection Guide as being recommended for support of the appropriate fixture.

B. Plainly and permanently mark each fixture and fitting with the manufacturer's name or trade mark.

C. Acid resistant surfaces shall be plainly and permanently marked with the manufacturer's label or symbol indicating acid resistance.

1.5 MAINTENANCE

A. Special Tools: Deliver to the Owner.

1. Furnish the following tools labeled with names and locations where used.
    a. Keys for stops (furnished with stops).
    b. Tools for Vandal Resistant Fasteners: Two (2) for each type and size.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. The following manufacturers are considered equal to the basis of design listed in the material list and schedules. The basis of design is preferred and will take precedence. Any products from an alternate approved manufacturer need to meet the requirements and performance specified and shall be equal to the basis of design.

Equipment	Acceptable Manufacturers
Backflow	Apollo/Conbraco, Watts/Febco/Ames, Zurn/Wilkins
Bathtubs	American Standard, Aquatic, Kohler
Domestic Water Circulation Pumps	Armstrong, Bell & Gossett, Grundfos, Taco
Drainage Fixtures	Josam, Mifab, Smith, Sun, Wade, Watts, Zurn
Electric Water Coolers	Acorn, Elkay, Halsey Taylor, Haws, Murdock, Oasis, Sloan
Emergency Fixtures	Acorn, Bradley, Encon, Guardian, Haws, Speakman
Expansion Tanks	Amtrol, Armstrong, Bell & Gossett, Elbi, Taco, Watts
Filter	Culligan, Everpure, Marlo, PEP, Watts
Fixture Carriers	Jay R. Smith, Josam, Mifab, Zurn
Flush Valves	Delta Commercial, Moen Commercial, Sloan, Toto, Zurn
Garbage Disposal	InSinkErator, Waste King
Grease Interceptor (Concrete)	Lister Industries, Old Castle Infrastructure, Jensen Precast
Grease Interceptor (Polyethylene)	Green Turtle, Mifab, Schier, Rockford, Zurn
Hose Bibbs & Misc. Valves	Apollo, Smith, Watts, Willoughby, Woodford, Zurn
Lavatories, Urinals, Water Closets (Fixtures)	American Standard, Eljer, Kohler, Sloan, Toto, Zurn
Lavatory & Sink Trim	American Standard, Chicago Faucet, Delta Commercial, Kohler, Moen Commercial, T&S Brass, Sloan, Zurn
Mixing Valves	Armstrong, Bradley, Lawler, Leonard, Powers
Mop And Service Sinks	Fiat, Stern-Williams, Zurn
Sand / Oil Interceptor	Striem, Mifab, Rockford, Zurn
Shower Fixtures	American Standard, Aqua Bath, Aquatic
Shower Trim	Bradley, Chicago Faucet, Lawler, Leonard, Moen Commercial, Powers, Symmons, Toto, Zurn
Stainless Steel Sinks	Elkay, Just, Kohler
Wall Boxes	Guy Gray, LSP, Oatey, Sioux Chief
Wash Fountains	Acorn, Bradley, Sloan, WIlloughby

Equipment	Acceptable Manufacturers
Water Hammer Arrestors	Sioux Chief, Watts, Jay R. Smith, Zurn
Whirlpool Tubs	Purewater Baths

B. All items shall be commercial grade unless specified otherwise.

C. All items shall be supplied by the same manufacturer.

2.2 FIXTURE MATERIALS

A. Vitreous China: First quality, smooth, uniform color and texture, with fused on glaze covering surfaces exposed to view.

1. Surfaces shall be free of chips, craze, warpage, cracks and discolorations. Surfaces in contact with walls or floors shall be flat, with warpage not to exceed 1/16 inch per foot.
2. Color: White.

B. Porcelain Enameled Cast Iron: Smooth, uniform color and texture, having fused on glaze covering surfaces exposed to view.

1. Material shall show no cracks, chips, craze or discolorations.
2. Enameled surfaces shall be acid resistant unless otherwise specified.
3. Color: White.

C. Fixture Trim: Brass, bronze, or stainless steel construction; consisting of supply and waste fittings, faucets, traps, stop valves, escutcheons, sink strainers, nipples, supplies, and metal trim.

1. Brass piping: IPS standard weight, with standard weight, 125 lb cast brass fittings.
2. Brass tubing: 18 B & S gauge.
3. Stainless steel: 18-8 Type 302 or 304 unless otherwise specified.

D. Fixture Trim: Acid Waste Systems

1. Tail pieces and p-traps for fixtures connected to acid waste systems shall be constructed of similar material to the acid waste piping.

E. Fixture Trim Finishes:

1. Brass or Bronze: Polished or satin finished chrome plating, 0.02 mil chromium over 0.2 mil nickel plating.
2. Stainless Steel: Invisible welds and seams, and unless otherwise specified, polished to No. 4 commercial finish.

F. Fixture Hold-down Bolts: Steel, plated for corrosion resistance.

1. Cap nuts: Metal, polished and chrome plated.
2. Vandal Resistant Fasteners: Torx head with center pin.

2.3 FIXTURE SUPPORTS AND SUPPORTING DEVICES FOR LAVATORIES, SINKS, AND EQUIPMENT

A. General: Ferrous metal members of carriers and supporting devices, with the exception of chrome plated or porcelain enameled cast iron, shall be factory painted for corrosion resistance.

B. Floor Mounted Carrier Supports: Steel pipe uprights, 1-1/4 inch IPS minimum diameter, or 1 inch x 2 inch steel tubing uprights, with cast iron or welded steel feet, drilled for bolting to the floor construction. Each carrier shall be provided with the appropriate fixture supporting devices

specified, or recommended by the carrier manufacturer's Fixture Support Selection Guide.Floor mounted carrier supports for banks of multiple adjacent fixtures shall have provisions in the support uprights to allow for waste piping to be concealed in the associated wall.

2. Concealed Arms: Steel, with fixture locking lugs, leveling screws and a means of attaching, positioning and securing the fixture to the carrier.
    a. Trim: Polished, chrome plated metal escutcheon to space fixture two inches from the wall.
3. Exposed Arms: Cast iron or steel, porcelain enamel finished, with locking lugs, and leveling screws. Include studs, nuts and washers for fixture to be supported.
    a. Trim: Polished and chrome plated metal cap nuts and washers.
    b. Vandal Resistant Trim: Polished, chrome plated metal cap nuts and washers retained with vandal resistant set screws or other approved means of securing trim.

C. Wall Mounted Carrier Supports: Plate type system, with steel plates on both sides of the wall and through-bolted. On walls having an integral finish, a single plate wall carrier designed for such installations may be used. Each carrier shall be provided with the appropriate fixture supporting devices specified, or recommended by the Carrier manufacturer's Fixture Support Selection Guide.

1. Concealed Arms: Steel, with fixture locking lugs, leveling screws and a means of attaching, positioning and securing the fixture to the carrier.
    a. Trim: Polished, Chrome plated metal escutcheon to space fixture two inches from the wall.
2. Exposed Arms: Cast iron or steel, porcelain enamel finished, with locking lugs, and leveling screws. Include studs, nuts, and washers for fixture to be supported.
    a. Trim: Polished and chrome plated metal cap nuts and washers.
    b. Vandal Resistant Trim: Polished, chrome plated metal cap nuts and washers retained with vandal resistant set screws.

D. Bearing Plate: Steel, minimum 1/8 inch thick, and provided with bearing studs, nuts and appurtenances required by the fixture to be supported.

1. Fixture Hanger: Furnished by the fixture manufacturer.

E. Wood Stud Filler Piece: 2 inch x 8 inch wood planking cut to fit between wood studding. Fasten with four 3/8 inch x 2-1/2 inch lag bolts with washers.

F. Water Closet Carriers

1. Closet Carrier (For Wall Hung Water Closets): Commercial type cast iron combination chair carrier and drainage fitting with the following:
    a. Capacity: 500 1,000 pounds.
    b. Face Plate: Cast iron; height adjustable.
    c. Feet: Cast iron, adjustable, with provisions for bolting to the floor slab.
    d. Studs, Nuts and Washers: Steel, treated for corrosion resistance.
    e. Fixture Washers: Plastic.
    f. Adjustable Closet Connection: Cast iron, steel, or ABS plastic.
    g. Fitting Ends: Compatible with the drainage piping system.
    h. Gasket: Impregnated felt or neoprene closet gasket; lead or neoprene face plate gasket.

i. Stud thread protectors.

j. Factory painted.

k. Trim: Polished chrome plated metal cap nuts and washers.

l. Vandal Resistant Trim: Polished chrome plated metal cap nuts and washers retained with vandal resistant set screws.

2.4 CLEANOUTS

A. Threaded pipe fitting or cast iron ferrule with gas tight cleanout plug.

B. Plug: Cast brass or bronze, with threaded end, and raised or countersunk head. Tapped head for attachment of cleanout wall or deck plate covers where required.

C. Covers: See Plumbing Material List.

D. Anti-Seize Lubricant: Never-Seez by Bostik Chemical Group, Molycote 1000 by Dow Corning Corp, Anti-Seize Lubricant by Loctite Corp

E. Membrane flange and clamping collar, secured with corrosion resistant fasteners.

2.5 AIR GAP FITTINGS

A. Provide when called for in Plumbing Material List.

B. Coated cast iron body with air gaps, set screw or threaded inlet, and outlet connection to match piping option selected.

2.6 DRAIN VALVES

A. Provide on all equipment with drain connections and as shown on details.

B. Cast brass body with renewable units, hose bibb vacuum breaker (ASSE 1011) with drainage feature, and removable cast iron handwheel with vandal resistant fastener.

1. Valve must be completely assembled to make hose connection.

2. Connections: 1/2 or 3/4 inch threaded or solder end inlet, and 3/4 inch hose bibb outlet.

2.7 WATER HAMMER ARRESTERS AND AIR CHAMBERS

A. Provide water hammer arresters as specified on the Plumbing Material List.

B. ANSI A112.26.1; sized in accordance with PDI WH-201, pre-charged for operation between -100º F and 300º F and maximum 250 psig working pressure.

2.11 WALL BOX WITH VALVES

A. Box and faceplate shall be 20 gauge, white powder-coated, cold-rolled steel.

B. The valve shall be brass, quarter-turn, lead-free valve complying with NSF 61, NSF 372, and ASME A112.18.1. Valve shall be marked for identification as lead free.

PART 3 - EXECUTION

3.1 FIXTURE SUPPORT AND SUPPORTING DEVICE INSTALLATION

A. Install heavy duty floor mounted carrier supports with specified fixture supporting devices for wall type plumbing fixtures.

1. Secure to building construction with lag bolts and metal expansion shields, or other appropriate means as required by the construction encountered.

B. Attach fixtures to floor or wall construction as specified in the Plumbing Material List.

C. Fixture Supporting Devices: Attach fixtures by means of the following fixture supporting devices attached to carrier supports.

FIXTURE	SUPPORTING DEVICE
Clinical Service Sink	Fixture hangers & bearing
Lavatory, VC, with back	Concealed arms
Lavatory, VC, no back	Concealed arms
Lavatory, ECI, with back	Exposed arms
Lavatory	Concealed arms
Lavatory	Through bolt
Surgeon's Sink	Concealed arms & valve support plate
Water Closet	Bolt to comb. carrier and drainage fitting
Urinal	Fixture hanger and bearing plate
Water Cooler (wall mounted)	Fixture hanger
Water Cooler (Recessed)	Mounting frame

D. Secure exposed external components in place with vandal resistant fasteners or devices which cannot be removed without the use of special tools.

3.2 FIXTURE INSTALLATION

A. Install the Work of this section in accordance with the manufacturer's printed installation instructions.

B. See Architectural Floor Plans and Interior Elevation drawings for final installation locations and heights of all plumbing fixtures. Architectural plans supersede these specifications.

C. Install fixtures level and at proper height, tighten connections, and install hold-down bolts, cap nuts and cover plates, where required.

D. Caulk joint between all fixtures and wall or floor with sealant; strike a neat joint.

E. Secure exposed external components in place with vandal resistant fasteners or devices which cannot be removed without the use of special tools.

F. Filters

1. Provide adequate service clearance in front of and below units to allow for removal and replacement of filters.
2. Include a shut off valve upstream of the filter to allow for service.
3. Provide pressure gauges upstream and downstream of multi-stage filters to monitor pressure drop for filter replacement.

G. Mop Service Sinks

1. Set receptor leveled in bed of mortar laid on clean roughened surface. Remove excess mortar and strike a neat joint.
2. Make connection from drainage pipe to receptor drain.
3. Install service fittings and miscellaneous trim such as mop hanger and wall protection as called for on Plumbing Material List.

H. Lavatories

1. Mount lavatories 34 inches from finished floor to rim unless otherwise specified.

I. Countertop Fixtures

1. Install fixture with securing devices supplied.

2. Set fixture on bedding of clear sealant, tighten securing devices and remove excess sealant.

J. Water Closets

1. Wall Hung Fixtures:

a. Standard Fixtures: Install wall hung fixtures 15 inches from finished floor to rim unless otherwise specified.

b. Set bearing nuts to position fixture 1/16 inch clear of finished wall.

2. Floor Supported Fixtures:

a. Set fixture in bed of setting compound; remove excess.

3. After connections are tightened, install cap nuts and washers.

K. Floor drains

1. Install the Work of this section in accordance with the manufacturer's printed installation instructions, unless otherwise specified.

2. Protect weep holes from plugging during installation. Rod out weep holes after installation to remove obstructions.

3. Set drainage flange flush with top of structural floor slab, or at elevation otherwise indicated.

4. After membrane waterproofing installed and cured, secure clamping ring.

5. Adjust strainer head to height indicated. If height not indicated, set at 1/2 inch below finished floor elevation.

L. Drains and Inlets During Construction

1. Provide a temporary cover for all floor, roof, trench and area drains during construction to prevent debris getting into the system and protect drain grates. Remove temporary covers and clean grates at the end of construction.

2. The contractor is responsible for the flushing of all drains used during construction. This includes main and branch lines. If solids or debris in the system result in flow issues, the contractor will be required to camera and remove obstructions.

M. Wall Hydrants: Installation Height: Minimum 18 inches above finished grade.

N. Cleanout Plug: Lubricate threads with anti-seize lubricant before final installation.

O. Water Hammer Arresters

1. Install water hammer arresters in accessible locations. Provide access doors as required. Coordinate type with Architect/Owner.

P. Wall Boxes

1. Coordinate installation height and required millwork openings with architectural plans and millwork submittals.

3.3 CLEANING, FLUSHING AND ADJUSTMENT

A. Clean fixtures and trim. Remove grease and dirt; polish surfaces but leave stickers and warning labels intact.

B. Flush supply piping and traps; clean strainers.

C. Adjust stops for proper delivery.

END OF SECTION

SECTION 23 05 00

HVAC COMMON WORK RESULTS

PART 1 - GENERAL

1.1 SCOPE

A. The work under this section includes basic mechanical requirements, which are applicable to all Division 21, 22 and 23 sections.

B. Overview of work

1. HVAC
2. Plumbing
3. Fire Protection

C. In these documents, “Contractor” refers to the mechanical contractor and all their subcontractors, unless listed otherwise. The division of work within the mechanical scope is the responsibility of the lead mechanical contractor.

D. Contractor is responsible for providing fully functional systems.

E. If work is shown on the drawings or listed in the specifications, it shall be included by the Contractor.

F. If equipment is provided by the Contractor, it shall be installed by the Contractor, unless noted otherwise.

G. The drawings are necessarily diagrammatic by their nature and are not intended to show every connection in detail or every item in its exact location. Carefully investigate structural and finish conditions and coordinate the separate trades in order to avoid interference between the various phases of Work. Organize and lay out Work so that it will be concealed in furred chases and suspended ceilings, etc., in finished portions of the building, unless specifically noted to be exposed. Install all Work parallel or perpendicular to building lines unless otherwise noted.

H. The intent of the Drawings is to establish the types of systems and functions; not to set forth each item essential to the functioning of the system. Install the Work complete, including minor details necessary to perform the function indicated. Review pertinent Drawings and adjust the Work to conditions shown. Where discrepancies occur between Drawings, Specifications, and actual field conditions, immediately notify the Architect and Engineer for interpretations.

I. All sizes as given are minimum except as noted.

J. Materials shall be new (unless noted or stated otherwise), first class, and workmanlike, and shall be subject at all times to the Architect’s, Engineer’s, and Owner’s observations from the commencement until the acceptance of the completed work.

K. Owner Furnished Equipment

1. The following items are provided by the Owner and installed by the contractor:
   a. Food service equipment
2. The following items are provided and set in place by the Owner. Contractor to make final utility connections.
   a. n/a

1.2 REFERENCES

A. Applicable provisions of Division 0 and Division 1 govern work under this Section.

B. All work shall conform to the most current version of all applicable codes and standards or the version adopted by the jurisdiction.

C. Codes

1. International Building Code
2. International Mechanical Code
3. Uniform Plumbing Code
4. International Fuel Gas Code
5. International Fire Protection Code
6. International Energy Conservation Code
7. NFPA – National Fire Protection Association
8. State or City Codes for Des Moines, IA

D. Standards

1. ASHRAE Standard 15
2. ASHRAE Standard 62
3. ASHRAE Standard 90.1
4. SMACNA – Sheet Metal and Air Conditioning Contractors National Association, Inc.
5. AMCA – Air Movement and Control Association
6. ASME – American Society of Mechanical Engineers
7. ANSI – American National Standards Institute
8. ARI – Air Conditioning and Refrigeration Institute

E. Governing Bodies

1. Owner's Insurance Company
2. State Fire Marshal
3. AHJ – Authority Having Jurisdiction
4. UL - Underwriters Laboratories

1.3 SUBMITTALS

A. The review of shop drawings by the Engineer is for general conformance with the design concept of the project and general compliance with the information given in the Contract Documents. Corrections or comments made on the shop drawings during this review do not relieve the contractor from compliance with the requirements of the plans and specifications. Approval of a specific item shall not include approval of an assembly of which the item is a component. The Contractor is responsible for: dimensions to be confirmed and correlated at the jobsite; information that pertains solely to the fabrication processes or to the means, methods, techniques, sequences and procedures of construction; coordination with the Work of all trades; and for performing all work in a safe and satisfactory manner.

B. Refer to individual technical specification sections for specific submittal requirements.

C. Submission of shop drawings electronically In .PDF format is preferred.

D. If hard copies of shop drawings are utilized on this project, coordinate the quantity with the Architect and General Contractor. Provide one (1) copy for the Engineer's records.

E. The Engineer will review one resubmittal for each product. If additional resubmittals are required, the Contractor shall be responsible to bear the cost for the Engineer to recheck and handle the additional shop drawing submittals. Documents will not be reviewed until payment is agreed upon.

F. Contractor may request electronic AutoCAD files from the Engineer if needed to complete their shop drawings. An Electronic File Request Form will be sent to the contractor if files are requested and must be completed and signed before the AutoCAD files are released to the Contractor.

G. All submittals for equipment and materials shall be reviewed and approved by the engineer prior to the fabrication or release by the contractor. This includes fabrication drawings for ductwork and fire protection and the coordination of equipment between trades. The release, purchase, installation or fabrication of any items prior to the contractor receiving an approved shop drawing will be at the contractor's own risk. Any rework that results will be provided by the contractor at no cost to the Owner or design team.

H. Submittals must be reviewed and approved by the Contractor before submitting to the Engineer.

I. 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.

1.4 QUALITY ASSURANCE

A. Warranty

1. Equipment warranty shall be a minimum of one (1) year from date of factory supervised startup or from the date of substantial completion, whichever is later.

2. Contractor shall warranty all of their work for one (1) year from the date of substantial completion.

B. Equipment Capacity

1. All equipment submitted shall meet or exceed the capacity listed in the specifications and schedules. This includes airflows / static pressure, heating / cooling capacities, pump flow / head, and all values listed in the construction documents.

2. All submitted motor brake horsepower's submitted shall be at least 5% less than the rated nominal motor horsepower. No motors shall be selected in the motor service factor with the exception of fire pumps.

3. The mechanical contractor shall be responsible for any structural, electrical, piping, ductwork or other utility modifications resulting from an alternate manufacturer than the basis of design being used.

C. These documents are diagrammatical in nature and intended to convey scope and general arrangement of the mechanical systems. Not all fittings, risers, size changes, offsets, valves, accessories, etc. are shown on plan. If items are required to make a system fully operational but not shown on plan or in these specifications, they shall be included by the contractor.

D. The intent of the Drawings is to establish the types of systems and functions; not to set forth each item essential to the functioning of the system. Install the Work complete, including minor details necessary to perform the function indicated. Review pertinent Drawings and adjust the Work to conditions shown. Where discrepancies occur between Drawings, Specifications, and actual field conditions, immediately notify the Architect and Engineer for interpretations.

E. It is the contractor's responsibility to determine all utility routing prior to purchase and installation of material.

F. For remodel or addition projects, the contractor shall visit and survey the site prior to submitting a bid. The contractor shall visit the site to understand the complexity of utility routing, phasing, staging, and all general installation. Submitting a bid means the contractor acknowledges the complexities of the project and has made provisions for overcoming these complexities in their bid.

G. The contractor shall report any discrepancies between these documents and site conditions immediately to the Engineer prior to submitting a bid or starting work. Submittal of a bid indicates that the contractor and the contractor's subcontractors have carefully and thoroughly reviewed the drawings, specifications, and other construction documents and have found them complete and free from ambiguities and sufficient for the purposes intended.

H. Install all equipment per the manufacturer's requirements / recommendations.

I. No equipment provided or installed shall contain mercury.

J. Manufacturer Supplier Inspection & Startup

1. The following equipment shall have a factory representative perform start-up. The procedure shall be documented and submitted to the design team and Owner. Include copies of startup reports in the Operations & Maintenance Manuals.
    a. Division 22
        1) Booster Pumps
        2) Water Softeners
    b. Division 23
        1) Air Handling Units
        2) Dehumidification Units
        3) Energy Recovery Units

K. All equipment shall be UL listed where applicable.

1.5 ELECTRONIC DOCUMENT RELEASE

A. Electronic versions of the bid documents will be made available to the contractors for use during the bidding process and to help generate fabrication drawings for various systems. A summary of the requirements for the various document types is listed below:

1. PDF
    a. Contact the Construction Manager or Architect to obtain a PDF version of the Bid Documents. No Document Release Form is required.
2. AutoCAD
    a. KEDbluestone Engineering can provide an AutoCAD version of the bid documents for the contractor to use for generating shop drawings and fabrication drawings. This will include plan drawings with the architectural background. The contractor is responsible for incorporating any modifications that occur during bidding by all disciplines. Details and schedules will not be included.
    b. A document release form (see attached) will be required to be completed by the contractor to determine the version of AutoCAD and drawings required. No fee is associated with these drawings.
3. REVIT
    a. The REVIT drawings will be converted to AutoCAD and then transferred to the contractor.
    b. KEDbluestone Engineering can provide an AutoCAD version of the bid documents for the contractor to use for generating shop drawings and fabrication drawings. This will include plan drawings with the architectural background. The contractor is

responsible for incorporating any modifications that occur during bidding by all disciplines. Details and schedules will not be included.

c. A document release form (see attached) will be required to be completed by the contractor to determine the version of AutoCAD and drawings required.

d. Submittal of the document release form will be required prior to the AutoCAD files being transmitted.

1.6 SUBSTITUTIONS

A. All manufacturers listed as Acceptable Manufacturers in each specification section are considered equal to the basis of design. The basis of design is preferred and will take precedence. Any products from an alternate approved manufacturer need to meet the requirements and performance specified and shall be equal to the basis of design.

B. The Contractor may request permission for a substitution of any item (equipment or material), subject to the following conditions:

1. Submit substitution requests in writing to the Engineer, on a form supplied by the Engineer. A sample copy of this form is included at the end of this section. An electronic copy can also be provided to the Contractor by the Engineer.

2. Where equipment or accessories are used which differ in arrangement, configuration, dimensions, ratings, or engineering parameters from those indicated on the contractor 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 as well as any re-design costs incurred by the Architect or Engineer. The Contractor is also responsible for coordinating changes required by other trades.

3. Any requests for alternate manufacturers must be submitted to the Architect/Engineer at least ten (10) days prior to bid day. Incomplete substitution requests will not be considered.

C. Approval

1. No work involving requests for substitution shall commence without written approval on the provided form by the Engineer.

2. Any work started or material ordered/installed by the Contractor without written approval shall be removed/repaired at the sole expense of the contractor. The Contractor will also be responsible for any costs incurred by the Owner for such rework.

1.7 COORDINATION DRAWINGS

A. The mechanical contractor shall be responsible for producing coordination drawings. The drawings will need to incorporate piping, ductwork, equipment, lighting, conduits, building structure and all other building and system components that will need to be coordinated for proper systems installation and operation.

B. The drawings will be 1/4" scale.

C. Coordination meetings will be conducted on site with all concerned contractors present. Representatives from the Owner, Architect and Engineer will also be present to review conflicts and approve contractor variations to the contract documents.

1.8 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 the Engineer and the Owner. Any outage must be scheduled when the interruption causes the least interference with normal work 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 unless specifically noted in the Specifications or in the bidding requirements.

B. This Contractor shall restore any mechanical services interrupted as a result of a lack of coordination to proper operation as soon as possible.

C. Contractor shall notify Owner of any utility service shutdown forty-eight (48) hours in advance. This includes gas, water, sanitary, storm, fire protection, cooling, and heating systems.

1.9 REGULATORY AND UTILITY REQUIREMENTS

A. Contractor is responsible for coordinating all required site inspections by authorities having jurisdiction. Contractor shall notify General Contractor of all scheduled inspections seven (7) working days prior to site visit.

B. Contractor is responsible for paying for all fees, permits, and inspections that are required to complete their work.

C. Contractor shall include all work required to relocate utilities and meters as shown on drawings.

D. Contractor shall include all work required to install new utilities and meters as shown on drawings. This includes any new service and meter fees in coordination with the utility company.

E. Utility work 5’-0” from outside of building is by others.

1.10 PROTECTION OF FINISHED SURFACES

A. Furnish one (1) can of touch-up paint for each different color factory finish for equipment furnished by the Contractor. Deliver touch-up paint with other "loose and detachable parts" as covered in the General Requirements.

1.11 SEALING AND FIRESTOPPING

A. Sealing and firestopping of sleeves/openings between ducts and piping and the structural or partition opening shall be the responsibility of the General Contractor. The contractor responsible shall hire individuals skilled in such work to do the sealing and firestopping. These individuals hired shall normally and routinely be employed in the sealing and fireproofing occupation.

1.12 WORK BY OWNER AND/OR OWNER AGENCY

A. Asbestos abatement, removal and disposal, if required, will be by the Owner under separate contract.

1.13 OMISSIONS

A. No later than ten (10) days before bid opening, the Contractor shall call the attention of the Architect and Engineer to any materials or apparatus the Contractor believes to be inadequate and to any necessary items of work omitted.

1.14 DELIVERY, STORAGE, AND HANDLING

A. All equipment and materials shall be protected during shipment and storage against physical damage, vermin, dirt, corrosive substances, fumes, moisture, cold and rain.

B. Store equipment indoors in clean dry space with uniform temperature to prevent condensation or damage from the elements.

C. Take such precautions as are necessary to protect apparatus and materials from damage. Damaged equipment shall be, as determined by the Owner and/or Engineer, placed in first class operating condition or be returned to the source of supply for repair or replacement.

D. Protect factory finish from damage during construction operations until acceptance of the Project. Restore any finishes that become stained or damaged to Owner’s satisfaction.

1.15 DIVISION OF WORK AND COORDINATION

A. The Electrical Contractor is responsible for providing and installing power wiring up to equipment provided by others for a single point connection. Internal wiring of equipment

provided by others shall be the responsibility of the contractor responsible for providing and installing the equipment.

B. Controls, disconnect switches, starters, variable frequency drives, etc. shall be provided and installed by the contractor noted on the plans and in the specifications. It is the responsibility of the Contractor to request written clarification for any ambiguity regarding division of work and coordination at least ten (10) days prior to bid.

C. Utilities routed within the building shall be installed in an orderly manner. All work will be coordinated with other disciplines prior to installation. The following list ranks the priority of the utilities to be installed:

1. Light fixtures
2. Gravity piping
3. Electrical busduct
4. Ductwork
5. Cable tray
6. All other piping
7. Electrical conduits

D. 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.

E. Coordinate work with the Testing and Balancing (TAB) Contractor. Verify system completion to the TAB Contractor such as pressure testing, chemical treatment, filling of liquid systems, proper pressurization and air venting of hydronic systems, clean filters, clean strainers, controls adjusted and calibrated, fire/smoke damper integration 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. Assist the TAB Contractor as needed to complete their work.

F. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for HVAC installations.

G. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

H. Coordinate requirements for access panels and doors for HVAC items requiring access that are concealed behind finished surfaces. Access panels and doors are specified in Division 08 Section "Access Doors and Frames."

1.16 OPERATION AND MAINTENANCE DATA

A. All operations and maintenance data shall comply with the submission and content requirements specified under section GENERAL REQUIREMENTS.

B. In addition to the general content specified under GENERAL REQUIREMENTS supply the following additional documentation as applicable:

1. Internal and interconnecting wiring and control diagrams with data to explain detailed operation and control of the equipment.
2. A control sequence describing start-up, operation, and shutdown.
3. Description of the function of each principal item of equipment.
4. Installation instructions.
5. Safety precautions for operation and maintenance.
6. Diagrams and illustrations.

7. Periodic maintenance and testing procedures and frequencies, including replacement parts numbers and replacement frequencies.
8. Performance data.
9. Where applicable, pictorial "exploded" parts list with part numbers. Emphasis shall be placed on the use of special tools and instruments. The list shall indicate sources of supply, recommended spare parts, and name of servicing organization.
10. List of factory approved or qualified permanent servicing organizations for equipment repair and periodic testing and maintenance, including addresses and factory certification qualifications.

1.17 RECORD DRAWINGS

A. The Contractor shall maintain at least one copy each of the Specifications and Drawings on the job site at all times.

B. The Architect will provide the Contractor with a suitable set of Contract Drawings on which daily records of changes and deviations from contract shall be recorded. 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 Contractor's field superintendent. No arbitrary mark-ups will be permitted.

D. At completion of the project, the Contractor shall submit the marked-up record drawings to the General Contractor prior to final payment.

1.18 SPECIAL REQUIREMENTS

A. Contractor bid shall allow color selection by Architect of any piece of exposed equipment from all available colors. Base bid color selection shall include those considered ‘premium’ by the manufacturer.

PART 2 - PRODUCTS

2.1 GENERAL

A. Conditions: Provide new products of manufacturers regularly engaged in production of such equipment. Provide the manufacturer's latest standard design for the type of product specified.

2.2 ACCESS PANELS AND DOORS

A. Provide access panels and/or doors where required to maintain access to the electrical installation and where noted on the Drawings.

B. Lay-in Ceilings

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

C. Plaster/Gypsum Walls and Ceilings

1. 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 application, 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; minimum size is 12" by 12".

2.3 SEALING AND FIRESTOPPING

A. Fire and/or Smoke Rated Penetrations

1. Manufacturers

a. 3M, STI/SpecSeal, Tremco, Hilti or approved equal.

2. All firestopping systems shall be by the same manufacturer.

3. Submittals

a. Contractor shall submit product data for each firestop system. Submittals shall include product characteristics, performance and limitation criteria, test data, MSDS sheets, installation details and procedures for each method of installation applicable to this project. For non-standard conditions where no UL tested system exists, submit manufacturer's drawings for UL system with known performance for which an engineering judgment can be based upon.

4. Product

a. Firestop systems shall be UL listed or tested by an independent testing laboratory approved by the Department of Commerce.

b. Use a product that has a rating not less than the rating of the wall or floor being penetrated. Reference architectural drawings for identification of fire and/or smoke rated walls and floors.

c. Contractor shall use firestop putty, caulk sealant, intumescent wrap strips, intumescent fire stop collars, fire stop mortar or a combination of these products to provide a UL listed system for each application required for this project. Provide mineral wool backing where specified in manufacturer's application detail.

B. Non-Rated Penetrations

1. Piping Penetrations Through Below Grade Walls

a. In exterior wall openings below grade, use a modular mechanical type seal consisting of interlocking synthetic rubber links shaped to continuously fill the annular space between the piping and the cored opening or a water-stop type wall sleeve.

2. Piping and Ductwork Penetrations

a. At penetrations of non-rated interior partitions, floors and exterior walls above grade, use urethane caulk in annular space between pipe/duct and sleeve or opening.

2.4 PAINT

A. For indoor applications, use paints and primers that have a VOC content of 250 g/L or less when calculated according to the adopted version of the Green Seal Standard GC-03, Anti-Corrosive Paints.

PART 3 - EXECUTION

3.1 DEMOLITION

A. Refer to Division 01 Section "Cutting and Patching" and Division 02 Section "Selective Structure Demolition" for general demolition requirements and procedures.

B. Coordinate work with the Owner to minimize disruption to the existing building occupants.

C. Disconnect, demolish, and remove mechanical systems, equipment, and components indicated to be removed. Perform demolition that may not be shown but required to accomplish new work. Where ductwork or piping is removed and not reconnected with new work, cap ends of existing services as if they were new work.

D. Remove portion of ductwork or piping indicated to be removed and cap or plug remaining utility with same or compatible materials.

E. All pipe, wiring and associated conduit, insulation, ductwork, and similar items demolished, abandoned, or deactivated are to be removed from the site by the Contractor. All piping and ductwork specialties are to be removed from the site by the Contractor unless they are dismantled and removed or stored by the Owner. All designated equipment is to be turned over to the Owner 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.

F. Unless noted otherwise, all duct and piping branches shown to be removed shall be removed back to the main and capped. Pressure piping shall have shutoff valves and caps installed.

G. If pipe, insulation, or equipment to remain is damaged in appearance or is unserviceable, remove damaged or unserviceable portions and replace with new products of equal capacity and quality.

3.2 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.

B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

C. Install HVAC equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations

D. Install equipment to allow right of way for piping installed at required slope.

E. Provide clearance for inspection, repair, replacement, and service to all equipment to include a minimum of 36 inches from all obstructions (walls, structure, ductwork, pipes, etc.). Clearance shall maintain access to all electrical panels, access doors, controllers, valves, junction boxes and operators and include the area directly in front of and above the system components.

3.3 EXCAVATION AND BACKFILL

A. Perform all excavation and backfill work to accomplish indicated mechanical systems installation in accordance with Section 312316.13 - Trenching.

3.4 CONCRETE BASES

A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.

1. Construct concrete bases not less than 4 inches larger in both directions than supported unit.

2. All pads to be a minimum of 4” thick unless noted otherwise. Thicken pads as needed to accommodate the slope of slab / grade around the equipment.Exterior pads installed on grade to include frost footings. Coordinate requirements with the civil / structural designers. Refer to equipment schedules for additional requirements. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of the base.

6. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.

7. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

8. Install anchor bolts to elevations required for proper attachment to supported equipment.

9. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

10. Indoor or outdoor equipment meeting any or all of the following requirements shall be installed on housekeeping pads:
    a. Floor mounted motorized equipment.
    b. All floor or ground mounted air handling equipment and fans.
    c. All heating, cooling, plumbing, and fire protection equipment and associated floor mounted accessories located in mechanical spaces.
    d. Equipment installed in areas with uneven surfaces and surfaces that are not level.
    e. As required by the equipment manufacturer
11. Refer to plans and details for additional pad locations.

3.5 PAINTING

A. Exposed piping in occupied areas to be painted by others. Coordinate color with architect.
    1. Contractor to prep duct and piping as needed to accept paint.

B. Contractor shall paint the following items with two (2) coats of exterior enamel over one (1) coat primer. Select paint to be compliant with material being used, i.e. metal, plastic, etc:
    1. All exposed duct, hydronic, and natural gas piping. Color to be coordinated with the Architect.

3.6 SEALING AND FIRESTOPPING

A. Fire and/or Smoke Penetrations
    1. Install approved product in accordance with the manufacturer's instructions where a pipe/duct penetrates a fire rated surface.
    2. Where firestop mortar is used to infill large fire-rated floor openings that could be required to support weight, provide permanent structural forming. Firestop mortar alone is not adequate to support any substantial weight.

B. Non-Rated Surfaces
    1. When the opening is through a non-fire rated wall, floor, ceiling or roof the opening must be sealed using an approved type of material.
    2. Install escutcheons or floor/ceiling plates where pipe/duct penetrates non-fire rated surfaces in occupied spaces. Occupied spaces for this paragraph include only those rooms with finished ceilings and the penetration occurs below the ceiling.
    3. In exterior wall openings below grade, assemble rubber links of mechanical seal to the proper size for the pipe/duct and tighten in place, in accordance with the manufacturer's instructions. Install so that the bolts used to tighten the seal are accessible from the interior of the building or vault.
    4. At interior partitions, pipe/duct penetrations are required to be sealed for all clean rooms, laboratories, and most hospital spaces, computer rooms, dormitory rooms, telephone/data/com rooms and similar spaces where the room pressure or odor transmission must be controlled. Apply sealant to both sides of the penetration in such a manner that the annular space between the sleeve and the pipe/duct is completely filled.

3.7 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.

3.8 SITE OBSERVATIONS

A. Site observations shall be performed by the Engineer at the following project milestones:

1. Prior to enclosure of the following areas:
    a. Underfloor
    b. Walls and chases
    c. Raised floor
    d. Above the ceiling
2. Final project completion

B. Contractor shall provide seven (7) working days' notice to Engineer prior to site visit.

C. The Engineer is only responsible to conduct one (1) final site visit for each phase of the project. If upon visiting the site, the Engineer finds that not enough work is complete for the final site visit, the Contractor shall be responsible to bear the cost for the Engineer to travel to the site and revisit. Revisiting will not occur until payment is agreed upon.

3.9 EQUIPMENT STARTUP

A. Contractor shall provide startup of equipment by factory certified personnel for equipment listed above.

B. For all other equipment, Contractor shall perform startup per manufacturer's requirements. Startup shall be performed by personnel qualified for this work.

C. Contractor shall test equipment to be fully functional. Test all equipment safeties and emergency stops. Test all control set-points and equipment modes.

D. Contractor shall return to site as needed to adjust equipment for seasonal equipment performance changes.

3.10 OWNER TRAINING

A. Contractor shall include at least eight (8) hours for each maintenance staff shift group in their bid to provide complete Owner training for all the mechanical systems. Training shall include explanation of system operation, startup/shutdown, routine maintenance, seasonal changes, and controls adjustments. Coordinate acceptable training schedule with Owner.

B. All training provided for the Owner shall comply with the format, general content requirements and submission guidelines specified under Section 019101, or 019102.

C. Contractor to provide factory authorized representative and/or field personnel knowledgeable with the operations, maintenance and troubleshooting of the system and/or components defined within this section for a minimum period of 24 hours or for the duration noted in the technical Specifications.

3.11 PROJECT CLOSEOUT REQUIREMENTS

A. Final project closeout tasks

1. Deliver all spare parts listed in each specification section. Deliver to Owner chosen location.
2. All equipment labeled per specifications.
3. All equipment cleaned and ready for use. Install new filters in all equipment with filters; do not use Owner's spare filter sets.

B. Contractor requirements

1. Marked up drawings and specifications provided to Engineer for incorporation of as-built drawings or to serve as the as-built drawings depending on the project requirements. As-built drawings shall be clean and legible.

2. Operation and Maintenance (O & M) Manuals shall include the following:
    a. Contractor contact for warranty work
    b. Approved shop drawings, incorporating all review comments
    c. Warranty copies
    d. Equipment start-up reports
    e. Testing and balancing reports
    f. Operation and maintenance instructions
3. Utility Rebate Forms
    a. Contractor shall submit completed energy rebate forms for each piece of equipment that is eligible for a rebate. Eligible equipment shall include, but not be limited to the following:
        1) Split System Air Conditioners
        2) Motors
        3) Variable Frequency Drives
    b. Contractor to complete information regarding equipment. Submit form to Owner, Owner will complete Owner's contact information and send the completed form to the utility.
4. Three (3) final approved O & M Manuals shall be delivered to Owner. Each manual shall be an appropriately sized three (3) ring binder with a vinyl cover and printed spine and cover labels. Each section shall have a printed divider tab. Each section shall be listed in a table of contents at the beginning of the manual.

END OF SECTION

(ELECTRONIC DOCUMENT RELEASE FORM & SUBSTITUTION REQUEST FORMS ATTACHED)

Document Release Form

Information Requested:

Project Name:
Drawings Requested:

Media Type: (Check all that are applicable)

- ☐ AutoCAD DWG Files (Version _____)
- ☐ REVIT Files (Version _____)
- ☐ Adobe PDF Files
- ☐ Other

Requesting Party:

Name:

Company:

Signature:

Date:

Address 1:

Address 2:

Email Address:

Phone #:

KEDbluestone Use:

Form Sent By:

Date:

KEDbluestone Project #:

Data contained on these electronic files are part of our instruments of service and shall not be used by you or anyone else receiving these data through or from you for any purpose other than as a convenience in the preparation of shop drawings for the referenced project. Any other use or reuse by you or by others will be at your sole risk and without liability or legal exposure to us. You agree to make no claim and hereby waive, to the fullest extent permitted by law, any claim or cause of action of any nature against us, our officers, directors, employees, agents or sub consultants that may arise out of or in connection with your use of the electronic files. Furthermore, you shall, to the fullest extent permitted by law, indemnify and hold us harmless against all damages, liabilities or costs, including reasonable attorneys' fees and defense costs, arising out of or resulting from your use of these electronic files. These electronic files are not construction documents. Differences may exist between these electronic files and corresponding hard-copy construction documents. We make no representation regarding the accuracy or completeness of the electronic files you receive. In the event that a conflict arises between the signed or sealed hard-copy construction documents prepared by us and the electronic files, the signed or sealed hard-copy construction documents shall govern. You are responsible for determining if any conflict exists. By your use of these electronic files, you are not relieved of your duty to fully comply with the contract documents, including, and without limitation, the need to check, confirm and coordinate all dimensions and details, take field measurements, verify field conditions and coordinate your work with that of other contractors for the project. Because information presented on the electronic files can be modified, unintentionally or otherwise, we reserve the right to remove all indicia of ownership and/or involvement from each electronic display.

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SUBSTITUTION REQUEST FORM (DURING BIDDING)

We submit for your consideration the following product instead of the specified item for the following project:

PROJECT: _____

SPEC. SECTION	SPEC. TITLE	PARAGRAPH	SPECIFIED ITEM
_____	_____	_____	_____

Proposed Substitution: _____

MANUFACTURER	TRADE NAME	MODEL NO.
_____	_____	_____

Attached data includes product description, specifications, drawings, photographs, and performance and test data adequate for evaluation of the request; applicable portions of the data are clearly identified.

Attached data also includes a description of changes to the Contract Documents that the proposed substitution will require for its proper installation.

The Undersigned certifies:

- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.
- Same warranty will be furnished for proposed substitution as for specified product.
- Same maintenance service and source of replacement parts, as applicable, is available.
- Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.
- Proposed substitution does not affect dimensions and functional clearances.
- Payment will be made for changes to building design, including Architectural and Engineering design, detailing, and construction costs caused by the substitution.

Submitted by:

_____

Signature

_____

Firm

_____

Telephone Email Date

Engineer's Review and Action

☐ Substitution Approved
☐ Substitution Approved As Noted
☐ Substitution Rejected
☐ Substitution Request Received Too Late

Signed by:

_____

Date

Supporting Data Attached:

☐ Drawings ☐ Product Data ☐ Samples ☐ Tests ☐ Reports ☐ Other _____

SECTION 23 05 29
PIPE HANGERS AND SUPPORTS

PART 1 - GENERAL

1.1 SCOPE

A. Perform all Work required to provide and install the following Pipe Hangers and Supports indicated by the Contract Documents with supplementary items necessary for proper installation.

1.2 REFERENCES

A. Refer to Section 230719, PIPING INSULATION for work related to this section.

1.3 SUBMITTALS

A. Product Data

1. Manufacturer's catalog sheets and specifications for hangers and supports materials.
2. Installation instructions.
3. Schedule indicating what type of hangers or support will be used for various piping types.

1.4 QUALITY ASSURANCE

A. Regulatory Requirements:

1. Comply with the applicable requirements of the ASME B31 Piping Codes.
2. Unless otherwise shown or specified, comply with the requirements of the Manufacturer's Standardization Society of the Valve and Fittings Industry (MSS) Standards SP-58, and SP-69.
3. Materials for use in Sprinkler Systems and Standpipe and Hose Systems shall comply with the requirements of NFPA 13 and NFPA 14 as applicable.
4. Hang and support cast iron soil pipe and fittings in accordance with the recommendations of the Cast Iron Soil Pipe's Institute's (CISPI) Cast Iron Soil Pipe and Fittings Handbook.

PART 2 - PRODUCTS

2.1 PIPE HANGERS AND SUPPORTS

A. Combination clevis hanger, pipe insulation shield and vapor barrier jacketed high density insulating saddle with companion high density filler piece.

1. Insulating saddles and filler pieces shall be of the same thickness and materials as the adjoining pipe insulation. Saddles shall cover the lower 180 degrees of the pipe or tubing, and companion filler pieces shall cover the upper 180 degrees of the pipe or tubing. Physical sizes, gages, etc. of the components of insulated hangers shall be in accordance with the following schedule:

PIPE OR TUBING SIZE (Inches)	SHIELD LENGTH (Inches)	SHIELD GAUGE	SADDLE LENGTH (Inches)	VAPOR BARRIER JACKET LENGTH (Inches)
Up to 2-1/2	4	16	6	10
3 to 6	4	14	6	10
8 to 14	10	12	12	16
16 and up	10	10	12	16

B. Pipe Insulation Shields: Fabricated of steel, with a minimum arc of 180 degrees, unless otherwise indicated. Shields for use with hangers and supports, with the exception of combination clevis type hangers, shall be in accordance with the following schedule:

PIPE OR TUBING SIZE (Inches)	SHIELD LENGTH (Inches)	SHIELD GAUGE
Up to 2-1/2	8	18
3 to 8	10	16
10 to 14	12	12
16 and up	18	10

C. Pipe Hangers: Height adjustable standard duty clevis type, with cross bolt and nut.

1. Pipe spreaders or spacers shall be used on cross bolts of clevis hangers, when supporting piping ten (10) inches in size and larger.
2. Swivel ring type hangers will be allowed for sprinkler piping up to a maximum of two (2) inches in size.

D. Adjustable Floor Rests and Base Flanges: Steel.

E. Hanger Rods: Mild, low carbon steel, fully threaded or threaded at each end, with two (2) nuts at each end for positioning rod and hanger, and locking each in place.

F. Riser Clamps: Malleable iron or steel.

G. Rollers: Cast Iron.

H. Specialty: Fasteners, supports and hangers for PEX piping shall be specifically designed for PEX piping.

2.2 ANCHORS AND ATTACHMENTS

A. Sleeve Anchors (Group II, Type 3, Class 3): Molly's Div./USM Corp. Parasleeve Series, Ramset's Dynabolt Series, or Red Head/Phillips AN, HN, or FS Series.

B. Wedge Anchors (Zinc Plated, Group II, Type 4, Class 1): Hilti's Kwik Bolt Series, Molly's Div./USM Corp. Parabolt PB Series, Ramset's Trubolt T Series, or Red Head/Phillips WS Series.

C. Self-Drilling Anchors (Group III, Type 1): Ramset's RD Series, or Red Head/Phillips S Series.

D. Non-Drilling Anchors (Group VIII, Type 1): Ramset's Dynaset DS Series, Hilti's HDI Series, or Red Head/Phillips J Series.

E. Stud Anchors (Group VIII, Type 2): Red Head/Phillips JS Series.

F. Beam Clamps: Forged steel beam clamp, with weldless eye nut (right hand thread), steel tie rod, nuts, and washers, Grinnell's Fig No. 292 (size for load, beam flange width, and rod size required).

G. Metal Deck Ceiling Bolts: B-Line Systems' Fig. B3019.

H. Continuous Slotted Type Concrete Insert, Galvanized.

I. Threaded Type Concrete Insert: Galvanized ferrous castings, internally threaded to receive 3/4 inch diameter machine bolts.

J. Wedge Type Concrete Insert: Galvanized box-type ferrous castings, designed to accept 3/4 inch diameter bolts having special wedge shaped heads.

2.3 FASTENERS

A. Bolts, Nuts, Washers, Lags, and Screws: Medium carbon steel; size and type to suit application; galvanized for high humidity locations, and treated wood; plain finish for other interior locations. Except where shown otherwise on the Drawings, furnish type, size, and grade required for proper installation of the Work.

2.4 SHOP PAINTING AND PLATING

A. Hangers, supports, rods, inserts and accessories used for pipe supports, unless chromium plated, cadmium plated or galvanized shall be shop coated with metal primer paint. Electroplated copper hanger rods, hangers and accessories shall be used when hangers are in direct contact with copper pipe or copper tubing.

B. Hanger supports for chromium plated pipe shall be chromium plated brass.

2.5 ROOFTOP SUPPORT SYSTEMS

A. Rooftop supports for piping equipment shall be provided for installation without requiring roof penetrations, flashing, or damage to the roofing material. Height-adjustable supports may be used where necessary. Support piping a minimum of 4” above the roof surface.

B. Materials:

1. Support bases shall be made of an engineered material with appropriate additives for UV protection. All structural steel components shall be hot-dipped galvanized.
2. The support shall have a continuous bottom surface to provide even load distribution and minimize point loading of the roof membrane. The support base will have a radiused edge to enhance compatibility with roof membranes.
3. Coordinate static load rating of the support(s) with the specific application being served.
4. Accessories: Clamps, bolts, nuts, washers, and other devices as required for a complete system.

C. Applications:

1. Fixed Strut Pipe Hanger Supports: Size and load ratings for the application
2. Adjustable Strut Pipe Hanger Supports: Height adjustable, size and load ratings for the application
3. Adjustable Single Piping Supports: Height adjustable, size and load ratings for the application
4. Block Supports: Size and load ratings for the application
5. Roller Supports: Height adjustable, size and load ratings for the application
6. Bridge Assemblies:
    a. Suitable for multiple piping runs or equipment
    b. Size and load ratings for the application
7. Post Base Assemblies:
    a. For use with vertical sections of channel support systems
    b. Size, channel support configuration, and load ratings for the application

D. Acceptable Manufacturers:

1. Caddy/Pentair
2. Cooper B-Line
3. Mifab, Arlington
4. Rooftop Blox

5. Haydon
6. MAPA Products
7. Miro Industries

PART 3 - EXECUTION

3.1 PREPARATORY WORK

A. Place inserts into construction form work expeditiously, so as not to delay the work of other trades.

3.2 INSTALLATION

A. Do not hang or support one (1) pipe from another or from ductwork.

B. Do not bend threaded rod.

C. Do not hang or support equipment from the bottom chord of joists.

D. Support all insulated horizontal piping conveying fluids below ambient temperature, by means of hangers or supports with insulation shields installed outside of the insulation.

E. Space hangers or supports for horizontal piping on maximum center distances as listed in the documents, and as follows.

1. Cast Iron Soil Pipe:
    a. General:
        1) Where piping is suspended on centers in excess of 18 inches by means of non-rigid hangers, provide sway bracing to prevent horizontal pipe movement.
        2) Additionally, brace piping five (5) inches and larger to prevent horizontal movement and/or joint separation. Provide braces, blocks, rodding or other suitable method at each branch opening, or change of direction
    b. For Bell & Spigot Cast Iron Soil Pipe: Space hangers or support pipe at each joint or on maximum centers of five (5) feet. Place hangers or supports as close as possible to joints and when hangers or supports do not come within one (1) foot of a branch line fitting, install an additional hanger or support at the fitting.
    c. For Hubless Cast Iron Soil Pipe: Space hangers or support pipe at each joint or on maximum centers of five (5) feet. Place hanger or supports as close as possible to joints and when hangers or supports do not come within one (1) foot of a branch line fitting, install an additional hanger or support at the fitting.
2. For Directional Changes: Install a hanger or support close to the point of change of direction of all pipe runs in either a horizontal or vertical plane.
3. For Concentrated Loads: Install additional hangers or supports, spaced as required and directed, at locations where concentrated loads such as in-line pumps, valves, fittings or accessories occur, to support the concentrated loads.
4. For Branch Piping Runs and Runouts Over 5 feet In Length: Install a minimum of one hanger, and additional hangers if required by the hanger spacing schedules.
5. Parallel Piping Runs: Where several pipe lines run parallel in the same plane and in close proximity to each other, trapeze hangers may be used. Base hanger spacing for trapeze type hangers on the smallest size of pipe being supported. Design the entire hanger assembly based on a safety factor of five, for the ultimate strength of the material being used.

F. Size hanger rods in accordance with the following

PIPE SIZE (Inches)	SINGLE ROD HANGER SIZE (Inches)		DOUBLE ROD HANGER SIZE (Inches)	
	PIPE	TUBING	PIPE	TUBING
1/2 to 2	3/8	1/4	3/8	1/4
2-1/2 and 3	1/2	3/8	3/8	1/4
4 and 5	5/8	1/2	1/2	3/8
6	3/4	1/2	5/8	1/2
8, 10 and 12	7/8	5/8	3/4	5/8

1. Secure hanger rods as follows: Install one (1) nut under clevis, angle or steel member; one (1) nut on top of clevis, angle or steel member; one (1) nut inside insert or on top of upper hanger attachment and one (1) nut and washer against insert or on lower side of upper hanger attachment. A total of four (4) nuts are required for each rod, two (2) at upper hanger attachment and two (2) at hanger.
2. Size hanger rods, for piping over 12 inches in size and multiple line supports, based on a safety factor of five for the ultimate strength of the materials being used.

G. Vertical Piping

1. Support vertical risers of piping systems, by means of heavy duty hangers installed close to base of pipe risers, and by riser clamps with extension arms at intermediate floors, with the distance between clamps not to exceed 25 feet, unless otherwise specified. Support pipe risers in vertical shafts equivalent to the aforementioned. Install riser clamps above floor slabs, with the extension arms resting on floor slabs. Provide adequate clearances for risers that are subject to appreciable expansion and contraction, caused by operating temperature ranges.
2. Support extension arms of riser clamps, secured to risers to be insulated for cold service, 4 inches above floor slabs, to allow room for insulating and vapor sealing around riser clamps.
3. Support cast iron risers, by means of heavy duty hangers installed close to the base of the pipe risers, and 1/4 inch thick malleable iron or steel riser clamps with extension arms at each floor level, with the distance between clamps not to exceed 25 feet. Support cast iron risers in vertical shafts equivalent to the aforementioned.
4. Support hubless cast iron risers, by means of heavy duty hangers installed close to the base of the pipe risers, and by malleable iron or steel riser clamps with the extension arms at each floor level, with the distance between clamps or intermediate supports not to exceed 12 feet. Support risers in vertical shafts equivalent to the aforementioned.

H. Floor Supports: Install adjustable yoke rests with base flanges, for the support of piping, unless otherwise indicated on the Drawings. Install supports in a manner, which will not be detrimental to the building structure.

I. Underground Cast Iron Pipe Supports: Firmly bed pipe laid underground, on solid ground along bottom of pipe. Install masonry piers for pipe laid in disturbed or excavated soil or where suitable bearing cannot be obtained. Support pipe, laid proximate to building walls in disturbed or excavated soil, or where suitable bearing cannot be obtained, by means of wall brackets or hold-fasts secured to walls in an approved manner.

3.3 UPPER HANGER ATTACHMENTS

A. General

1. Secure upper hanger attachments to overhead structural steel, steel bar joists, or other suitable structural members.
2. Do not attach hangers to steel decks that are not to receive concrete fill.
3. Do not attach hangers to precast concrete plank decks less than 2-3/4 inches thick.
4. Do not use flat bars or bent rods as upper hanger attachments.

B. Attachment to Steel Frame Construction: Provide intermediate structural steel members where required by pipe support spacing. Select steel members for use as intermediate supports based on a minimum safety factor of five.

1. Do not use drive-on beam clamps.
2. Do not support piping over 4 inches in size from steel bar joists. Secure upper hanger attachments to steel bar joists at panel points of joists.
3. Do not drill holes in main structural steel members.
4. Beam clamps, with tie rods as specified, may be used as upper hanger attachments for the support of piping, subject to clamp manufacturer's recommended limits.

C. Attachment to Concrete Filled Steel Decks

1. New Construction: Install metal deck ceiling bolts.
2. Existing Construction: Install welding studs (except at roof decks). Do not support a load in excess of 250 lbs from any single welded stud.
3. Do not attach hangers to decks less than 2-1/2 inches thick.

D. Attachment to Cast-In-Place Concrete: Secure to overhead construction by means of cast-in-place concrete inserts.

E. Attachment to Existing Cast-In-Place Concrete

1. For piping up to a maximum of 4 inches in size, secure hangers to overhead construction with self-drilling type expansion shields and machine bolts.
2. Secure hangers to wall or floor construction with single unit expansion shields or self-drilling type expansion shields and machine bolts.

F. Attachment to Cored Precast Concrete Decks: Toggle bolts may be installed in cells for the support of piping up to a maximum of 2-1/2 inches in size.

G. Attachment to Hollow Block or Hollow Tile Filled Concrete Decks

1. New Construction: Omit block or tile and pour solid concrete with cast-in-place inserts.
2. Existing Construction: Break out block or tile to access, and install machine bolt anchors at highest practical point on side of web.

H. Attachment to Waffle Type Concrete Decks

1. New Construction: Install cast-in-place inserts.
2. Existing Construction: Install machine bolt expansion anchors at highest practical point on side of web.

I. Attachment to Precast Concrete Tee Construction

1. New Construction: Tee hanger inserts between adjacent flanges, except at roof deck without concrete fill.
2. Existing Construction: Dual unit expansion shields in webs of tees. Install shields as high as possible in the webs.

a. Exercise extreme care in the field drilling of holes to avoid damage to reinforcing.

b. Do not use powder driven fasteners.

J. Attachment to Wood Construction: Secure hangers to the sides (only) of wood members, by means of malleable iron side beam connectors, or malleable iron or steel side beam brackets. Do not secure hanger attachments to nailing strips resting on top of steel beams.

1. Secure side beam connectors to wood members with two (2) No.18 x 1-1/2 inch long wood screws, or two (2) No.16 x 1-1/2 inch long drive screws. Do not support piping over 1-1/2 inches in size from side beam connectors. Do not hammer in wood screws.

2. Secure side beam brackets to wood members with steel bolts or lag screws. Do not use lag screws in wooden members having a nominal thickness (beam face) under two (2) inches in size. Install bolts or lag screws, in the sides of a timber or a joist, at the mid-point or above, not less than 2-1/2 inches from the lower edge when supporting branch lines and not less than three (3) inches from the lower edge when supporting mains. Install heavy gauge steel washers under all nuts.

3. Secure side beam brackets to wooden beams or joists, with lag screws or bolts of size as follows:

PIPE SIZE (Inches)	LAG SCREW SIZE (Inches)	BOLT DIAMETER (Inches)
2 and under	3/8 diameter x 1-3/4	3/8
2-1/2 and 3	1/2 diameter x 2	1/2
4 and 5	Use Bolt	5/8

a. Do not support piping larger than 3 inches with lag screws. Pre-drill holes for lag screws 1/8 inch in diameter less than the root diameter of the lag screw thread.

b. The minimum width of the lower face of wood beams or joints in which lag screws of size as specified may be used is as follows:

LAG SCREW DIAMETER (Inches)	NOMINAL WIDTH OF BEAM FACE (Inches)
3/8	2
1/2	3

4. Do not secure hanger attachment to the diagonals or vertical members of the trusses.

3.4 ANCHORS, RESTRAINTS, RIGID SUPPORTS, STAYS AND SWAY BRACES

A. Install pipe anchors, restraints and sway braces, at locations noted on the Drawings. Design anchors so as to permit piping to expand and contract freely in opposite directions, away from anchor points. Install anchors independent of all hangers and supports, and in a manner that will not affect the structural integrity of the building.

B. Cast Iron Soil Piping Systems

1. Where piping is suspended on centers in excess of 18 inches by means of non-rigid hangers, provide sway braces, of design, number and location in accordance with the Cast Iron Soil Pipe Institute's Cast Iron Soil Pipe and Fittings Handbook to prevent horizontal pipe movement.

2. Additionally, brace piping five (5) inches and larger to prevent horizontal movement and/or joint separation. Provide braces, blocks, rodding or other suitable method at each branch opening, or change of direction in accordance with the Cast Iron Soil Pipe Institute's Cast Iron Soil Pipe and Fittings Handbook to prevent horizontal pipe movement.

3.5 COMBINATION CLEVIS HANGER, PIPE INSULATION SHIELD AND VAPOR BARRIER JACKETED HIGH DENSITY INSULATING SADDLES

A. Install a combination clevis hanger, pipe insulation shield and vapor barrier jacketed high density insulating saddles, at all points of support for piping or tubing to be insulated for cold service. Furnish companion high density vapor barrier jacketed saddle pieces, of the same material, thickness and length, for installation over the top 180 degree surface of pipe or tubing, at each point of support where an insulated clevis hanger is utilized.

3.6 PIPE INSULATION SHIELDS

A. Unless otherwise specified, install a pipe insulation shield, at all points of support. Center shields on all hangers and supports outside of high density insulation insert, and install in such a manner so as not to cut, or puncture jacket.

3.7 ROOFTOP SUPPORT SYSTEM

A. Install in accordance with manufacturer's instructions and recommendations.

B. Provide complete and adequate support of all piping and equipment.

C. The use of wood blocks for supporting piping or equipment is not permitted.

D. If gravel top roof, gravel must be removed around and under support.

E. Consult roofing manufacturer for roof membrane compression capacities. If necessary, a compatible sheet of roofing material (isolation pad) may be installed under rooftop support to disperse concentrated loads and add further membrane protection.

F. Use properly sized clamps to secure piping or equipment.

END OF SECTION 23 0529

SECTION 23 05 48
VIBRATION AND EXPANSION CONTROL

PART 1 - GENERAL

1.1 SCOPE

A. Perform all Work required to provide and install the Vibration Isolation and Expansion Control Devices indicated by the Contract Documents with supplementary items necessary for proper installation.

B. All mechanical equipment, piping and ductwork as noted on the equipment schedule or in the specification shall be mounted on or suspended from vibration isolators to reduce the transmission of vibration and mechanically transmitted sound to the building structure. Vibration isolators shall be selected in accordance with the weight distribution so as to produce reasonably uniform deflections.

C. All isolation materials shall be supplied by the same manufacturer.

D. Any variance or non-compliance with these specification requirements shall be corrected by the contractor in an approved manner.

E. Equipment included in This Section

1. Vibration isolation for piping, ductwork and equipment
2. Equipment isolation bases
3. Flexible piping connections
4. Resilient Pipe Anchors and Guides

1.2 SUBMITTALS

A. The manufacturer of vibration isolation shall provide submittals for products as follows

1. Descriptive Data:
    a. Schedules of flexibly mounted equipment, referencing drawings by number.
    b. Catalog cuts or data sheets on vibration isolators.
2. Drawings:
    a. Submit details of equipment bases including dimensions, structural member sizes and support point locations.
    b. Submit details of isolation hangers for ceiling hung equipment, piping and ductwork.
    c. Submit details of mountings for floor supported equipment, piping and ductwork.
    d. All hanger, mounting or pad drawings shall indicate deflections and model numbers as well as any other requirements in the specifications.
    e. Spring diameters, rated loads and deflections, heights at rated load and closed height shall be provided for all springs shown in the submittals in tabular form.
    f. Complete flexible connector details.
3. Design Submittal:
    a. Piping Expansion Compensation shall be performance based. All piping that requires expansion compensation will require the design information to be provided by the manufacturer.
    b. Expansion compensation and restraint details shall be submitted to comply with performance requirements and design criteria for the project. This shall include analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
    c. Include design calculations for static and dynamic loading for all systems components

and equipment. Provide a summary of assumptions and system requirements.

d. Horizontal and Riser Supports: Include riser diagrams and calculations showing anticipated expansion and contraction at each support point, initial and final loads on building structure, and spring deflection changes.

PART 2 - PRODUCTS

2.1 BASE MOUNTED NEOPRENE MOUNTINGS

A. Minimum static deflection of 0.35”

B. All metal surfaces shall be neoprene covered and have friction pads both top and bottom. Bolt holes shall be provided on the bottom and a tapped hole and cap screw on top.

C. Steel rails shall be used above the mountings under equipment such as small vent sets to compensate for the overhang.

D. Acceptable Manufacturers

1. Amber/Booth Company, Inc.
2. Kinetics Noise Control
3. Mason Industries
4. Vibro-Acoustics
5. Vibration Eliminator Co., Inc.
6. Vibration Mountings & Controls, Inc.
7. Twin City Hose
8. Patterson
9. Acrefine

2.2 BASE MOUNTED SPRING ISOLATORS – FREE STANDING

A. Free standing and laterally stable without any housing and complete with a molded neoprene cup or 1/4” neoprene acoustical friction pad between the baseplate and the support.

B. All mountings shall have leveling bolts that must be rigidly bolted to the equipment. Installed and operating heights shall be equal.

C. The ratio of the spring diameter divided by the compressed spring height shall be no less than 0.8. Springs shall have a minimum additional travel to solid equal to 50% of the rated deflection.

D. Acceptable Manufacturers

1. Amber/Booth Company, Inc.
2. Kinetics Noise Control
3. Mason Industries
4. Vibro-Acoustics
5. Vibration Eliminator Co., Inc.
6. Vibration Mountings & Controls, Inc.
7. Twin City Hose
8. Patterson
9. Acrefine

2.3 BASE MOUNTED MULTIPLE BELLOW AIR SPRINGS – FREE STANDING

A. Powder coated upper and lower steel sections connected by a replaceable, flexible Nylon reinforced Neoprene element to achieve a maximum natural frequency of 3 Hz.

B. Burst pressure must be a minimum of three (3) times the published maximum operating pressure. All air spring systems shall be equipped with three (3) leveling valves connected to the building control air or a supplementary air supply to maintain elevation plus or minus 1/8”(3mm).

C. An air filter and water separator shall be installed before the air distribution system to the leveling valves. Submittals shall include natural frequency, as well as load and damping tests, all as performed by an independent lab or acoustician.

D. Acceptable Manufacturers

1. Amber/Booth Company, Inc.
2. Kinetics Noise Control
3. Mason Industries
4. Vibro-Acoustics
5. Vibration Eliminator Co., Inc.
6. Vibration Mountings & Controls, Inc.
7. Twin City Hose
8. Patterson
9. Acrefine

2.4 BASE MOUNTED SPRING ISOLATORS - RESTRAINED

A. Equipment with large variations in the operating and installed weight, such as chillers, boilers, etc., and equipment exposed to the wind such as cooling towers, roof mounted fans and roof mounted air handling equipment shall be mounted on restrained spring mountings. Include neoprene acoustical pad within a rigid sided housing that includes vertical limit stops to prevent spring extension when weight is removed and temporary steel spacers between the upper and lower housings. Housings shall serve as blocking during erection.

B. When the equipment is at full operating weight, the springs shall be adjusted to assume the weight and the spacers removed, without changing the installed and operating heights.

C. All restraining bolts shall have large rubber grommets to provide cushioning in the vertical as well as horizontal modes. The hole through the bushing shall be a minimum of 0.75” larger in diameter than the restraining bolt. Horizontal clearance on the sides between the spring assembly and the housing shall be a minimum of 0.5” to avoid bumping and interfering with the spring action.

D. Vertical limit stops shall be out of contact during normal operation. Cooling tower mounts are to be located between the supporting steel and the roof or the grillage and dunnage as shown on the drawings when there is no provision for direct mounting.

E. Housings and springs shall be powder coated and hardware electro galvanized.

F. Acceptable Manufacturers

1. Amber/Booth Company, Inc.
2. Kinetics Noise Control
3. Mason Industries
4. Vibro-Acoustics
5. Vibration Eliminator Co., Inc.
6. Vibration Mountings & Controls, Inc.
7. Twin City Hose
8. Patterson
9. Acrefine

2.5 BASE MOUNTED MULTIPLE BELLOWS AIR SPRINGS - RESTRAINED

A. Equipment with large variations in the operating and installed weight, such as chillers, boilers, etc., and equipment exposed to the wind such as cooling towers, roof mounted fans and roof mounted air handling equipment shall be mounted on air springs, but within a rigid sided housing that includes vertical limit stops to prevent spring extension when weight is removed and temporary steel spacers between the upper and lower housings. Housings shall serve as blocking during erection.

B. When the equipment is at full operating weight, the air springs shall be pressurized to take the weight so the spacers can be removed without changing the installed and operating heights.

C. All restraining bolts shall be large rubber grommets to provide cushioning in the vertical as well as the horizontal modes. The hole through the bushing shall be a minimum of 0.75”(20mm) larger in diameter than the restraining bolt. Horizontal clearance between the air spring assembly and the housing shall be a minimum of 0.5”(12mm) to avoid bumping and interference with the air spring action.

D. Vertical limit stops shall be out of contact during normal operation. Mountings and air spring parts shall be powder coated. Hardware electro galvanized. Air spring systems shall be connected to the building control air or a supplementary air supply and equipped with three (3) leveling valves to maintain level within plus or minus 0.125”. Cooling tower mounts are to be located between the supporting steel and the roof or the grillage and dunnage as shown on the drawings when there is no provision for direct mounting.

2.6 SPRING HANGERS

A. Spring and Neoprene Hanger

1. Assembly shall consist of rigid steel frames containing minimum 1-1/4” thick neoprene elements at the top and a steel spring, seated in a steel washer reinforced neoprene cup on the bottom. The neoprene element and the cup shall have neoprene bushings projecting through the steel box.

2. In order to maintain stability, the boxes shall not be articulated as clevis hangers nor the neoprene element stacked on top of the spring. Spring diameters and hanger box lower hole sizes shall be large enough to permit the hanger rod to swing through a 30° arc from side to side before contacting the cup bushing and short circuiting the spring

B. Pre-compressed Spring and Neoprene Hanger

1. Assembly shall be as described in 1, but they shall be pre-compressed and locked at the rated deflection by means of a resilient upstop to keep the piping or equipment at a fixed elevation during installation.

2. The hangers shall be designed with a release mechanism to free the spring after the installation is complete and the hanger is subjected to its full load. Deflection shall be clearly indicated by means of a scale.

3. Springs are seated in a steel washer reinforced neoprene cup that has a neoprene bushing projecting through the bottom hole to prevent rod to hanger contact.

4. Spring diameters and the lower hole sizes, shall be large enough to allow the hanger rod to swing through a 30° arc from side to side before contacting the cup bushing.

C. Pre-Compressed Spring and Neoprene Hanger for Ductwork

1. If ducts are suspended by flat strap iron, the hanger assembly shall be modified by the manufacturer with an eye on top of the box and on the bottom of the spring hanger rod to allow for bolting to the hanger straps.

D. Acceptable Manufacturers

1. Amber/Booth Company, Inc.

2. Kinetics Noise Control
3. Mason Industries
4. Vibro-Acoustics
5. Vibration Eliminator Co., Inc.
6. Vibration Mountings & Controls, Inc.
7. Twin City Hose
8. Patterson
9. Acrefine

2.7 THRUST RESTRAINTS FOR DUCTWORK

A. When total air thrust exceeds 10% of the isolated weight, floor mounted or suspended air handling equipment shall be protected against excessive displacement by the use of horizontal thrust restraints.

B. The restraint shall consist of a modified base mounted, free standing, spring isolator.

C. Restraint springs shall have the same deflection as the isolator springs. The assembly shall be pre-set at the factory and fine tuned in the field to allow for a maximum of 1/4" movement from stop to maximum thrust.

D. The assemblies shall be furnished with rod and angle brackets for attachment to both the equipment and duct work or the equipment and the structure. Restraints shall be attached at the center line of thrust and symmetrically on both sides of the unit.

2.8 STEEL BASES

A. Steel Beam Box Style Base

1. Vibration isolation manufacturer shall furnish integral structural steel bases for equipment not supplied with manufacturer’s base. Rectangular bases are preferred for all equipment.
2. Centrifugal refrigeration machines and pump bases may be T or L shaped.
3. Pump bases for split case pumps shall be large enough to support suction and discharge elbows.
4. All perimeter members shall be steel beams with a minimum depth equal to 1/10 of the longest dimension of the base. Base depth need not exceed 14" provided that the deflection and misalignment is kept within acceptable limits as determined by the manufacturer.
5. Height saving brackets shall be employed in all mounting locations to provide a base clearance of 1".

B. Steel Beam Base RailsVibration isolation manufacturer shall provide steel members welded to height saving brackets to cradle equipment having legs or bases that do not require a complete supplementary base.Members shall have sufficient rigidity to prevent distortion of equipment.Steel Beam Concrete Filled Base

1. Vibration isolation manufacturer shall furnish rectangular steel concrete pouring forms for floating concrete bases.
2. Bases for split case pumps shall be large enough to provide support for suction and discharge elbows.
3. Bases shall be a minimum of 1/12 of the longest dimension of the base but not less than 6". The base depth need not exceed 12" unless specifically recommended by the base manufacturer for mass or rigidity.
4. Forms shall include minimum concrete reinforcing consisting of 1/2" bars welded in place on 6" centers running both ways in a layer 1-1/2" above the bottom. Forms shall be furnished

with steel templates to hold the anchor bolt sleeves and anchor bolts while concrete is being poured.

5. Height saving brackets shall be employed in all mounting locations to maintain a 1" clearance below the base.
6. Wooden formed bases leaving a concrete rather than a steel finish are not acceptable.

D. Acceptable Manufacturers

1. Amber/Booth Company, Inc.
2. Kinetics Noise Control
3. Mason Industries
4. Vibro-Acoustics
5. Vibration Eliminator Co., Inc.
6. Vibration Mountings & Controls, Inc
7. Twin City Hose
8. Patterson
9. Acrefine

2.9 VIBRATION ISOLATION ROOF CURB

A. Curb mounted rooftop equipment shall be mounted on vibration isolation bases that fit over the roof curb and under the isolated equipment. The extruded aluminum top member shall overlap the bottom to provide water runoff independent of the seal. Aluminum members shall house electro galvanized or powder coated springs selected for 0.75"(20mm) minimum deflection. Travel to solid shall be 1.5"(40mm) minimum. Spring diameters shall be no less than 0.8 of the spring height at rated load. Wind resistance shall be provided by means of resilient snubbers in the corners with a minimum clearance of 1/4"(6mm) so as not to interfere with the spring action except in high winds. Manufacturer's self adhering closed cell sponge gasketing must be used both above and below the base and a flexible EPDM duct like connection shall seal the outside perimeter. Foam or other sliding or shear seals are unacceptable in lieu of the EPDM duct-like closure. Submittals shall include spring deflections, spring diameters, compressed spring height and solid spring height as well as seal and wind resistance details. Curb mounted bases shall be Type CMAB as manufactured by Mason Industries, Inc.

B. Curb mounted rooftop equipment shall be mounted on spring isolation curbs. The lower member shall consist of a sheet metal Z section containing adjustable and removable steel springs that support the upper floating section. The upper frame must provide continuous support for the equipment and must be captive so as to resiliently resist wind forces. All directional neoprene snubber bushings shall be a minimum of 1/4"(6mm) thick. Steel springs shall be laterally stable and rest on 1/4"(6mm) thick neoprene acoustical pads. Hardware must be plated and the springs provided with a rust resistant finish. The curbs waterproofing shall consist of a continuous galvanized flexible counter flashing nailed over the lower curb’s waterproofing and joined at the corners by EPDM bellows. All spring locations shall have access ports with removable waterproof covers. Lower curbs shall have provision for 2"(50mm) of insulation. Curb shall be type RSC as manufactured by Mason Industries, Inc.

2.10 FLEXIBLE EXPANSION LOOP

A. Provide flexible expansion loops of size and type noted on drawings.

B. Flexible loops shall consist of two (2) flexible sections of hose and braid, two (2) 90° elbows, and a 180° return assembled in such a way that the piping does not change direction, but maintains its course along a single axis.

C. Flexible loops shall have a factory supplied, center support nut located at the bottom of the 180°

return, and a drain/air release plug.

D. Flexible loops shall impart no thrust loads to system support anchors or building structure. Loops shall be installed in a neutral, pre-compressed or pre-extended condition as required for the application.

E. For steam service, loops must be installed with flexible legs horizontal to prevent condensate buildup.

F. Install and guide per manufacturer's recommendations.

G. Materials of construction and end fitting type shall be consistent with pipe material and equipment/ pipe connection fittings.

H. For natural gas service, connectors shall be A.G.A. certified.

I. For potable water service, connectors shall be UL classified in accordance with ANSI/NSF 61-1977 standards.

1. Acceptable Manufacturers:

a. Metraflex Metralop or prior approved equal.

2.11 PIPE EXPANSION JOINTS

A. Pipe Expansion Joints (Rubber Type)

1. Rubber expansion joints shall be peroxide cured EPDM throughout with Kevlar tire cord reinforcement. Substitutions must have certifiable equal or superior characteristics. The raised face rubber flanges must encase solid steel rings to prevent pull out. Flexible cable wire is not acceptable.

2. Sizes 1-1/2" through 14" shall have a ductile iron external ring between the two (2) spheres. Sizes 16" through 24" may be single sphere. Sizes 3/4" through 2" may have one sphere, bolted threaded flange assemblies and cable retention.

a. Minimum ratings through 14" shall be 250psi at 170°F and 215psi at 250°F, 16" through 24" 180psi at 170°F and 150psi at 250°F. Higher published rated connectors may be used where required.

b. Safety factors shall be a minimum of 3/1. All expansion joints must be factory tested to 150% of maximum pressure for 12 minutes before shipment.

c. The piping gap shall be equal to the length of the expansion joint under pressure. Control rods passing through 1/2" thick Neoprene washer bushings large enough to take the thrust at 1000psi of surface area may be used on unanchored piping where the manufacturer determines the condition exceeds the expansion joint rating without them.

d. Submittals shall include two test reports by independent consultants showing minimum reductions of 20 DB in vibration accelerations and 10 DB in sound pressure levels at typical blade passage frequencies on this or a similar product by the same manufacturer. All expansion joints shall be installed on the equipment side of the shut off valves.

B. Pipe Expansion Joints (Stainless Steel)

1. Flexible stainless steel hose shall have stainless steel braid and carbon steel fittings. Sizes 3" and larger shall be flanged. Smaller sizes may have male nipples.

2. Minimum lengths shall be as follows:

Flanged

3” x 18” (75 x 300mm)	6” x 24” (150 x 450mm)	12” x 36” (300 x 600mm)
4” x 18” (100 x 300mm)	8” x 24” (200 x 450mm)	14” x 36” (350 x 750mm)
5” x 24” (125 x 450mm)	10” x 24” (250 x 450mm)	16” x 36” (400 x 800mm)

3. A

Male Nipples		
1/2" x 12" (12 x 300mm)	1-1/4" x 12" (32 x 300mm)	2" x 12" (50 x 300mm)
3/4" x 12" (19 x 300mm)	1-1/2"x 12" (38 x 300mm)	2-1/2" x 12" (64 x 450mm)
1" x 12" (25 x 300mm)		

quipment, hoses shall be installed on the equipment side of the shut-off valves horizontal and parallel to the equipment shafts wherever possible.

C. Miscellaneous Piping Supports

1. Pipe Alignment Guide (Spider Type):
   a. Primary and intermediate guides shall be of the radial type employing a heavy wall guide cylinder with weld down or bolt down anchor base.
   b. A two section guide spider, having 1/8" maximum diametrical clearance with guide cylinder inside diameter, bolted or welded tight to the carrier pipe which slides through the guide cylinder I.D. Cylinder shall be of sufficient size to clear pipe insulation and long enough to prevent over travel of the spider.
2. Pipe Alignment Guide (Slide Type):
   a. Primary and intermediate guides shall be of the sliding type. Two piece construction employing a sliding member to be welded to the carrier pipe and a weld down or bolt down anchor base.
   b. Sliding member shall be of sufficient height to clear pipe insulation and long enough to prevent over travel of the slide. Load bearing surfaces shall be Teflon to Teflon (T/T-standard), Teflon to Stainless (T/S), or Graphite to Graphite (G/G) as required for the application.
3. Style RG – Riser Pipe Alignment Guide (Glide Type):
   a. Primary guides shall be of the vertical sliding type. Guides to be used in all building riser, piping systems in conjunction with the Metraflex HPL series compensators (specification #35).
   b. Glide series floor and ceiling pipe guides to be installed in pairs, at the floor and ceiling penetrations, and require no additional intermediate guides. Two piece construction employing a sliding member to be welded to the carrier pipe and a bolt down anchor base. Sliding member shall be of sufficient height to clear pipe insulation and long enough to prevent over travel of the slide. Stationary member shall consist of a steel mounting bracket, containing an isolating slide bearing to prevent the transmission of vibration and mechanically transmitted sound to the building structure.
   c. Riser pipe alignment guides shall be style “RG” as manufactured by The Metraflex

Company®, Chicago, IL.

4. Split Seals consist of pipe halves with minimum 3/4" thick neoprene sponge cemented to the inner faces. The seal shall be tightened around the pipe to eliminate clearance between the inner sponge face and the piping. Concrete may be packed around the seal to make it integral with the floor, wall or ceiling if the seal is not in place prior to the construction of the building member. Seals shall project a minimum of 1" past either face of the wall. Where temperatures exceed 240°F, 10 lb. density fiberglass may be used in lieu of the sponge.
5. All-directional acoustical pipe anchors, consist of two (2) sizes of steel tubing separated by a minimum 1/2" thickness of 60 duro or softer neoprene. Vertical restraint shall be provided by similar material arranged to prevent up or down vertical travel. Allowable loads on the isolation material shall not exceed 500 psi and the design shall be balanced for equal resistance in any direction.
6. Pipe guides shall consist of a telescopic arrangement of two (2) sizes of steel tubing separated by a minimum 1/2" thickness of 60 durometer or softer neoprene. The height of the guides shall be preset with a shear pin to allow vertical motion due to pipe expansion or contraction. Guides shall be capable of 1-5/8" motion, or to meet location requirements.
7. The first four (4) pipe hangers in the main lines near the mechanical equipment or as shown on plan shall be isolated. The first four (4) isolators from the isolated equipment shall have the same static deflection as specified for the mountings under the connected equipment. If piping is connected to equipment located in basements and hangs from ceilings under occupied spaces the first four (4) hangers shall have 0.75" deflection for pipe sizes up to and including 3", 1-1/2" deflection for pipe sizes over 3" and up to and including 6", and 2-1/2" deflection thereafter.
9. Where piping connects to mechanical equipment install expansion joints or stainless hoses.
10. All vertical risers shall be supported by spring isolators designed to support the riser filled with water, if it is a water line. Assigned loads must be within the building design limits at the support points. Neutral central resilient anchors close to the center of the run shall direct movement up and down. The anchors shall be capable of holding an upward force equal to the water weight when the system is drained. If one (1) level cannot accommodate this force, anchors can be located on two (2) or three (3) adjacent floors. Resilient guides shall be spaced and sized properly depending on the pipe diameter. Submittals must include the initial load, initial deflection, change in deflection, final load and change in load at all spring and anchor support locations, as well as guide spacing. The initial spring deflection shall be a minimum of 0.75"(20mm) or four (4) times the thermal movement at the isolator location, whichever is greater. Calculations shall include pipe stress at end conditions and branch off locations and the manufacturer must include installation instructions. Submittal must be stamped and signed by a licensed professional engineer in the employ of the vibration vendor for at least five (5) years. Proper provision shall be made for seismic protection in seismic zones. The isolator manufacturer shall be the same firm supplying the mechanical contract. Support spring mountings shall be Specification B, anchors Specification R, telescoping guides Specifications.
11. All air ducts with a cross section of $2ft^2$ ($0.19m^2$) or larger shall be isolated from the building structure by specification H hangers or B floor supports with a minimum deflection of 0.75" (20mm). Isolators shall continue for 50’ (15m) from the equipment. If air velocity exceeds 1000 fpm (5.3 mps), hangers or supports shall continue for an additional 50' (15m) or as shown on the drawings.

D. Acceptable Manufacturers

1. Amber/Booth Company, Inc.
2. Kinetics Noise Control

3. Mason Industries
4. Vibro-Acoustics
5. Vibration Eliminator Co., Inc.
6. Vibration Mountings & Controls, Inc.
7. Twin City Hose
8. Patterson
9. Acrefine

PART 3 - EXECUTION

3.1 GENERAL

A. All vibration isolators must be installed in strict accordance with the manufacturers written instructions and all certified submittal data.

B. Installation of vibration isolators must not cause any change of position of equipment, piping, or duct work resulting in stresses or misalignment.

C. No rigid connections between equipment and the building structure shall be made that degrades the noise and vibration control system herein specified.

D. The contractor shall not install any equipment, piping, duct or conduit which makes rigid connections with the building unless isolation is not specified. “Building” includes but is not limited to slabs, beams, columns, studs and walls.

E. Coordinate work with other trades to avoid rigid contact with the building.

F. Any conflicts with other trades which will result in rigid contact with equipment or piping due to inadequate space or other unforeseen conditions should be brought to the architects/engineers attention prior to installation. Corrective work necessitated by conflicts after installation shall be at the responsible contractor’s expense.

G. Bring to the architects/engineers attention any discrepancies between the specifications and the field conditions or changes required due to specific equipment selection, prior to installation. Corrective work necessitated by discrepancies after installation shall be at the responsible contractor’s expense.

H. Correct, at no additional cost, all installations which are deemed defective in workmanship and materials at the contractor’s expense.

I. Where piping passes through walls, floors or ceilings the vibration isolation manufacturer shall provide seals.

J. Locate isolation hangers as near to the overhead support structure as possible.

K. Air handling equipment and centrifugal fans shall be protected against excessive displacement which results from high air thrust when thrust forces exceed 10% of the equipment weight.

L. Rooftop equipment isolators must be bolted to the equipment and structure. Mountings must be designed to resist 100m/h wind loads.

END OF SECTION

SECTION 23 05 53
MECHANICAL IDENTIFICATION

PART 1 - GENERAL

1.1 SCOPE

A. Perform all Work required to provide and install the following Equipment Identification indicated by the Contract Documents with supplementary items necessary for proper installation.

B. Items to be labeled

1. Plumbing and Piping Valves
2. Piping
3. Equipment (Including but not limited to the following)
    a. Air Handling Units (AHU, RTU, ERU, Blower Coil, Makeup Air Units)
    b. Fans
    c. Terminal Devices (TAB, Heat Pumps, Fan Coil, Cabinet Heater, Unit Heater)
    d. Pumps
    e. Heat Exchangers
    f. Condensing Units
    g. Dedicated equipment control panels (sump pumps, sewage ejectors, radiant infloor heat zones)
4. Variable Frequency Drives
5. Thermostats
6. Fire, Smoke and Fire / Smoke Dampers

1.2 REFERENCES

A. ANSI A13.1 - Scheme for Identification of Piping Systems.

1.3 SUBMITTALS

A. Product Data

1. Manufacturer’s catalog sheets and specifications for mechanical identification materials.
2. Installation instructions.
3. Schedule indicating what type of materials will be used for various equipment, valves, piping, and devices.

PART 2 - PRODUCTS

2.1 EQUIPMENT TAGS

A. Aluminum Nameplates: Black enamel background with natural aluminum border and engraved letters furnished with two mounting holes and screws.

B. Plastic Tags: 1/16” thick, UV resistant phenolic plastic. Minimum 1-1/2" square or round laminated with engraved, 1/4" minimum black letters on light contrasting background.

C. Tags shall be black with white lettering.

D. Lettering: Lettering shall be supplier’s normal font, minimum 1” high

2.2 VALVE TAGS

A. Brass Tags: 1-1/2” Round 19 gauge brass tags with 1/4” minimum engraved letters.

B. Plastic Tags: 1/16” thick, UV resistant phenolic plastic. 1-1/2” round laminated with engraved, 1/4" minimum black letters on light contrasting background.

C. Tags shall be brass or white with solid black lettering.

D. Provide with brass ball chain or plastic zip connectors to attach tag to valve

2.3 PIPE MARKERS AND ACCESSORIES

A. Snap-on Marker: One (1) piece wrap around type constructed of pre-coiled acrylic plastic with clear polyester coating, integral flow arrows, legend printed in alternating directions, 3/4 inch adhesive strip on inside edge, and 360 degree visibility.

B. Strap-On Marker: Strip type constructed of pre-coiled acrylic plastic with clear polyester coating, integral flow arrows, legend printed in alternating directions, factory applied grommets, and pair of stainless steel spring fasteners.

C. Stick-On Marker: Pressure sensitive adhesive backed type constructed of vinyl with clear polyester coating, and integral flow arrows for applications where flow arrow banding tape is not being used.

D. Underground Marker: 6” wide, thickness depends on type. Detectable or non-detectable is acceptable. Provide detectable type for non-metallic piping such as plastic gas, water main, or underground PVC piping.

E. Pipe Marker Legend and Color Field Sizes:

OUTSIDE DIAMETER OF PIPE OR INSULATION (Inches)	LETTER SIZE (Inches)	LENGTH OF COLOR FIELD (Inches)
3/4 to 1-1/4	1/2	8
1-1/2 to 2	3/4	8
2-1/2 to 6	1-1/4	12
8 to 10	2-1/2	24
Over 10	3-1/2	32

F. Banding Tapes: Pressure sensitive adhesive backed type constructed of vinyl with clear polyester coating.

1. Plain Tape: Unprinted type; color to match pipe marker background.
2. Flow Arrow Tape: Printed type with integral flow arrows; color to match pipe marker background.

G. Pipe Size Labels: Pressure sensitive adhesive backed type constructed of vinyl with clear polyester coating, vertical reading pipe size in inches, and legend size matching adjacent pipe marker.

PART 3 - EXECUTION

3.1 PREPARATION

A. Complete testing, insulation and finish painting work prior to completing the Work of this Section.

B. Clean pipe surfaces with cleaning solvents prior to installing piping identification.

C. Remove dust from insulation surfaces with clean cloths prior to installing piping identification.

3.2 PIPING IDENTIFICATION

A. Install the Work of this Section in accordance with the manufacturer's printed installation instructions, unless otherwise specified.

B. Stick-On Pipe Markers:

1. Install minimum of two (2) markers at each specified location, 90 degrees apart on visible side of pipe.

2. Encircle ends of pipe markers around pipe or insulation with banding tape with one inch lap. Use plain banding tape on markers with integral flow arrows, and flow arrow banding tape on markers without integral flow arrows.

C. Pipe Size Labels: Install labels adjacent to each pipe marker and upstream from flow arrow. Install a minimum of two (2) pipe size labels at each specified location, 90 degrees apart on visible side of pipe.

D. Underground Pipe Markers: Install 8-12" above buried piping. Install along entire length of pipe.

3.3 PIPING IDENTIFICATION SCHEDULE

A. Piping Identification Types

Piping:	Field Color:	Lettering Color:
Domestic Water	Green	White
Sanitary, Vent, Condensate, Drain	Green	White
Storm	Green	White
Refrigerant Piping	Yellow	Black
Natural Gas	Yellow	Black
Sprinkler-Fire	Red	White

B. Locate piping identification as follows:

1. Locate piping identification at valve locations; at points where piping enters and leaves a partition, wall, floor or ceiling, and at intervals of 20 feet on straight runs.

2. Where two (2) or more pipes run in parallel, place printed legend and other markers in same relative location.

3.4 EQUIPMENT IDENTIFICATION

A. Install engraved tags on equipment using metal rivets or stainless steel sheet metal screws with a pan head. For indoor equipment, industrial strength double-sided tape is acceptable if rivets or screws cannot be used. Install label on most visible side of equipment. Place identification along center line of equipment, if possible.

B. Label all mechanical equipment using the same callout as used on the drawings, by means of engraved tags.

C. Label all fire, fire/smoke, and smoke dampers with adhesive labels or permanent nameplates. Labels shall read "Fire Damper", "Fire/Smoke Damper", or "Smoke Damper" to match damper type.

D. Do not label equipment in exposed public spaces, e.g. cabinet unit heaters, diffusers, louvers, etc.

E. Label hidden equipment such as sump pumps on the control panel or disconnect if it does not make sense to label the equipment itself.

F. Label thermostats with the corresponding terminal air box or equipment served.

3.5 VALVE TAGS

A. Valve tags shall be engraved with the following information:
   1. Service Abbreviation
   2. Valve number

B. Service Abbreviation shall match piping nomenclature used on Drawings.

C. Attach tags to valves, not valve handles or wheels.

D. Trim excess from connecting strip or chain.

E. Valve Schedule
   1. Provide a valve schedule that lists all valves not installed for individual plumbing fixtures. Valve schedule shall list the following information in order: service, tag number, size, usage (shut-off, balancing, control, etc.), name and number or room location, normally open or closed, pressure rating, manufacturer, model number, and installation date.
   2. Provide three (3) laminated hard copies and one (1) electronic copy in .pdf format. Hard copies shall be clearly legible and a minimum of 11” x 17”.
   3. Mount one (1) of the hard copies in a solid metal frame in a location designated by the Owner.

3.6 SPECIAL CONDITIONS

A. Additional labels shall be installed at the request of the Engineer/Owner.

END OF SECTION

SECTION 23 05 93
CLEANING AND TESTING

PART 1 - GENERAL

1.1 SCOPE

A. Cleaning of systems to remove construction debris and prepare for testing and operation.

B. Perform testing on systems and equipment to confirm they can withstand normal operating and design conditions as outlined in various equipment sections.

C. Equipment Included in This Section

1. Refrigerant piping
2. Natural gas piping
3. Domestic water piping

1.2 REFERENCES

A. Balancing of Systems: Section 230594.

1.3 SUBMITTALS

A. Quality Control Submittals

1. Submit Field Test Reports for all systems to be tested.

1.4 QUALITY ASSURANCE

A. Regulatory Requirements

1. Perform factory testing of factory fabricated equipment in complete accordance with the agencies having jurisdiction.
2. Perform field testing of piping systems in complete accordance with the local utilities and other agencies having jurisdiction and as specified.

1.5 PROJECT CONDITIONS

A. Protection: During test Work, protect controls, gages and accessories which are not designed to withstand test pressures. Do not utilize permanently installed gauges for field testing of systems.

1.6 SEQUENCING AND SCHEDULING

A. Transmit written notification of proposed date and time of operational tests to the Architect / Engineer at least five (5) days in advance of such tests.

B. Perform cleaning and testing Work in the presence of the Owner's Representative.

C. Pressure test piping systems inside buildings, at the roughing-in stage of installation, before piping is enclosed by construction Work, and at other times as directed. Perform test operations in sections as required and directed, to progress the Work in a satisfactory manner and not delay the general construction of the building. Valve or cap-off sections of piping to be tested, utilizing valves required to be installed in the permanent piping systems or temporary valves or caps as required to perform the Work.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Test Equipment and Instruments: Type and kind as required for the particular system under test.

B. Test Media (air, gas, refrigerant, dry nitrogen, vacuum, water): As specified for the particular piping or system under test.

C. Cleaning Agent (chemical solution, steam, water): As specified for the particular piping, apparatus or system being cleaned.

D. Propylene Glycol: Permanent type anti-freeze solution as manufactured by Dow Chemical Co. or Union Carbide.

PART 3 - EXECUTION

3.1 PRELIMINARY WORK

A. Thoroughly clean pipe and tubing prior to installation. During installation, prevent foreign matter from entering systems. Prevent if possible and remove stoppages or obstructions from piping and systems.

B. Thoroughly clean compressed air, control air, refrigerant pipe and similar systems prior to pressure or vacuum testing.

1. Refrigerant Piping

a. Only use factory sealed refrigerant piping.

b. Crimp and braze caps on ends of previously cleaned piping at the end of the day if piping was cut.

c. When brazing, purge lines with dry nitrogen.

3.2 PRESSURE TESTING OF PIPING

A. Piping shall be tight under test and shall not show loss in pressure or visible leaks, during test operations or after the minimum duration of time as specified. Remove piping which is not tight under test; remake joints and repeat test until no leaks occur.

B. Water Systems

1. Domestic water (potable cold, domestic hot and recirculation) inside buildings:

a. Before fixtures, faucets, trim and accessories are connected, perform hydrostatic test at 125 psig minimum for four (4) hours.

b. After fixtures, faucets, trim and accessories are connected, perform hydrostatic retest at 75 psig for four (4) hours.

2. Circulating water systems, including propylene glycol solution systems and cold water make-up piping connections to heating, ventilating, air conditioning and refrigeration systems, unless otherwise specified:

a. Before final connections are made perform hydrostatic test at 1-1/2 times the maximum working pressure, but not less than 125 psig, for four (4) hours.

b. After final connections are made perform hydrostatic retest at a pressure equal to maximum operating system design pressure, but not less than 30 psig, for four (4) hours.

C. Gas Piping: Before backfilling or concealment perform air test of duration and pressure as required by the local gas company. However, for gas piping designed for pressures of from 4 inches to 6 inches water column, air test at 15 inches Hg for one (1) hour, without drop in pressure. Test gas piping with air only. Check joints for leaks with soap suds.

3.3 TESTING OF EQUIPMENT, APPARATUS AND APPURTENANCES

A. Low Pressure Steam Boilers: Perform hydrostatic test at 15 psig after installation with all piping connections shut-off.

B. Hot Water Boilers: Perform hydrostatic test at 30 psig, after installation, with piping connections shut-off.

C. Relief Valves: Increase pressure in equipment or apparatus to relief valve setting, to test opening of valves at required relief pressures.

3.4 REFRIGERATION SYSTEMS – TESTING, DEHYDRATION AND CHARGING

A. Leak Test Procedure

1. Refrigerant Piping Systems

a. Pressurize with dry nitrogen to 50 psig and test for leaks using a bubble type solution.

b. Release this partial test pressure and correct deficiencies.

c. Charge system with a trace of refrigerant to 15 psig, then add dry nitrogen until system test pressures are reached and retest for leaks with an electronic leak detector.

d. Release pressure, repair leaks and retest as necessary until no leaks occur.

e. Recover refrigerant used for leak testing.

2. System Test Pressures

a. Charge system with dry nitrogen and trace of refrigerant (HFC 134A, HFC 407C, or HFC 410A) to 350 psig and retest for leaks with an electronic leak detector. The system must stay at 350 psig pressure for 24 hours to pass the system test pressure test.

b. Release pressure, repair leaks and retest as necessary until no leaks occur.

c. Recover refrigerant used for leak testing.

B. Dehydration

1. Low and Ultra Low Temperature Refrigeration Systems (-30° F to 32° F):

a. Following pressure tests dehydrate each system with a vacuum pump.

b. Draw and hold an initial vacuum of 800 microns. Break this vacuum by pressurizing with dry nitrogen to 10 psig, and change oil in vacuum pump.

c. Draw and hold a second vacuum of 500 microns. Break this vacuum by pressurizing with dry nitrogen to 10 psig, and change oil in vacuum pump.

d. Draw and hold a third vacuum of 250 microns for eight (8) to twelve (12) hours with an allowable maximum rise of 50 microns. Break this third vacuum by adding liquid refrigerant specified for the equipment to the high side of the system (liquid line).

e. Verify vacuum obtained with an electronic vacuum gauge.

2. Medium Temperature Refrigeration Systems (33° F to 55° F), and Air Conditioning Systems:

a. Following pressure tests dehydrate each system with a vacuum pump.

b. Draw and hold an initial vacuum of 500 microns. Break this vacuum by pressurizing with dry nitrogen to 10 psig, and change oil in vacuum pump.

c. Draw and hold a second vacuum of 500 microns. Break this vacuum by pressurizing with dry nitrogen to 10 psig, and change oil in vacuum pump.

d. Verify vacuum obtained with an electronic vacuum gauge.

C. Refrigerant Charging: Follow equipment manufacturer's printed charging directions unless otherwise specified.

1. Introduce refrigerant of type and quantity required through a filter/drier installed in the temporary charging line.

a. Purge small amount of liquid out of the system side of the charging hose.

b. Prevent moisture and other contaminants from entering the system.

2. Charge liquid refrigerant through a charging valve provided in the high pressure side of the system.

a. Small amounts of gaseous refrigerant may be charged through the compressor suction service valve port.

3. No bubbles shall appear at the moisture-liquid indicator when the system is fully charged and operational. Do not overcharge.

4. Record the weight in pounds of refrigerant charged into each system and submit this record to the Director's Representative.

D. Compressor Oil Charge: Pump oil into the compressor after the last vacuum has been preformed. Follow all Manufactures Recommended for oil type and amount to be installed.

E. Adjustments and Operational Testing

1. Adjustments: Place the system in operation with automatic controls functioning. Adjust controls and apparatus for proper operation. Test thermometers and gauges for accuracy over the entire range. Remove and replace items found defective.

a. Check belts, fan blades, fittings, TXV bulbs, and electrical connections for tightness before start up.

b. Check TXV bulb for proper location should be between 8 and 10 o'clock or 2 & 4 o'clock.

c. Seal off all holes in the condition space as specified.

d. Provide a point to point control check of the system to ensure that the specified inputs and outputs are receiving the signal from the proper sensors or controlling the proper device.

e. Set pressure controls and safety controls.

f. Close or de-energize all solenoids, and start up the system.

g. Check that all controls and safety switches are operating properly.

h. Adjust TXV for proper super heat back to the compressors.

i. Clean TXV strainers as many times as required.

j. After one (1) week of run time, change the liquid cores if they are the replaceable type.

k. After one (1) month of run time, replace the liquid cores and compressor suction socks. Replace the liquid cores as required. Clean the TXV's as required.

3.5 DISINFECTION OF POTABLE WATER SYSTEMS

A. Disinfect potable water pipe and equipment installed in the Work of this Contract.

1. Completely fill the piping, including water storage equipment if installed, with a water solution containing 50 mg/L available chlorine, and allow stand for twenty-four (24) hours.

2. Operate all valves during this period to assure their proper disinfection.

3. After the retention period, discharge the solution to an approved waste and flush the system thoroughly with water until substantially all traces of chlorine are removed.

4. Drain and flush water storage equipment if installed.

B. Connect plumbing fixtures and equipment and place the system into service. Prevent recontamination of the piping during this phase of the Work.

END OF SECTION

SECTION 23 05 94
TESTING ADJUSTING AND BALANCING

PART 1 - GENERAL

1.1 SCOPE

A. Perform all Work required for complete Testing, Adjusting and Balancing of the systems as indicated by the Contract Documents with supplementary items necessary for proper system operation.

B. Equipment included in This Section

1. Air Handling Equipment
    a. Air handling units
    b. Exhaust fans
    c. Air inlets and outlets
2. Plumbing Equipment
    a. Hot water circulation pump
    b. Hot water circulation branch balancing valves

1.2 SUBMITTALS

A. Certified TAB reports

1.3 QUALITY ASSURANCES

A. TAB Contractor Qualifications: Engage a TAB entity certified by AABC, NEBB, or TABB.

1. TAB Field Supervisor: Employee of the TAB contractor and certified by AABC, NEBB, or TABB.
2. TAB Technician: Employee of the TAB contractor and who is certified by AABC, NEBB, or TABB as a TAB technician.

1.4 DEFINITIONS

A. AABC: Associated Air Balance Council.

B. NEBB: National Environmental Balancing Bureau.

C. TAB: Testing, adjusting, and balancing.

D. TABB: Testing, Adjusting, and Balancing Bureau.

E. TAB Specialist: An entity engaged to perform TAB Work.

1.5 PROJECT CONDITION

A. Partial Owner Occupancy: Owner may occupy completed areas of building before Substantial Completion. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations

1.6 COORDINATION

A. Notice: Provide seven (7) days advance notice for each test. Include scheduled test dates and times.

B. Perform TAB after leakage and pressure tests on air and water distribution systems have been satisfactorily completed.

1.7 TOLERANCES

A. Set HVAC system's air flow rates and water flow rates within the following tolerances:

1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus or minus 10 percent

2. Air Outlets and Inlets: Plus or minus 10 percent
3. Heating-Water Flow Rate: Plus or minus 10 percent
4. Cooling-Water Flow Rate: Plus or minus 10 percent

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.1 TAB SPECIALISTS

A. Subject to compliance with requirements, engage one (1) of the following
1. Precision Facility Solutions
2. System Management and Balance
3. System Works

3.2 EXAMINATION

A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems' designs that may preclude proper TAB of systems and equipment.

B. Examine systems for installed balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Verify that locations of these balancing devices are accessible.

C. Examine the approved submittals for HVAC systems and equipment.

D. Examine design data including HVAC system descriptions, statements of design assumptions for environmental conditions and systems' output, and statements of philosophies and assumptions about HVAC system and equipment controls.

E. Examine ceiling plenums and underfloor air plenums used for supply, return, or relief air to verify that they meet the leakage class of connected ducts as specified in Division 23 Section "Metal Ductwork" and are properly separated from adjacent areas. Verify that penetrations in plenum walls are sealed and fire-stopped if required.

F. Examine equipment performance data including fan and pump curves.
1. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.
2. Calculate system-effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from the conditions used to rate equipment performance. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," or in SMACNA's "HVAC Systems - Duct Design". Compare results with the design data and installed conditions.

G. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.

H. Examine test reports specified in individual system and equipment Sections.

I. Examine HVAC equipment and filters and verify that bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.

J. Examine terminal units, such as variable-air-volume boxes, and verify that they are accessible and their controls are connected and functioning.

K. Examine strainers. Verify that startup screens are replaced by permanent screens with indicated perforations.

L. Examine three-way valves for proper installation for their intended function of diverting or mixing fluid flows.

M. Examine heat-transfer coils for correct piping connections and for clean and straight fins.

N. Examine system pumps to ensure absence of entrained air in the suction piping.

O. Examine operating safety interlocks and controls on HVAC equipment.

P. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.3 PREPARATION

A. Prepare a TAB plan that includes strategies and step-by-step procedures.

B. Complete system-readiness checks and prepare reports. Verify the following:

1. Permanent electrical-power wiring is complete.
2. Hydronic systems are filled, clean, and free of air.
3. Automatic temperature-control systems are operational.
4. Equipment and duct access doors are securely closed.
5. Balance, smoke, and fire dampers are open.
6. Isolating and balancing valves are open and control valves are operational.
7. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.
8. Windows and doors can be closed so indicated conditions for system operations can be met.

3.4 GENERAL PROCEDURES FOR TESTING AND BALANCING

A. Perform testing and balancing procedures on each system according to the procedures contained in this specification and one of the following:

1. AABC's "National Standards for Total System Balance"
2. ASHRAE 111
3. NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems"
4. SMACNA's "HVAC Systems - Testing, Adjusting, and Balancing"

B. Comply with requirements of the adopted version of ASHRAE 62.1, Section on balancing.

C. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary for TAB procedures.

1. After testing and balancing, patch probe holes in ducts with same material and thickness as used to construct ducts.

2. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish according to Division 23 Section "HVAC Insulation".

D. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.

E. Take and report testing and balancing measurements in inch-pound (IP).

3.5 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.

B. For variable-air-volume systems, develop a plan to simulate diversity.

C. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.

D. Check airflow patterns from the outdoor-air louvers and dampers and the return- and exhaust-air dampers through the supply-fan discharge and mixing dampers.

E. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.

F. Verify that motor starters are equipped with properly sized thermal protection.

G. Check dampers for proper position to achieve desired airflow path.

H. Check for airflow blockages.

I. Check condensate drains for proper connections and functioning.

J. Check for proper sealing of air-handling-unit components.

K. Verify that air duct system is sealed as specified in Division 23 Section "Metal Ductwork."

3.6 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.

1. Measure total airflow.

2. Where sufficient space in ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow

3. Measure fan static pressures as follows to determine actual static pressure:

4. Measure outlet static pressure as far downstream from the fan as practical and upstream from restrictions in ducts such as elbows and transitions.

5. Measure static pressure a few feet downstream of a fan or in a location that will avoid turbulent or unrepeatable performance.

6. Measure inlet static pressure of single-inlet fans in the inlet duct as near the fan as possible, upstream from the flexible connection, and downstream from duct restrictions.

7. Measure inlet static pressure of double-inlet fans through the wall of the plenum that houses the fan.

8. Measure static pressure across each component that makes up an air-handling unit, rooftop unit, and other air-handling and -treating equipment.

9. Report the cleanliness status of filters and the time static pressures are measured.

10. Measure static pressures entering and leaving other devices, such as sound traps, heat-recovery equipment, and air washers, under final balanced conditions.

11. Balancer can adjust fan speeds 15% higher or lower than speed indicated in the approved shop drawing to meet the required capacity. If a fan needs to operate outside

these parameters to meet the capacity requirements, balancer to contact the Engineer for approval. Comply with requirements in Division 23 Sections for air-handling units for adjustment of fans, belts, and pulley sizes to achieve indicated air-handling-unit performance

12. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload will occur. Measure amperage in full-cooling, full-heating, economizer, and any other operating mode to determine the maximum required brake horsepower.

B. Adjust volume dampers for main duct, sub-main ducts, and major branch ducts to indicated airflows within specified tolerances.

1. Measure airflow of sub-main and branch ducts.
2. Where sufficient space in sub-main and branch ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow for that zone.
3. Measure static pressure at a point downstream from the balancing damper, and adjust volume dampers until the proper static pressure is achieved.
4. Re-measure each sub-main and branch duct after all have been adjusted. Continue to adjust sub-main and branch ducts to indicated airflows within specified tolerances.

C. Measure air outlets and inlets without making adjustments.

1. Measure terminal outlets using a direct-reading hood or outlet manufacturer's written instructions and calculating factors.

D. Adjust air outlets and inlets for each space to indicated airflows within specified tolerances of indicated values. Make adjustments using branch volume dampers rather than extractors and the dampers at air terminals.

1. Adjust each outlet in same room or space to within specified tolerances of indicated quantities without generating noise levels above the limitations prescribed by the Contract Documents.
2. Adjust patterns of adjustable outlets for proper distribution without drafts.

3.7 PROCEDURES FOR MOTORS

A. Motors, 1/2 HP and Larger: Test at final balanced conditions and record the following data:

1. Manufacturer's name, model number, and serial number.
2. Motor horsepower rating.
3. Motor rpm.
4. Efficiency rating.
5. Nameplate and measured voltage, each phase.
6. Nameplate and measured amperage, each phase.
7. Starter thermal-protection-element rating.

B. Motors Driven by Variable-Frequency Controllers: Test for proper operation at speeds varying from minimum to maximum. Test the manual bypass of the controller to prove proper operation. Record observations including name of controller manufacturer, model number, serial number, and nameplate data.

3.8 PROCEDURES FOR CONDENSING UNITS

A. Verify proper rotation of fans.

B. Measure entering- and leaving-air temperatures.

C. Record compressor data.

3.9 PROCEDURES FOR BOILERS & WATER HEATERS

A. Hydronic Boilers & Water Heaters: Measure and record entering- and leaving-water temperatures and water flow.

3.10 PROCEDURES FOR HEAT-TRANSFER COILS

A. Measure, adjust, and record the following data for each electric heating coil:

1. Nameplate data
2. Airflow
3. Entering- and leaving-air temperature at full load
4. Voltage and amperage input of each phase at full load and at each incremental stage
5. Calculated kilowatt at full load
6. Fuse or circuit-breaker rating for overload protection

B. Measure, adjust, and record the following data for each refrigerant coil:

1. Dry-bulb temperature of entering and leaving air
2. Wet-bulb temperature of entering and leaving air
3. Airflow
4. Air pressure drop

3.11 FINAL REPORT

A. General: Prepare a certified written report;

1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.
2. Include a list of instruments used for procedures, along with proof of calibration.

B. Final Report Contents: In addition to certified field-report data, include the following:

1. Pump curves
2. Fan curves
3. Manufacturers' test data
4. Field test reports prepared by system and equipment installers
5. Other information relative to equipment performance; do not include Shop Drawings and product data

C. General Report Data: In addition to form titles and entries, include the following data:

1. Title page
2. Name and address of the TAB contractor
3. Project name
4. Project location

5. Architect's name and address
6. Engineer's name and address
7. Contractor's name and address
8. Report date
9. Signature of TAB supervisor who certifies the report
10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
11. Summary of contents including the following:
    a. Indicated versus final performance.
    b. Notable characteristics of systems.
    c. Description of system operation sequence if it varies from the Contract Documents.
    d. Nomenclature sheets for each item of equipment.
    e. Data for terminal units, including manufacturer's name, type, size, and fittings.
    f. Notes to explain why certain final data in the body of reports vary from indicated values.
12. Test conditions for fans and pump performance forms including the following:
    a. Settings for outdoor-, return-, and exhaust-air dampers.
    b. Conditions of filters.
    c. Cooling coil, wet- and dry-bulb conditions.
    d. Face and bypass damper settings at coils.
    e. Fan drive settings including settings and percentage of maximum pitch diameter.
    f. Settings for supply-air, static-pressure controller.
    g. Other system operating conditions that affect performance.

D. System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present each system with single-line diagram and include the following:
1. Quantities of outdoor, supply, return, and exhaust airflows.
2. Water and steam flow rates.
3. Duct, outlet, and inlet sizes.
4. Pipe and valve sizes and locations.
5. Terminal units.
6. Balancing stations.
7. Position of balancing devices.

3.12 INSPECTIONS

A. Initial Inspection
1. After testing and balancing are complete, operate each system and randomly check measurements to verify that the system is operating according to the final test and balance readings documented in the final report.
2. Check the following for each system:
    a. Measure airflow of at least ten (10) percent of air outlets.
    b. Measure water flow of at least five (5) percent of terminals.

c. Measure room temperature at each thermostat/temperature sensor. Compare the reading to the set point.

d. Verify that balancing devices are marked with final balance position.

e. Note deviations from the Contract Documents in the final report.

B. Final Inspection

1. After initial inspection is complete and documentation by random checks verifies that testing and balancing are complete and accurately documented in the final report, request that a final inspection be made by Construction Manager.

2. The TAB contractor's test and balance engineer shall conduct the inspection in the presence of Construction Manager.

3. Construction Manager shall randomly select measurements, documented in the final report, to be rechecked. Rechecking shall be limited to either 10 percent of the total measurements recorded or the extent of measurements that can be accomplished in a normal eight (8)-hour business day.

4. If rechecks yield measurements that differ from the measurements documented in the final report by more than the tolerances allowed, the measurements shall be noted as "FAILED."

5. If the number of "FAILED" measurements is greater than ten (10) percent of the total measurements checked during the final inspection, the testing and balancing shall be considered incomplete and shall be rejected.

C. TAB Work will be considered defective if it does not pass final inspections. If TAB Work fails, proceed as follows:

1. Recheck all measurements and make adjustments. Revise the final report and balancing device settings to include all changes; resubmit the final report and request a second final inspection.

2. If the second final inspection also fails, Owner may contract the services of another TAB contractor to complete TAB Work according to the Contract Documents and deduct the cost of the services from the original TAB contractor's final payment.

D. Prepare test and inspection reports.

3.13 ADDITIONAL TESTS

A. Within ninety (90) days of completing TAB, perform additional TAB to verify that balanced conditions are being maintained throughout and to correct unusual conditions.

B. Seasonal Periods: If initial TAB procedures were not performed during near-peak summer and winter conditions, perform additional TAB during near-peak summer and winter conditions.

END OF SECTION

SECTION 23 07 13

DUCTWORK INSULATION

PART 1 - GENERAL

1.1 SCOPE

A. Perform all Work required to provide and install the following Ductwork Insulation indicated by the Contract Documents with supplementary items necessary for proper installation.

B. Equipment Included in This Section

1. Insulation
2. Fasteners
3. Jacketing
4. Sealants

1.2 REFERENCES

A. Ductwork schedules located on Drawings.

B. All materials, installation and workmanship shall comply with the applicable requirements and standards addressed in the following references:

1. NFPA 90
2. ASTM

C. Abbreviations

1. K: Thermal Conductivity, in Btu per inch thickness per hour per square foot.
2. PVC: Polyvinylchloride

1.3 SUBMITTALS

A. Product Data

1. Manufacturer’s catalog sheets and specifications for insulation materials and jacket materials.
2. Materials Schedule: Itemize insulation materials and thicknesses for each specified application in Insulation Material Schedules in Part 3 of this Section. Where optional materials are specified, indicate option selected. Schedule should be similar to Ductwork schedule on Drawings.

1.4 QUALITY ASSURANCE

A. Qualifications: The persons installing the Work of this Section and their Supervisor shall be personally experienced in mechanical insulation work and shall have been regularly employed by a company installing mechanical insulation for a minimum of five (5) years.

B. Regulatory Requirements

1. Insulation installed inside buildings, including duct lining materials, laminated jackets, mastics, sealants and adhesives shall have a Fire Spread/Smoke Developed Rating of 25/50 or less based on ASTM E 84.

PART 2 - PRODUCTS

2.1 ADHESIVES

A. For indoor applications, use adhesive that has a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Calcium Silicate Adhesive: fibrous, sodium-silicate-based adhesive with a service temperature range of 50° F - 800° F (10° C - 427° C).

C. Cellular-Glass, Phenolic, Polyisocyanurate, and Polystyrene Adhesive: Solvent-based resin adhesive, with a service temperature range of -75° F to +300° F (-59° C to +149° C).

D. Flexible Elastomeric and Polyolefin Adhesive: Comply with MIL-A-24179A, Type II, Class I.

E. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, class 2, Grade A.

F. ASJ Adhesive, and FSK and PVDC Jacket Adhesive: comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

G. PVC Jacket Adhesive: Compatible with PVC jacket.

2.2 MASTICS

A. For indoor applications, use mastics that have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-C-19565C, Type II.

2.3 LAGGING ADHESIVES

A. For indoor applications, use adhesive that has a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Description: Comply with MIL-A-3316C Class I, Grade A and shall be compatible with insulation materials, jackets, and substrates.

2.4 JACKETS

A. PVC Jackets

1. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness: 0.030”.
2. Adhesive: As recommended by jacket material manufacturer.
3. 3. Color: White.

B. Stainless Steel Jackets:

1. Stainless-Steel Jacket: ASTM A 167 or ASTM A 240/A 240M.
2. Type 304 or Type 316 sheet and roll stock ready for shop or field sizing. Material thickness: 0.030”.
3. Moisture Barrier for Outdoor Applications: 3-mil- thick, heat-bonded polyethylene and 2.5mil- thick polysurlyn.

C. Aluminum Jackets:

1. Aluminum Jacket: Comply with ASTM B 209 (ASTM B 209M), Alloy 3003, 3005, 3105, or 5005, Temper H-14.
2. Moisture Barrier for Outdoor Applications: 3-mil thick, heat-bonded polyethylene.

D. Self-Adhesive Outdoor Jackets:

1. Self-Adhesive Outdoor Jacket: 60-mil thick, laminated vapor barrier and waterproofing membrane for installation over insulation located aboveground outdoors; consisting of a rubberized bituminous resin on a crosslaminated polyethylene film covered with white aluminum-foil facing.

2.5 BANDING

A. Stainless Steel: ASTM A 167 or ASTM A 240/A 240M, Type 304 or Type 316 as required to match jacketing material; 0.015 inch thick, 3/4 inch wide with wing seals.

B. Aluminum: ASTM B 209 (ASTM B 209M), Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020

inch thick, 3/4 inch wide with wing seals.

2.6 SEALANTS

A. For indoor applications, use sealants that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.7 INSULATION

A. Ductwork Insulation Types

1. Type A: Flexible fiberglass duct wrap. Minimum density 0.75 #/ft^3, K of 0.30 at 75° F; ASTM C 553, Type II.
2. Type B: Semi-rigid fiberglass board wrap. Minimum density 3.0 #/ft^3, K of 0.23 at 75° F; ASTM C612, Type IA.
3. Type C: Flexible fiberglass duct liner. Minimum density 3.0 #/ft^3, K of 0.24 at 75° F; ASTM C 1071. Liner between insulation and airstream side of double-wall ductwork shall have a Fire Spread/Smoke Developed Rating of 25/50 or less based on ASTM E 84.
4. Type D: Preformed rigid fiberglass duct liner. Minimum density 3.0 #/ft^3, K of 0.23 at 75°F; ASTM C 1071. Liner shall have a Fire Spread/Smoke Developed Rating of 25/50 or less based on ASTM E 84
5. Type E: Flexible mineral fiber duct wrap (Suitable for Temperatures Up to 1800° F). Minimum density 6 #/ft^3; ASTM E 2336, NFPA 96-2011, UL 1978 (Rev. 6-02). Two (2)-hour fire separation rating with zero clearance to combustibles. Thickness shall be as specified or as required by AHJ to meet fire separation requirements.
6. Type F: Flexible fiberglass duct liner for spiral ductwork. Minimum density 3.0 #/ft^3, K of 0.23 at 75° F; Liner shall have a Fire Spread/Smoke Developed Rating of 25/50 or less based on ASTM E 84.

B. Fire resistant, anti-erosion, and anti-microbial coating on lining interior to duct; NFPA 90-A and 90-B.

C. All insulation densities listed are minimum densities. Contractor shall be responsible for verifying the required insulation thickness & density to meet the minimum installed insulation R-values as listed in the ductwork schedules on the drawings.

PART 3 - EXECUTION

3.1 DUCT INSULATION SCHEDULE

A. Refer to Ductwork Application Schedule on Drawings for insulation requirements.

3.2 PREPARATION

A. Perform the following before starting insulation work.

1. Install hangers, supports and appurtenances in their permanent locations.
2. Complete testing of piping, ductwork, and equipment.
3. Clean and dry surfaces to be insulated.

3.3 INSTALLATION, GENERAL

A. Install the work of this section in accordance with the manufacturer’s printed installation instructions unless otherwise specified.

3.4 INSTALLATION AT HANGERS AND SUPPORTS

A. Reset and realign hangers and supports if they are displaced while installing insulation.

B. Insulation inserts for use with fibrous glass insulation:

1. Ductwork: Install 6 #/ft^3 density jacketed fibrous glass board, same thickness as adjoining insulation, sized for full bearing on supporting trapeze member, and as required to enable abutting to adjoining insulation and overlapping of jacketing.

3.5 INSTALLATION OF DUCTWORK INSULATION

A. Exterior to Ductwork

1. Cut insulation to stretch-out dimensions as recommended by insulation manufacturer.
2. Remove two (2) inch wide strip of insulation material from the jacketing on the longitudinal and circumferential joint edges to form an overlapping staple/tape flap.
3. Install insulation with jacketing outside so staple/tape flap overlaps insulation and jacketing on other end.
4. Butt ends of insulation tightly together.
    a. Rectangular and Square Ductwork: Do not compress insulation at duct corners.
5. Staple longitudinal and circumferential joints with outward clinching staples minimum six (6) inches on center, and seal with pressure sensitive sealing tape.
6. Cut off protruding ends of fasteners flush with insulation surface and seal with pressure sensitive sealing tape.
7. Install duct insulation fasteners on bottom side of horizontal duct runs, when bottom dimension of the duct is in excess of 24 inches in width.
8. Install duct insulation fasteners on sides of duct risers having a dimension over 24 inches in size.
9. Seal tears, punctures, and penetrations of insulation jacketing with sealing tape.

B. Interior to Ductwork

1. Insulate ducts prior to erection in place when ducts are required to be installed proximate to walls, ceilings, equipment or other ductwork, which will not permit adequate space for installation of insulation after ducts are installed.
2. Line interior surfaces of ducts with thermal and acoustic board insulation, when the specified application of exterior insulation is impractical.
    a. Written permission from the Engineer must be received, prior to the substitution of lined ducts for exterior insulated ducts.
    b. Maintain interior cross-sectional areas of ducts, as noted on drawings.

3.6 INSTALLATION OF JACKETING MATERIAL

A. PVC Jackets:

1. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints; for horizontal applications, install with longitudinal seams along top and bottom of tanks and vessels. Seal with manufacturer's recommended adhesive.
2. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

B. Metal Jackets:

1. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

3.7 FIELD QUALITY CONTROL

A. Field Samples: The Director's Representative, may at his discretion, take field samples of installed insulation for the purpose of checking materials and application. Reinsulate sample cut areas.

3.8 DUCTWORK SERVICE INSULATION SCHEDULE

A. Insulate all ductwork except where otherwise specified. See Ductwork schedule on Drawings.

B. Notes

1. Equipment: Insulate air handling equipment, not furnished with factory applied insulated jacket or internal insulation, with minimum 1-1/2 inch thick fibrous glass board with an ASTM C 1136 Type I jacket, installed and finished as specified for exposed ductwork in finished spaces.

END OF SECTION

SECTION 23 07 19
PIPING INSULATION

PART 1 - GENERAL

1.1 SCOPE

A. Perform all Work required to provide and install the Piping Insulation indicated by the Contract Documents with supplementary items necessary for proper installation.

1.2 REFERENCES

A. Pipe Hangers and Supports: Section 230529.

B. Abbreviations

1. K: Thermal Conductivity, i.e., maximum Btu per inch thickness per hour per square foot.
2. pcf: Pounds per cubic foot.
3. PVC: Polyvinylchloride.

1.3 SUBMITTALS

A. Product Data: Manufacturer's catalog sheets and specifications for the following:

1. Insulation Materials.
2. Jacket Materials.
3. Sealant and Adhesive Materials.

1.4 QUALITY ASSURANCE

A. Qualifications: The person(s) directly supervising the installation of this work in the field shall be personally experienced in mechanical insulation work and shall have been regularly employed by a company installing mechanical insulation for a minimum of five (5) years.

B. Regulatory Requirements

1. Insulation installed inside buildings, including laminated jackets, mastics, sealants and adhesives shall have a Fire Spread/Smoke Developed Rating of 25/50 or less based on ASTM E 84.
2. Insulation shall meet minimum requirements ASHRAE 90.1-2007.

PART 2 - PRODUCTS

2.1 PIPING INSULATION

A. Fibrous Glass (Mineral Fiber) Insulation: Composed principally of fibers manufactured from rock, slag, or glass, with or without binders, and asbestos free.

1. Preformed Pipe Insulation: Minimum density 3 pcf; ASTM C 547
   a. Class 1 (Suitable for Temperatures Up to 450° F): K of 0.26 at 75° F.
2. Premolded Fitting Insulation: Minimum density 4.0 pcf, K of 0.26 at 75° F; ASTM C 547, Class 1.
3. Insulation Inserts for PVC Fitting Jackets: Minimum density 1.5 pcf, K of 0.28 at 75° F; ASTM C 553, Type III. Suitable for temperatures up to 450° F.

B. Flexible Elastomeric Foam Insulation

1. Meeting the following:
   a. Maximum Water Vapor Transmission: 0.10 perm - inch based on ASTM E 96, Procedure A.
   b. K of 0.27 at 75° F based on ASTM C 518 or C 177.

2. Pipe Insulation: ASTM C 534, Type I.

3. Polyethylene and polyolefin insulation is not acceptable.

C. High Density Jacketed Insulation Inserts for Hangers and Supports

1. For Use with Fibrous Glass Insulation:

a. Cold Service Piping:

1) Polyurethane Foam: Minimum density 4 pcf, K of 0.13 at 75° F, minimum compressive strength of 125 psi.

b. Hot Service Piping:

1) Calcium Silicate: Minimum density 15 pcf, K of 0.50 at 300° F; ASTM C 533.

2) Perlite: Minimum density 12 pcf, K of 0.60 at 300° F; ASTM C 610.

2. For Use with Flexible Elastomeric Foam Insulation: Hardwood dowels and blocks, length or thickness equal to insulation thickness, other dimensions as specified or required.

D. Cements

1. Fibrous Glass Thermal Insulating Cement: Asbestos free; ASTM C 195.

2. Fibrous Glass Hydraulic Setting Thermal Insulating and Finishing Cement: ASTM C 449/C 449M.

2.2 INSULATION JACKETS

A. Laminated Vapor Barrier Jackets for Piping: Factory applied by insulation manufacturer, conforming to ASTM C 1136, Type I.

1. Type I: Reinforced white kraft and aluminum foil laminate with kraft facing out.

a. Pipe Jackets: Furnished with integral 1-1/2” self sealing longitudinal lap, and separate 3” wide adhesive backed butt strips.

2. Laminated vapor barrier jackets are not required for flexible elastomeric foam insulation.

B. Canvas Jackets: Cotton duck, fire retardant, NFPA 701 compliant, 4 or 6 oz. per square yard as specified.

C. PVC Jackets and Premolded Fitting Covers

1. Constructed of high impact, UV resistant PVC. 0.020” thickness.

a. ASTM D 1784, Class 14253-C.

b. Working Temperature: 0-150° F.

D. Metal Jacketing

1. Aluminum: ASTM B 209, Alloys 1100, 3003, 3105 or 5005, Temper H14, 0.016 inch thick.

a. Factory Pre-formed Sectional Pipe Jacketing:

1) Smooth outer finish with integral bonded laminated polyethylene film, kraft paper moisture barrier underside.

2) Pittsburgh or modified Pittsburgh longitudinal lock seams.

3) 2 inch overlapping circumferential joints with integral locking clips, or butt joints sealed with 2 inch wide mastic backed aluminum snap bands.

b. Fastening Devices:

1) Strapping: Type 18-8 stainless steel, 0.020” thick, 1/2" and 3/4" wide as specified.

2) Wing Seals: Type 18-8 stainless steel, 0.032” thick.

2. Circumferentially Corrugated Aluminum Jacketing: Childer's Corrolon, or Prior Approved Equal.
    a. Construction: 3/16" circumferentially corrugated embossed aluminum, ASTM B 209, Types 1100, 3003, 3105, or 505, H-14 temper, 0.016" thick.
    b. Moisture Barrier: Integrally bonded to jacket over entire surface in contact with insulation.
    c. Fastening Devices:
        1) Strapping: 0.020" thick by 1/2" wide, Type 3003, 3105, 5005, H-14 temper.
        2) Wing Seals: 0.032" thick Type 5005, H-14 temper aluminum.

E. Self-Adhesive Outdoor Jackets:
1. Self-Adhesive Outdoor Jacket: 15-mil thick, laminated vapor barrier and waterproofing membrane for installation over insulation located above ground and outdoors; consisting of a multi-layered laminate coating with acrylic adhesive covered with white aluminum-foil facing.

F. Insulated Safety Wrap: Handi Lav-Guard by Truebro Inc., or Prior Approved Equal.
1. Construction: 1/8" thick chemical resistant vinyl with internal ribs.
2. Fasteners: Nylon tie laces or reuseable clips.
3. Kit includes covering for 8" tailpiece, P trap, 8" waste arm, hot and cold lines and valves, and required fasteners.

G. Removable Insulation Covers: Advance Thermal Corp., or Prior Approved Equal.
1. Construction: Teflon or silicon coated canvas blanket. Insulation shall match insulation thickness or be as thick as possible.
2. Fasteners: A minimum of Velcro, double-loop d-rings, and laces.
3. Use materials that are rated for an application's specific temperature requirements, e.g. use high temperature (800° F) rated products for generator exhaust flues.

2.3 ADHESIVES, MASTICS, AND SEALERS

A. Adhesives
1. For indoor applications, use adhesive that has a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D(EPA Method 24).
2. Calcium silicate Adhesive: Fibrous, sodium-silicate-based adhesive with a service temperature range of 50 - 800° F (10 - 427° C).
3. Cellular-Glass, Phenolic, Polyisocyanurate, and Polystyrene Adhesive: Solvent-based resin adhesive with a service temperature range of -75°F to +300°F (-59°C to +149°C)
4. Flexible Elastomeric and Polyolefin Adhesive: Comply with MIL-A-24179A, Type II, Class I.
5. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
6. ASJ Adhesive, and FSK and PVDC Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.
7. PVC Jacket Adhesive: Compatible with PVC jacket.

B. Mastics
1. For indoor applications, use mastics that have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D(EPA Method 24).
2. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-C-19565C, Type II.

C. Lagging Adhesives

1. For indoor applications, use adhesive that has a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D(EPA Method 24).
2. Description: Comply with MIL-A-3316C, Class I, Grade A, and shall be compatible with insulation materials, jackets, and substrates.

D. Sealants

1. For indoor applications, use sealants that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D(EPA Method 24).
2. Vapor Seal Adhesive (Fibrous Glass Insulation): Childers' CP-82, Epolux's Cadoprene 400, Foster's 85-75 or 85-20.
3. Vapor Barrier Mastic/Joint Sealer (Fibrous Glass Insulation): Childers' CP-30, Epolux's Cadalar 670, Foster's 95-44 or 30-35.
4. Adhesive (Flexible Elastomeric Foam): Armstrong's 520, Childers' CP-80, Epolux's Cadoprene 488, Foster's 82-40.
5. Sealant (Metal Pipe Jacket): One-part silicone sealant for high temperatures; Dow Corning's Silastic 736 RTV or General Electric's RTV 106.

2.4 MISCELLANEOUS MATERIALS

A. Pressure Sensitive Tape for Sealing Laminated Jackets:

1. Acceptable Manufacturers:
   a. Alpha Associates
   b. Childers
   c. Ideal Tape
   d. Morgan Adhesive
2. Type: Same construction as jacket.

B. Wire, Bands, and Wire Mesh:

1. Binding and Lacing Wire: Nickel copper alloy or copper clad steel, gauge as specified.
2. Bands: Galvanized steel, 1/2" wide x 0.015" thick, with 0.032" thick galvanized wing seals.
3. Wire Mesh: Woven 20-gauge steel wire with 1" hexagonal openings, galvanized after weaving.

PART 3 - EXECUTION

3.1 PREPARATION

A. Perform the following before starting insulation Work:

1. Install hangers, supports and appurtenances in their permanent locations.
2. Complete testing of piping.
3. Clean and dry surfaces to be insulated.

3.2 INSTALLATION, GENERAL

A. Install the Work of this Section in accordance with the manufacturer's printed installation instructions unless otherwise specified.

B. Provide continuous piping insulation and jacketing when passing thru interior wall, floor, and ceiling construction.

1. At Through Penetration Firestops: Coordinate insulation densities with the requirements of approved firestop system being installed. See Section 078400.

a. Insulation densities required by approved firestop system may vary with the densities specified in this Section. When this occurs use the higher density insulation.

C. Do not intermix different insulation materials on individual runs of piping.

3.3 INSTALLATION AT HANGERS AND SUPPORTS

A. Reset and realign hangers and supports if they are displaced while installing insulation.

B. Install high density jacketed insulation inserts at hangers and supports for insulated piping.

C. Insulation Inserts For Use with Fibrous Glass Insulation

1. Where clevis hangers are used, install insulation shields and high density jacketed insulation inserts between shield and pipe.

a. Where insulation is subject to compression at points over 180° apart, e.g. riser clamps, U-bolts, trapezes, etc.; fully encircle pipe with two (2) protection shields and two (2) high density jacketed fibrous glass insulation inserts within supporting members.

D. Insulation Inserts For Use with Flexible Elastomeric Foam Insulation:

1. Where clevis hangers are used, install insulation shields with hardwood filler pieces, same thickness as adjoining insulation, inserted in undersized die cut or slotted holes in insulation at support points.

2. Contour hardwood blocks to match the curvature of pipe, and shield.

3. Coat dowels and blocks with insulation adhesive, and insert while still wet.

4. Vapor seal outer surfaces of dowels and blocks with adhesive after insertion.

5. Install filler pieces as follows:

PIPE/TUBING SIZE	FILLER PIECES	POSITION
Thru 1-1/2”	2 dowel plugs	6 o’clock; in tandem
2” thru 4”	1 block, 2 dowel plugs	6 o’clock, and 4 & 8 o’clock respectively
6” thru 8”	2 blocks, 4 dowel plugs	6 o’clock; in tandem and 4 & 8 o’clock; in tandem

3.4 INSTALLATION OF FIBROUS GLASS COLD SERVICE INSULATION

A. Install insulation materials with a field or factory applied ASTM C 1136 Type I laminated vapor barrier jacket, unless otherwise specified.

B. Piping

1. Butt insulation joints together, continuously seal minimum 1-1/2” wide self-sealing longitudinal jacket laps and 3” wide butt adhesive backed strips.

a. Substitution: 3” wide pressure sensitive sealing tape, of same material as jacket, may be used in lieu of butt strips.

2. Bed insulation in a 2” wide band of vapor barrier mastic, and vapor seal exposed ends of insulation with vapor barrier mastic at each butt joint between pipe insulation and equipment, fittings or flanges at the following intervals:

a. Horizontal Pipe Runs: 21 ft.

b. Vertical Pipe Runs: 9 ft.

C. Fittings, Valves, Flanges and Irregular Surfaces

1. Piping Systems (less than 40° F)

a. Insulate with mitre cut or pre-molded fitting insulation of same material and thickness as pipe insulation.

b. Secure insulation in place with 16-gauge wire, with ends twisted and turned down into insulation.

c. Butt insulation against pipe insulation and bond with joint sealer.

d. Insulate valves up to and including bonnets, without interfering with packing nuts.

e. Insulate pump impeller casings on pump systems operating below 45° F.

f. Apply leveling coat of insulating cement to smooth out insulation and cover wiring.

g. When insulating cement has dried, seal fitting, valve and flange insulation, by imbedding a layer of reinforcing membrane between two (2) flood coats of vapor barrier mastic, each 1/8" thick wet.

h. Lap reinforcing membrane or canvas on itself and adjoining pipe insulation at least 2 inches.

i. Trowel, brush or rubber glove outside coat over entire insulated surface.

2. Piping Systems (40 - 60° F)

a. Valves, fittings and flanges shall be insulated with pre-molded PVC fitting jackets, with fibrous glass insulation inserts.

1) Additional insulation inserts are required for services with operating temperatures under 45° F or where insulation thickness exceeds 1-1/2". The surface temperature of PVC fitting jacket must not go below 45° F.

3.5 INSTALLATION OF FIBROUS GLASS HOT SERVICE INSULATION

A. Install insulation materials with field or factory applied ASTM C 1136 Type I laminated vapor barrier jacket unless otherwise specified.

B. Piping

1. Butt insulation joints together, continuously seal minimum 1-1/2" wide self-sealing longitudinal jacket laps and 3" wide adhesive backed butt strips.

a. Substitution: 3" wide pressure sensitive sealing tape, of same material as the jacket, may be used in lieu of butt strips.

2. Fill voids in insulation at hanger with insulating cement.

3. Exceptions:

a. Piping in Accessible Shafts, Attic Spaces, Crawl Spaces, Unfinished Spaces and Concealed Piping: Butt insulation joints together and secure minimum 1-1/2" wide longitudinal jacket laps and 3" wide butt strips of same material as jacket, with outward clinching staples on maximum 4" centers. Fill voids in insulation at hangers with insulating cement.

b. Piping in Tunnels: Butt insulation joints together and secure minimum 1-1/2" wide longitudinal jacket laps and 3" wide butt strips, of same material as jacket, with outward clinching staples on maximum 4" centers and 16 gauge wires a minimum of four (4) loops per section. Fill voids in insulation with insulating cement.

C. Fittings, Valves, Flanges and Irregular Surfaces

1. Insulate with mitre cut or pre-molded fitting insulation of same material and thickness as insulation.

2. Secure in place with 16-gauge wire, with ends twisted and turned down into insulation.

3. Butt fitting, valve and flange insulation against pipe insulation, and fill voids with insulating cement.
4. Insulate valves up to and including bonnets, without interfering with packing nuts.
5. Apply leveling coat of insulating cement to smooth out insulation and cover wiring.
6. After insulating cement has dried, coat insulated surface with lagging adhesive, and apply 4 oz or 6 oz canvas jacket as required by pipe size.
    a. Lap canvas jacket on itself and adjoining pipe insulation at least 2".
    b. Size entire canvas jacket with lagging adhesive.
7. Piping Systems (below 250° F)
    a. Valves, fittings and flanges may be insulated with pre-molded PVC fitting jackets, with fibrous glass insulation inserts.
        1) The surface temperature of PVC fitting jacket not to exceed 150° F.

3.6 INSTALLATION OF FLEXIBLE ELASTOMERIC FOAM INSULATION

A. Where possible, slip insulation over the pipe, and seal butt joints with adhesive.
1. Where the slip-on technique is not possible, slit the insulation and install.
2. Re-seal with adhesive, making sure the mating surfaces are completely joined.

B. Insulate fittings and valves with miter cut sections. Use templates provided by the manufacturer, and assemble the cut sections in accordance with the manufacturer's printed instructions.
1. Insulate threaded fittings and valves with sleeved fitting covers. Overlap and seal the covers to the adjoining pipe insulation with adhesive.

C. Carefully mate and seal with adhesive all contact surfaces to maintain the integrity of the vapor barrier of the system.

D. Piping Exposed Exterior to a Building, Totally Exposed to the Elements:
1. Apply flexible elastomeric foam insulation to piping with adhesive.
2. Apply reinforcing membrane around piping insulation with adhesive or mastic.
3. Adhesive Applied System: Apply two (2) coats of finish.
4. Mastic Applied System: Apply another coat of mastic over reinforcing membrane.

3.7 INSTALLATION OF PVC JACKETING ON PIPING

A. Secure jacketing to insulated piping and seal with adhesive. All seams shall be secured flat.

B. Jacket fittings with preformed covers.

3.8 INSTALLATION OF METAL JACKETING ON PIPING

A. Secure jacketing to insulated piping with preformed aluminum snap straps and stainless steel strapping installed with special banding wrench.

B. Jacket fittings, valves and flanges with mitred sections of aluminum jacketing.
1. Seal joints with sealant and secure with preformed aluminum bands.
2. Factory fabricated, preformed, sectional aluminum fitting covers may be used in lieu of mitred sections of aluminum jacketing for covering fittings, valves and flanges.

3.9 INSTALLATION OF REMOVABLE INSULATION COVERS

A. Install Removable Insulation Covers in lieu of field applied insulation on the following items:
1. Steam pressure reducing valve stations. Insulate all non-field insulated surfaces of valve assembly.

2. Generator exhaust piping from generator to silencer.
3. Heating water and steam condensate return pumps.
4. Uninsulated headers of shell-and-tube heat exchangers.
5. Steam boiler gate and non-return valves.
6. Control valves 4” and over.

3.10 FIELD QUALITY CONTROL

A. Field Samples: The Owner’s Representative, may at his discretion, take field samples of installed insulation for the purpose of checking materials and application. Contractor shall reinsulate sample cut areas.

3.11 EQUIPMENT INSULATION SCHEDULE

A. Unless factory insulated, contractor shall insulate the following with the same thickness and material as the piping system they serve:

1. Steam Condensate Return Stations and Units
2. Domestic Water Softener Tanks
3. Domestic Water Booster Pump Skid Piping
4. Domestic Water Hydro-pneumatic Tanks
5. Hydronic Water Air Separators and Buffer Tanks
6. Uninsulated Cold Chiller Surfaces
7. Steam-to-Water, Glycol/Water-to-Water, and Steam-to-Steam Heat Exchangers
8. Steam-to-Water Domestic Water Heaters
9. Chilled and Heating Water Pumps and Accessories
10. Domestic Hot Water Storage Tanks
11. RO Water Storage Tanks and Distribution Pumps
12. Steam Boiler FGR Piping
13. Steam Boiler Sections Around Doors With Removable Insulation and Jackets to Allow For Inspection and Cleaning

3.12 PIPING INSULATION SCHEDULE

A. Refer to Piping Application Schedule on Drawings for Piping Insulation Schedule.

B. Insulate all cold service and hot service piping, and appurtenances except where otherwise specified.

C. Schedule of items not to be insulated:

1. Do not insulate the following items:
    a. Actual heat transfer surfaces.
    b. Chromium plated piping, unless otherwise specified.
    c. Flexible vibration eliminators.
    d. Water meters.
    e. Drains from heating equipment and appurtenances that flow to waste.
    f. Chemical feed piping.
    g. Piping inside convector and finned tube radiation enclosures.
    h. Boiler blow-off and blow-down piping.
    i. Safety and relief valves. Discharge piping from relief valves.

j. Vent piping to atmosphere installed exposed in Mechanical Rooms, connected to the following: Blow-off tanks, flash tanks, condensate tanks.

k. Flanges and unions in piping systems over 140° F.

l. Hydronic Specialties: Flow indicators, control valves 3” and under, air vents and air control fittings.

m. Steam traps and cooling legs of steam traps.

n. Float chambers and level controllers.

2. Do not insulate mechanical equipment with a factory applied insulated steel jacket, unless specified otherwise.

D. Notes:

1. Insulate cold condensate drain piping connected to drain pans under cooling coils within unit enclosure, except where over drain pans:

3.13 SCHEDULE OF METAL JACKETING FOR INSULATED PIPE

A. Jacket exposed insulated risers with preformed sectional aluminum metal jacketing, in piping systems with service temperatures 105-450° F, installed in finished rooms or finished spaces above Basement Floor Level.

1. Exception: Preformed sectional aluminum metal jacketing is not required on piping in Mechanical Equipment Rooms, Steam Service Rooms, Penthouse, Mechanical Equipment Rooms and Machine Rooms.

B. Install jacketing from floor to ceiling or from floor to first change of direction in riser, when such change in direction is a minimum of 9’-0” above finished floor, whichever is applicable.

C. Piping in Tunnel Manholes: Jacket insulated piping with circumferentially corrugated aluminum jacketing.

1. Lap longitudinal and circumferential joints a minimum of 2”.

2. Secure jacketing in place with 1/2” x 0.020” thick aluminum bands secured with aluminum wing type seals, on maximum 12” centers.

3. Jacketing is not required on fittings, valves, flanges, and irregular surfaces.

4. Install jacketing so as to avoid trapping condensation and precipitation.

5. Extend jacketing a minimum of ten (10) feet inside tunnels in all directions.

D. Piping Exterior to Building: Jacket insulated piping with circumferentially corrugated aluminum jacketing.

1. Lap longitudinal and circumferential joints a minimum of 2”.

2. Secure jacketing in place with 1/2" x 0.020” thick aluminum bands secured with aluminum wing type seals, on maximum 12” centers.

3. Cover insulated fittings, valves, and offsets with mitered sections of jacketing. Seal joints with mastic, and secure with aluminum strapping and wing seals.

4. Factory fabricated, preformed fitting covers of same material as jacketing may be used instead of mitered jacketing.

5. Install jacketing so as to avoid trapping condensation and precipitation.

3.14 SCHEDULE OF PVC JACKETING FOR INSULATED PIPE

A. For exposed piping, install jacketing from floor to ceiling or from floor to first change of direction in riser, when such change in direction is a minimum of 9’-0” above finished floor, whichever is applicable.

B. Jacket exposed insulated piping in mechanical rooms and tunnels with PVC jacketing.

3.15 SCHEDULE OF ALUMINUM JACKETING FOR INSULATED PIPE

A. Jacket exposed insulated piping on roof with aluminum jacketing.

END OF SECTION

SECTION 23 11 26
NATURAL GAS PIPING

PART 1 - GENERAL

1.1 SCOPE

A. Perform all Work required to provide and install the following Natural gas Piping System indicated by the Contract Documents with supplementary items necessary for proper installation.

B. Equipment Included in This Section

1. Piping
2. Regulators
3. Unions
4. Valves

1.2 REFERENCES

A. All materials, installation and workmanship shall comply with the applicable requirements and standards addressed within the following references:

1. Adopted version of the International Fuel Gas Code.
2. Adopted version of NFPA 54, National Fuel Gas Code.
3. ASME as it pertains to the welding of piping.
4. State Boiler Code

1.3 SUBMITTALS

A. Product Data

1. Catalog sheets and specifications indicating manufacturer name, type, applicable reference standard, schedule, or class for specified pipe and fittings.
2. Material Schedule: Itemize pipe and fitting materials for each specified application in Pipe and Fittings Schedule in Part 3 of this Section. Where optional materials are specified indicate option selected.

B. Submit piping layout drawings as per Section 230500.

1.4 QUALITY ASSURANCE

A. All materials, equipment and Work shall meet or exceed all applicable federal, state and local requirements and conform to codes and ordinances of authorities having jurisdiction.

B. Valves: Manufacturer's name, size, standards compliance and pressure rating clearly marked on outside of valve body.

C. Welding Materials and Procedures: Conform to ASME Code and applicable state labor regulations.

D. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three (3) years documented experience.

E. Installer Qualifications: Company specializing in performing the Work of this Section with minimum three (3) years documented experience. All installation shall be supervised by a licensed Master Plumber. All testing shall be performed by a licensed Journeyman or Master Plumber. Welders shall be certified in accordance with ASME.

1.5 EXTRA MATERIALS

A. Provide one (1) plug valve wrench for every ten (10) plug valves sized 2 inches and smaller, minimum of one (1). Provide each plug valve sized 2-1/2 inches and larger with a wrench incorporating a setscrew.

PART 2 - PRODUCTS

2.1 GENERAL

A. All materials shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.

B. Natural gas pressures shall not exceed two (2) pounds per square inch gauge on customer side of the meter.

C. Pipe joint compound shall be lead-free, non-toxic, non-hardening, insoluble in the presence of natural gas and compliant with ANSI/NSF 61 and Federal Specification TT-S-1732. Temperature service range of -15° F to +400° F.

2.2 PIPING

A. Polyethylene Piping

B. Polyethylene, SDR-11, ASTM D2513 pipe and fittings with heat fusion socket joints.

C. Polyethylene pipe and fitting materials shall be compatible and by same manufacturer to ensure uniform melting and a proper bond. Fabricated fittings shall not be used.

D. Provide connection between buried plastic gas service piping and metallic riser in accordance with the gas code. Provide metallic riser consisting of HDPE fused coating on steel pipe for connection to above ground building distribution piping. Underground horizontal metallic portion of riser shall be at least twenty four (24) inches in length before connecting to the plastic service pipe. An approved transition fitting or adaptor meeting design pressure rating and plastic pipe manufacturers recommendations shall be used where the plastic joins the metallic riser.

E. Steel Piping

F. Schedule 40 black steel, ASTM A53, Grade A or B, seamless or electric resistance welded.

G. Malleable Iron, Steam Pattern Threaded Fittings

1) 150 lb Class: ASME B16.3

H. Schedule 40 Carbon Steel Fittings

I. ASME B16.9

J. Corrugated Stainless Steel Tubing (CSST) & Fittings

K. Tubing shall be made from 300 series stainless steel strip conforming to ASTM A240 & shall be suitable for operation with fuel gases.

L. Tubing shall be rated for a minimum of 25 PSI operating pressure.

M. Tubing come with a factory installed, integral polyethylene sleeve. The polyethylene sleeve shall have internal vent channels lengthwise to direct any leakage along the pipe to the end fittings. The construction of the pre-sleeved system shall provide the code required encasement & venting capabilities of the system.

N. All fittings shall be non-gasketed, CSA International listed for installation in concealed locations, & constructed of yellow brass with a stainless steel insert.

O. All fittings shall be provided with a plastic containment coupling & a ¼" NPT vent port to provide venting as required.

P. The underground piping system shall be listed by the International Code Council (ICC) or the International Association of Plumbing & Mechanical Officials (IAPMO) for underground or

underground beneath building applications

Q. Vent pipe material shall be schedule 40 black steel. All vent piping shall be routed & terminated per the International Fuel Gas Code & NFPA 54 requirements.

R. Approved manufacturers: TracPipe PS-II or prior approved equal.

2.3 EXCEPTIONS

A. All piping distributed within the building and above 5 psi is required to be welded.

B. Gas piping is prohibited from being installed in solid partitions or walls unless a chase or casing (pipe sleeve) is provided.

C. Threaded fittings shall not be used for pipe sizes 4 inches and larger.

2.4 VALVES

A. Acceptable Manufacturers:

B. A.Y. McDonald

C. Homestead

D. Nibco

E. Milwaukee

F. Nordstrom

G. Mueller.

H. All valves shall be designed, manufactured and approved for natural gas service.

I. Line Shut-off Valves sizes 2” and smaller:

J. Iron body lubricated plug valve conforming to ASME B16.33, U.L. Listed, and A.G.A. Approved for natural gas service with threaded ends, wrench operation, rated for 175 WOG service pressure and –20 to 150° F.

K. Brass body, full port ball valve conforming to ASME B16.44 and U.L. Listed. Blowout-proof stem and PTFE seats. Approved for natural gas service not to exceed 5 psig with threaded ends, rated for 600 WOG, 150 PSI WSP and 32 to 125°F working temperature.

L. Line Shut-off Valves sizes 2 1/2” and larger:

M. Iron body lubricated plug valve conforming to ASME B16.38, U.L. Listed, and A.G.A. Approved for natural gas service with flanged ends, wrench operation, rated for 125 WOG service pressure and –20 to 150° F.

N. Brass body, full port ball valve conforming to ASME B16.44 and U.L. Listed. Blowout-proof stem and PTFE seats. Approved for natural gas service not to exceed 5 psig with threaded ends, rated for 600 WOG, 150 PSI WSP and 32 to 125°F working temperature.

O. Appliance/Equipment Shut-off Valves at local connections sizes two (2) inches and smaller shall be bronze body, full port ball or butterfly type, U.L. Listed, and A.G.A. Approved for natural gas service with threaded ends, quarter turn lever handle operation, rated for 175 W.O.G. service pressure and 30 to 275° F.

P. Manual Emergency Shut-off Valves 2” and smaller shall be bronze body, full port ball or butterfly type, U.L. Listed, and A.G.A. Approved for natural gas service with threaded ends, quarter turn lever handle operation, rated for 175 W.O.G. service pressure and 30 to 275° F.

Q. Automatic Emergency Shut-off Valves shall be U.L. Listed for natural gas service, two (2)-way electrically tripped solenoid type; fail safe closed; manual reset; Type 1 solenoid enclosure; NBR seals and disc; stainless steel core tube and springs; copper coil.

2.5 PRESSURE REGULATORS

A. Acceptable Manufacturers:

B. Fisher

C. Maxitrol

D. Rockwell

E. Schlumberger.

F. All pressure regulators shall be designed, manufactured and approved for natural gas service.

G. Pressure regulators for individual service lines shall be capable of reducing distribution line pressure to pressures required for equipment. Pressure relief shall be set at a lower pressure than would cause unsafe operation of any connected unit. Regulator shall have a single port with orifice diameter no greater than that recommended by manufacturer for the maximum gas pressure at the regulator inlet. Regulator vent valve shall be of resilient materials designed to withstand flow conditions when pressed against valve port. Regulator shall be capable of limiting build-up of pressure under no-flow conditions to 50 percent or less of the discharge pressure maintained under flow conditions. Commercial grade diaphragm type with internal relief valve, vent valve, cast iron body, Buna-N diaphragm.

H. Install pressure gauge adjacent to and downstream of each line pressure regulator.

2.6 UNIONS

A. Unions in 2” and smaller in ferrous lines shall be Class 300 AAR malleable iron unions with iron to brass seats, 2-1/2” and larger shall be ground flange unions. Companion flanges on lines at various items of equipment, machines and pieces of apparatus may serve as unions to permit disconnection of piping.

B. Unions connecting ferrous pipe to copper or brass pipe shall be Epco dielectric type.

C. Above grade flexible stainless steel appliance/equipment connectors shall conform with AGA under the ANSI Z21.69 Standard. Hose shall be braided stainless steel with a polyolefin heat-shrink tubing with high flame-retardant qualities. Hose shall be equipped with malleable iron unions and spring loaded brass quick-link couplings. An easily accessible manual shut-off valve shall be installed ahead of all hose connections. Specify T&S Brass "Safe-T-Link" or approved equal.

2.7 FLANGES

A. All 150 lb. and 300 lb. ANSI flanges shall be domestically manufactured, weld neck forged carbon steel, conforming to ANSI B16.5 and ASTM A-181 Grade I or II or A-105-71. Slip on flanges shall not be used.

B. Each fitting shall be stamped as specified by ANSI B16.9 and, in addition, shall have the laboratory control number stenciled on each fitting for ready reference as to physical properties and chemical composition of the material. Complete test reports may be required for any fitting selected at random.

C. Flanges which have been machined, remarked, painted or otherwise produced domestically from imported forges will not be acceptable. Flanges shall have the manufacturer’s trademark permanently identified in accordance with MSS SP-25.

D. Bolts used shall be carbon steel bolts with semi-finished hexagon nuts of American Standard Heavy dimensions. Threaded rods will not be an acceptable alternate for flange bolts. Bolts shall have a tensile strength of 60,000 psi and an elastic limit of 30,000 psi.

E. Flat-faced flanges shall be required to match flanges on pumps, check valves, strainers, etc. Only one (1) manufacturer of weld flanges will be approved for each project.

F. All flanges shall be gasketed. Contractor shall place gasket between flanges of flanged joints.

Gaskets shall fit within the bolt circle on raised face flanges and shall be full face on flat face flanges. Gaskets shall be cut from 1/16" thick, non metallic, non asbestos gasket material suitable for operating temperatures from -150° F to +75° F.

PART 3 - EXECUTION

3.1 DELIVERY, STORAGE AND HANDLING

A. Accept piping, fittings, and accessories on Site in shipping containers with labeling in place, inspect for damage and store with a minimum of handling. Store plastic piping under cover out of direct sunlight. Do not store materials directly on the ground.

B. Provide temporary protective coating on all cast iron and steel devices.

C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work and isolating parts of completed system.

3.2 PREPARATION

A. Ream pipe ends and remove cutting burrs. Bevel plain end ferrous pipe.

B. Remove cutting oil, scale and dirt, on inside and outside of piping, before assembly.

3.3 PAINTING

A. Prepare all piping as needed to allow for proper coverage and adherence.

B. Piping to be painted includes the following:

1. Exterior to building: Color selected by Architect.
2. Interior to building: Yellow
3. Extension of existing system: Match existing color

3.4 EQUIPMENT CONNECTIONS

A. Provide specified connections, shutoff valves, regulators and unions at each and every appliance and piece of equipment requiring natural gas, including equipment furnished under other Divisions of these Specifications and/or by the Owner.

B. Provide and install union type connections at all equipment to permit removal of service piping.

C. Gas service connections shall have a diameter at least one (1) pipe size larger than that of the inlet connection to the equipment as provided by the manufacturer and be of adequate size to provide the total input demand of the connected equipment.

D. Provide listed and labeled appliance connectors complying with ANSI Z21.69 and listed for use with food service equipment having casters, or that is otherwise subject to movement for cleaning, and other large movable equipment. Connectors shall have listed and labeled quick-disconnect devices and shall have retaining cables attached to structures and equipment. Connectors shall not be concealed within or extended through wall, floor or partition and shall be located entirely in the same room as the connected equipment. Provide an accessible shut-off valve not less than the nominal size of the equipment connector, immediately ahead of the connector.

E. Rigid metallic pipe and fittings shall be used at service connections to all permanently stationary equipment.

3.5 INSTALLATION - GENERAL

A. All gas piping installed in return air plenums shall be welded.

B. Valves shall not be installed in concealed locations and return air plenums.

C. Line shutoff valves installed exterior to the building shall be lubricated plug valves. Line shutoff valves installed interior to the building shall be full-port ball valves.

D. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.

E. All installation shall be in accordance with manufacturer's published recommendations.

F. Provide support for and connections to natural gas service meter in accordance with requirements of the utility company.

G. All installation shall be in accordance with manufacturer's published recommendations.

H. All above ground gas piping shall be electrically continuous and bonded to electrical system ground conductor in accordance with NFPA 70.

I. Provide and install unions at proper points to permit dismantling or removal of pipe. No unions will be required in welded lines except at equipment connections.

J. Provide dielectric isolation device where copper lines connect to ferrous lines or equipment, such as dielectric union, coupling or dielectric flange fitting.

K. Valves, regulators, flanges, unions and similar appurtenances shall be accessible for operation and servicing and shall not be located above ceilings in accessible locations or within partitions.

L. Route piping in orderly manner and maintain gradient. Install piping to conserve building space. Group piping whenever practical at common elevations.

M. Install piping to allow for expansion and Contraction without stressing pipe, joints, or connected equipment.

N. Make service connections at the top of the main, whenever the depth of the main is sufficient to allow top connections. When service connections cannot be made at the top of the main, they shall be made on the side of the main no lower than the horizontal midpoint of the gas main.

O. Cross type fittings shall not be installed in any gas line. Bushings shall not be used in conjunction with any gas piping.

P. Slope piping and arrange to drain at low points. Install drip/sediment traps at points where condensate and debris may collect. Locate drip/sediment traps where readily accessible for cleaning and emptying. Do not install where condensate would be subject to freezing. Construct drip/sediment traps using tee fitting with capped nipple connected to bottom outlet. Use minimum-length nipple of three (3) pipe diameters, but not less than 4 inches long, and same size as connected pipe. Cap shall be screwed pattern, black, standard weight, malleable iron. Install with adequate space for removal of cap.

Q. Install valves for shut off and to isolate equipment, parts of systems, or vertical risers. All valves shall be located such that servicing and operation is possible. All flanged valves shown in horizontal lines with the valve stem shall be positioned so that the valve stem is inclined one bolt hole above the horizontal position. Screw pattern valves placed in horizontal lines shall be installed with their valve stems inclined at an angle of a minimum of 30 degrees above the horizontal position. All valves must be true and straight at the time the system is tested and inspected for final acceptance. Valves shall be installed as nearly as possible to the locations indicated in the Contract Drawings. Any change in valve location must be so indicated on the Record Drawings.

R. Install line shut-off valve at each branch connection to riser. Branch line shut-off valves shall be automatic type where indicated on Drawings.

S. Provide adequate clearance for access to and operation of all valves.

T. Install valves with stems upright or horizontal, not inverted unless required otherwise by the valve manufacturer.

U. Pipe vents from gas pressure reducing valves and pipe casing sleeves to the exterior of the

building and terminated with outlet turned down and capped with corrosion resistant insect screen. Vent terminations shall be at least seven feet above grade or pedestrian traffic and a minimum five (5) feet above or twenty five (25) feet horizontally from all air intakes or building openings.

V. Above ground horizontal natural gas and encasement piping shall be supported at intervals of no greater than 6 foot for 1/2" piping, 8 foot for 3/4" and 1" piping and 10 foot for 1-1/4" and larger piping. Vertical piping shall be supported at each floor level and at intervals as specified for horizontal piping.

W. Extension bars shall not be used for supporting gas or encasement piping. Gas or encasement piping shall not be used to support any other piping or component.

3.6 INSTALLATION - UNDERGROUND

A. All excavation required for gas piping is the responsibility of the contractor and shall be done in accordance with project Specifications.

B. Do not install underground piping when bedding is wet or frozen.

C. Bury all underground piping at least three (3) feet below finished grade. Provide a continuous detectable warning tape on tamped backfill, 12" above all buried non-metallic gas lines. Refer to Mechanical Identification Section 230553 for underground warning tape requirements.

D. Do not install gas piping in the same trench with other utilities. The minimum horizontal clearance between gas pipe and parallel utility pipe shall be two (2) feet. Do not install gas pipe through catch basins, vaults, manholes or similar underground structures.

3.7 INSTALLATION – POLYEHTYLENE SERVICE PIPING

A. Install and support all polyethylene piping in accordance with manufacturer's recommendations. All heat fusion welds shall be performed by welders qualified to the manufacturer's procedures.

B. Polyethylene piping shall not be installed above ground.

C. Provide connection between buried plastic gas piping and metallic riser in accordance with the gas code.

3.8 INSTALLATION - WELDED PIPING

A. Welding of pipe in normally occupied buildings is prohibited. Off-Site welding is acceptable. Should welding be required in a normally occupied building for connecting to an existing welded system, obtain written approval from the Construction Manager and comply with Owner's fire and life safety requirements.

B. Piping and fittings shall be welded and fabricated in accordance with ASME/ANSI.

C. Ensure complete penetration of deposited metal with base metal. Provide filler metal suitable for use with base metal. Maintain inside of fittings free from globules of weld metal. All welded pipe joints shall be made by the fusion welding process, employing a metallic arc or gas welding process. All pipes shall have the ends beveled 37 1/2 degrees and all joints shall be aligned true before welding. Except as specified otherwise, all changes in direction, intersection of lines, reduction in pipe size and the like shall be made with factory-fabricated welding fittings. Mitering of pipe to form elbows, notching of straight runs to form tees, or any similar construction will not be permitted.

D. Align piping and equipment so that no part is offset more than 1/16". Set all fittings and joints square and true and preserve alignment during welding operation. Use of alignment rods inside pipe is prohibited.

E. Contractor shall not permit any weld to project within the pipe so as to restrict it. Tack welds, if used, must be of the same material and made by the same procedure as the completed weld. Otherwise, remove tack welded during welding operation.

F. In no cases shall Schedule 40 pipe be welded with less than three (3) passes including one (1)

stringer/root, one (1) filler and one (1) lacer. Schedule 80 pipe shall be welded with not less than four (4) passes including one (1) stringer/root, two (2) filler and one (1) lacer. In all cases, however, the weld must be filled before the cap weld is added.

3.9 INSTALLATION – CORRUGATED STAINLESS STEEL TUBING

A. Install and support all corrugated stainless steel tubing in accordance with manufacturer's recommendations.

B. All piping system vents shall be routed to the building exterior per code & local AHJ requirements.

3.10 WELD TESTING

A. All welds are subject to inspection, visual and/or x-ray, for compliance with Specifications. At the Owner's option, the Owner will provide employees or employ a testing laboratory for the purposes of performing said inspections and/or x-ray testing. Initial visual and x-ray inspections will be provided by the Owner. The Contractor shall be responsible for all labor, material and travel expenses involved in the re-inspection and retesting of any welds found to be unacceptable. In addition, the Contractor shall be responsible for the costs involved in any and all additional testing required or recommended by ASME/ANSI Standards B31.1 and B31.3 due to the discovery of poor, unacceptable or rejected welds.

B. Welds lacking penetration, containing excessive porosity or cracks, or are found to be unacceptable for any reason, must be removed and replaced with an original quality weld as specified herein. All qualifying tests, welding and stress relieving procedures shall, moreover, be in accord with Standard Qualification for Welding Procedures, Welders and Welding Operators, Appendix A, Section 6 of the Code, current edition.

3.11 TESTING

A. All natural gas systems shall be inspected, tested, purged and placed into operation in accordance with NFPA 54 and as required herein.

B. All natural gas piping systems shall be very carefully inspected, tested, purged and placed into operation by a Licensed Plumber.

C. All necessary apparatus for conducting tests shall be furnished by the Contractor and comply with the requirements of NFPA 54.

D. All new rough-in distribution piping and affected portions of existing systems connected to, shall be subjected to a pneumatic test pressure utilizing clean, dry air and must be demonstrated to be absolutely tight when subjected to the pressures and time durations listed herein. All equipment and components designed for operating pressures of less than the test pressure shall not be connected to the piping system during test.

E. Systems on which the normal operating pressure is less than 0.5 pounds per square inch gauge (psig), the test pressure shall be 5.0 psig and the time interval shall be thirty (30) minutes.

F. Systems on which the normal operating pressure is between 0.5 psig and 5.0 psig, the test pressure shall be 1.5 times the normal operating pressure or 5.0 psig, whichever is greater, and the time interval shall be thirty (30) minutes.

G. Systems on which the normal operating pressure is 5.0 psig or greater, the test pressure shall be 1.5 times the normal operating pressure, and the time interval shall be one (1) hour.

H. After testing is complete, the entire gas system shall be purged with dry nitrogen to eliminate all air, debris and moisture from the piping before natural gas is introduced into the system.

I. After successful results of pressure test and purging have been completed, a leakage test shall be performed in accordance with NFPA 54 Appendix D.

J. Connect, inspect and purge gas utilization equipment, lab hook-ups, outlets, etc., and place into operation only after successful results of pressure test, leakage test and purging have been

completed and accepted.

K. In all instances in which leaks are then found, they shall be eliminated. Testing operations shall be repeated until gas-piping systems are absolutely tight at the pneumatic test pressures indicated above.

L. Pressure test gas piping sleeve system with clean, dry compressed air at 15 psig by temporarily sealing all openings between gas carrier pipe and sleeve and vent openings. Sleeve systems must be demonstrated to be absolutely tight when subjected to this pressure for a period of four (4) hours.

END OF SECTION

SECTION 23 23 00

REFRIGERANT PIPING

PART 1 - GENERAL

1.1 SCOPE

A. Perform all work required to provide and install the Refrigerant Piping indicated by the Contract Documents with supplementary items necessary for proper installation.

B. Equipment Included in This Section

a. Piping

b. Equipment

c. Valves

d. Accessories

e. Specialties

1.2 REFERENCES

A. Welding: Qualify procedures and personnel according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

B. Comply with ASHRAE 15, "Safety Code for Refrigeration Systems."

C. Comply with ASME B31.5, "Refrigeration Piping and Heat Transfer Components."

1.3 SUBMITTALS

A. Shop Drawings: Show layout of refrigerant piping and specialties, including pipe, tube, and fitting sizes, flow capacities, valve arrangements and locations, slopes of horizontal runs, oil traps, double risers, wall and floor penetrations, and equipment connection details. Show interface and spatial relationships between piping and equipment.

1. Refrigerant piping indicated on Drawings is schematic only.

2. Size piping and design actual piping layout, including oil traps, double risers, and specialties. Coordinate the number of circuits, required pipe and tube sizes as needed to accommodate the provided cooling coils and condensing units.

3. Verify the equipment to be provided, elevation difference between compressor and evaporator, and length of piping to ensure proper operation and compliance with warranties of connected equipment.

B. Field quality-control test reports.

C. Operation and Maintenance Data: For refrigerant valves and piping specialties to include in maintenance manuals.

1.4 PERFORMANCE REQUIREMENTS

A. Line Test Pressure for Refrigerant R-134a

1. Suction Lines for Air-Conditioning Applications: 115 psig

2. Suction Lines for Heat-Pump Applications: 225 psig

3. Hot-Gas and Liquid Lines: 225 psig

B. Line Test Pressure for Refrigerant R-404A

1. Suction Lines for Air-Conditioning Applications: 240 psig

2. Suction Lines for Heat-Pump Applications: 400 psig

3. Hot-Gas and Liquid Lines: 400 psig

C. Line Test Pressure for Refrigerant R-407C
   1. Suction Lines for Air-Conditioning Applications: 230 psig
   2. Suction Lines for Heat-Pump Applications: 380 psig
   3. Hot-Gas and Liquid Lines: 380 psig

D. Line Test Pressure for Refrigerant R-410A
   1. Suction Lines for Air-Conditioning Applications: 300 psig
   2. Suction Lines for Heat-Pump Applications: 535 psig
   3. Hot-Gas and Liquid Lines: 535 psig

E. Line Test Pressure for Refrigerant R-454B
   1. Suction Lines for Air-Conditioning Applications: 300 psig
   2. Suction Lines for Heat-Pump Applications: 535 psig
   3. Hot-Gas and Liquid Lines: 535 psig

PART 2 - PRODUCTS

2.1 REFRIGERANT PIPING

A. Copper Tube and Fittings
   1. Copper Tube: ASTM B 280, Type ACR
   2. Wrought-Copper Fittings: ASME B16.22
   3. Wrought-Copper Unions: ASME B16.22
   4. Silver Solder: Cadmium-free high-silver alloy consisting of at least 45% silver
   5. Brazing Filler Metals: Phosphorus/copper/silver alloy consisting of 15% silver

B. Flexible Connectors
   1. Body: Tin-bronze bellows with woven, flexible, tinned-bronze-wire-reinforced protective jacket
   2. End Connections: Socket ends
   3. Offset Performance: Capable of minimum 3/4-inch misalignment in minimum 7-inch- long assembly
   4. Pressure Rating: Factory test at minimum 500 psig
   5. Maximum Operating Temperature: 250° F

2.2 VALVES AND SPECIALTIES

A. Provide all necessary valves and specialties as needed to provide an operational system. Components may include the following items:
   1. Diaphragm Packless Valves
   2. Packed-Angle Valves
   3. Check Valves
   4. Service Valves
   5. Solenoid Valves
   6. Safety Relief Valves
   7. Thermostatic Expansion Valves
   8. Hot-Gas Bypass Valves

9. Strainers
10. Moisture/Liquid Indicators
11. Replaceable-Core Filter Dryers
12. Permanent Filter Dryers
13. Mufflers
14. Receivers
15. Liquid Accumulators

B. Coordinate refrigerant system configuration with equipment manufacturer.

2.3 REFRIGERANTS

A. The following refrigerants are acceptable for comfort cooling related systems.
1. ASHRAE 34, R-454b
2. ASHRAE 34, R-32

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

A. Suction Lines for Conventional Air-Conditioning Applications: Copper, Type L or ACR, drawn-temper tubing and wrought-copper fittings with brazed or silver soldered joints.

B. Hot-Gas and Liquid Lines, and Suction Lines for Heat-Pump Applications: Copper, Type L or ACR, drawn-temper tubing and wrought-copper fittings with brazed or silver soldered joints.

C. Safety-Relief-Valve Discharge Piping: Copper, Type L or ACR, drawn-temper tubing and wrought-copper fittings with brazed or silver soldered joints.

3.2 SYSTEM CONSTRAINTS

A. Install a full-sized, three (3)-valve bypass around filter dryers and all equipment that require routine servicing.

B. Design refrigeration system to operate at an ambient temperature of 95˚F 105˚F and a minimum outside air temperature of 30˚F 0˚F -20˚F.

3.3 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems.

B. Install refrigerant piping according to the appropriate requirements of ASHRAE 15, including A2L refrigerants as required.

C. Install piping as short and direct as possible, with a minimum number of joints, elbows, and fittings.

D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

E. Install piping free of sags and bends.

F. Install fittings for changes in direction and branch connections.

G. Arrange piping to allow inspection and service of refrigeration equipment.

H. Install valves and specialties in accessible locations to allow for service and inspection. Install access doors or panels if valves or equipment requiring maintenance is concealed behind finished surfaces.

I. Install refrigerant piping in protective conduit where installed belowground.

J. Install refrigerant piping in rigid or flexible conduit in locations where exposed to mechanical injury.

K. Slope refrigerant piping as follows:

1. Install horizontal hot-gas discharge piping with a uniform slope downward away from compressor.
2. Install horizontal suction lines with a uniform slope downward to compressor.
3. Use double-suction riser for maximum compressor efficiencies if load variation is expected.
4. Install traps and double risers to entrain oil in vertical runs.
5. Liquid lines may be installed level.

L. When brazing or soldering, remove solenoid-valve coils and sight glasses; also remove valve stems, seats, and packing, and accessible internal parts of refrigerant specialties. Do not apply heat near expansion-valve bulb.

M. Install piping with adequate clearance between pipe and adjacent walls and hangers or between pipes for insulation installation.

N. Install sleeves for piping penetrations of walls, ceilings, and floors.

O. Install sleeve seals for piping penetrations of concrete walls and slabs.

P. Install escutcheons for piping penetrations of walls, ceilings, and floors.

Q. Install safety relief valves where required by ASME Boiler and Pressure Vessel Code. Pipe safety-relief-valve discharge line to outside according to ASHRAE 15.

R. Install strainers upstream from and adjacent to the following unless they are furnished as an integral assembly for device being protected:

1. Solenoid valves.
2. Thermostatic expansion valves.
3. Hot-gas bypass valves.
4. Compressor.

S. Install flexible connectors at compressors.

3.4 PIPE JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Soldered Joints: Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook."

D. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."

3.5 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

B. Tests and Inspections

1. Comply with ASME.
2. Test refrigerant piping, specialties, and receivers. Isolate compressor, condenser, evaporator, and safety devices from test pressure if they are not rated above the test pressure.
3. Test high- and low-pressure side piping of each system separately at not less than the pressures indicated in Part 1 "Performance Requirements" Article.
    a. Fill system with nitrogen to the required test pressure.

b. System shall maintain test pressure at the manifold gage throughout duration of test.

c. Test joints and fittings with electronic leak detector or by brushing a small amount of soap and glycerin solution over joints.

d. Remake leaking joints using new materials and retest until satisfactory results are achieved.

3.6 SYSTEM CHARGING

A. Charge system using the following procedures:

1. Install core in filter dryers after leak test but before evacuation.
2. Evacuate entire refrigerant system with a vacuum pump to 500 micrometers or manufacturers' required level. If vacuum holds for twelve (12) hours, system is ready for charging.
3. Break vacuum with refrigerant gas, allowing pressure to build up to 2 psig.
4. Charge system with a new filter-dryer core in charging line.

3.7 ADJUSTING

A. Adjust high- and low-pressure switch settings to avoid short cycling in response to fluctuating suction pressure.

B. Adjust set-point temperature of air-conditioning or chilled-water controllers to the system design temperature.

C. Perform the following adjustments before operating the refrigeration system, according to manufacturer's written instructions:

1. Open shutoff valves in condenser water circuit.
2. Verify that compressor oil level is correct.
3. Open compressor suction and discharge valves.
4. Open refrigerant valves except bypass valves that are used for other purposes.
5. Check open compressor-motor alignment and verify lubrication for motors and bearings.

D. Replace core of replaceable filter dryer after system has been adjusted and after design flow rates and pressures are established.

END OF SECTION

SECTION 23 31 13
METAL DUCTWORK

PART 1 - GENERAL

1.1 SCOPE

A. Perform all work required to provide and install the Ductwork Insulation indicated by the Contract Documents with supplementary items necessary for proper installation.

1.2 REFERENCES

A. National Fire Protection Association (NFPA)

B. Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA)

C. Definition

1. Low Pressure

a. 2 inch W.G. Pressure Class: Ductwork systems up to 2 inch w.g. positive or negative static pressure with velocities less than or equal to 1500 fpm.

2. Medium Pressure

a. 3 inch W.G. Pressure Class: Ductwork systems over 2 inch w.g. and up to 3 inch W.G. positive or negative static pressure with velocities less than or equal to 2500 fpm.

b. 4 inch W.G. Pressure Class: Ductwork systems over 3 inch w.g. and up to 4 inch w.g. positive or negative static pressure with velocities less than or equal to 2500 fpm.

c. 6 inch W.G. Pressure Class: Ductwork systems over 4 inch w.g. and up to 6 inch w.g. positive or negative static pressure with velocities less than or equal to 2500 fpm.

3. High Pressure

a. 10 inch W.G. Pressure Class: Ductwork systems over 6 inch w.g. and up to 10 inch w.g. positive or negative static pressure with velocities greater than 2500 fpm.

1.3 SUBMITTALS

A. Shop Drawings

1. Submit CAD drawn duct layout drawings for all project ductwork. Submit detailed elevations and sections where required to convey complete scope of work. Shop drawings shall be based on other trades contract drawings and field dimensions. Submit drawings on full size paper at 1/4" = 1'-0" scale.

2. Layouts for areas in which it may be necessary to deviate substantially from layout shown on the Drawings. Show major relocation of ductwork and major changes in size of ducts. Minor transitions in ductwork, if required due to job conditions, need not be submitted as long as the duct area is maintained.

3. Layout and fabrication details for cooking equipment exhaust ductwork.

4. Layouts of mechanical equipment rooms and penthouses.

5. Details of intermediate structural steel members required to span main structural steel for the support of ductwork.

6. Method of attachment of duct hangers to building construction.

B. Coordinate shop drawings with related contractors prior to submission.

C. Product Data: Material, gauge, type of joints, sealing materials, and reinforcing for each duct size range, including sketches or SMACNA plate numbers for joints, method of fabrication and reinforcing. Include ACGIH figure numbers for hoods if applicable.

1.4 QUALITY ASSURANCE

A. SMACNA: Gauges of materials, fabrication, reinforcement, sealing requirements, installation, and method of supporting ductwork shall be in accordance with the following SMACNA manuals, unless otherwise shown or specified:

1. HVAC Duct Construction Standards
2. Round Industrial Duct Construction Standard
3. Rectangular Industrial Duct Construction Standard

B. Unless otherwise shown or specified, follow the Hood Design Data, and Construction Guidelines for Local Exhaust Systems from the ACGIH Industrial Ventilation Manual.

C. Conform to the applicable requirements of NFPA 90A, 90B, 91, 96, and 101.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Sheet Metal

1. Aluminum: ASTMB-209, Alloy 3003, Temper H-14.
2. Carbon Steel: 16 gauge black iron
3. Galvanized Steel: ASTM A653, ASTM A924, Class LFQ (lock forming quality), coating designation G-60.
4. Galvannealed Steel: ASTM A653, ASTM A924, Class LFQ (lock forming quality), coating designation A-40 (A60).
5. Stainless Steel: AISI Types 302, 304 and 316, as specified.

B. Duct Hangers

1. Strap Hangers: Same material as ducts, except that hangers for stainless steel ducts in unfinished spaces may be galvanized steel.
2. Rod Type Hangers: Mild low carbon steel, unless otherwise specified; fully threaded or threaded each end, with 2 removable nuts each end for positioning and locking rod in place. Unless stainless steel, galvanized or cadmium plated; shop coat with metal primer.

C. Miscellaneous Fasteners and Upper Hanger Attachments

1. Sheet Metal Screws, Machine Bolts and Nuts: Same material as duct, unless otherwise specified.
2. Concrete Inserts: Steel or malleable iron, galvanized; continuously slotted or individual inserts conforming with MSS SP-58, Types 18 & 19, Class A-B.
3. C Clamps: Fee & Mason Co.'s 255L with locking nut, and 255S with retaining strap.
4. Metal Deck Ceiling Bolts: B-Line Systems, Inc.'s Fig. B3019.
5. Welding Studs: Erico Fastening Systems, capacitor discharge, low carbon steel, copper flashed.
6. Structural (carbon) Steel Shapes and Steel Plates: ASTM A36, shop primed.
7. Stainless Steel Shapes and Plates: ASTM A276 and ASTM A666.
8. Machine Bolt Expansion Anchors

a. Non-caulking single unit type: FS FF-S-325, Group II, Type 2, Class 2, Style 1.

b. Non-caulking double unit type: FS FF-S-325, Group II, Type 2, Class 2, Style 2.

c. Self-drilling type: FS FF-S-325, Group III, Types 1 and 2.

2.2 FABRICATION – GENERAL

A. Refer to the ductwork application schedule on the drawings for the types and material usage for the various ductwork types required.

B. Duct sizes shown on the Drawings are inside clear dimensions available for air movement. Verify with duct construction method to determine exterior dimensions for layout and fabrication purposes.

C. Fabricate ductwork from galvanized sheet metal, except as follows:

1. Fabricate the following ductwork from aluminum:

   a. Inlet and discharge ductwork connected to cooling towers and evaporative condensers.

   b. Exhaust ductwork from shower, locker, can washing and steam service rooms, and swimming pool areas.

   c. Dryer exhaust ductwork. Aluminum ductwork for dryer exhaust shall be a minimum of 26 gauge.

2. Fabricate the following ductwork from galvannealed steel:

   a. Ductwork in exposed areas that will be painted.

3. Fabricate the following ductwork from stainless steel:

   a. Exhaust ductwork connected to cooking equipment, dishwashing, and other scullery equipment hoods. Install stainless steel from the individual hood to its respective fan and from the fan to the point of discharge to the outside air. Use AISI Type 302 or 304 stainless steel.

   b. Dryer exhaust ductwork. Dryer exhaust ductwork where penetrating rated walls shall be stainless steel. Provide separation for dissimilar metals as required.

D. Dissimilar Metals: Separate dissimilar metals used for ductwork with 12 oz vinyl coated woven fiberglass duct connector fabric, such as Duro Dyne's Glasseal. No separation is required between screws or rivets and the materials in which they are inserted.

2.3 FABRICATION OF STAINLESS STEEL DUCTS

A. Use minimum No. 18 gauge for exhaust ducts connected to cooking equipment hoods. Use minimum No. 20 gauge for exhaust ducts connected to other hoods. Use miniumum 26 gauge for dryer exhaust ducts.

B. Use stainless steel reinforcing members for ducts in finished spaces and galvanized steel in unfinished spaces.

C. Longitudinal Seams for Dishwashing, and Other Scullery Equipment Exhaust Ducts: Form double corner seams, or Pittsburgh lock seams.

1. Fabricate elbows and transitions with Pittsburgh lock seams.

2. Fabricate double compounded elbows and other complex fittings with double corner seams.

3. Locate seams in horizontal ducts at top corners of ducts, unless otherwise approved in writing.

4. Locate seams in vertical ducts at rear corners of ducts.

D. All exposed stainless steel ductwork shall have a #3 finish.

2.4 REGISTERS AND GRILLES INSTALLED IN EXPOSED DUCTWORK

A. Frames are not required for registers and grilles installed directly in un-insulated exposed ductwork.

B. Cut openings in ducts, forming a double thickness of metal, to attach registers or grilles with sheet metal screws. Bend back edges of openings into duct, on all four (4) sides, a minimum of 1 inch to provide the thickness of metal stated above. Provide felt or sponge rubber gasketing, all four (4) sides of duct openings, for supply grilles and supply registers.

2.5 AIR DIFFUSERS INSTALLED IN EXPOSED DUCTWORK

A. Frames are not required for diffusers installed directly in un-insulated exposed ductwork.

B. Cut and form openings in ducts, to accommodate the specified volume control damper and adjustable equalizing grid assembly. Reinforce openings as required and approved. Provide felt or sponge rubber gasketing, around duct opening, for supply diffuser assemblies.

2.6 VIBRATION ISOLATION FOR DUCTWORK

A. Type: Combination rubber and spring type designed for insertion in a split hanger rod for isolating ductwork from the overhead construction.

1. Approved isolators: Amber Booth Type BSSR, Korfund Type VX, Mason Industries, Type DNHS, Vibration Eliminator Co. Type SNRC and Vibration Mountings and Controls Type RSH.

PART 3 - EXECUTION

3.1 INSTALLATION - GENERAL

A. Install ductwork to allow maximum headroom. Properly seam, brace, stiffen, support, and render ducts mechanically airtight. Adjust ducts to suit job conditions. Dimensions may be changed as approved if cross sectional area is maintained.

B. Provide necessary transformation pieces, and flexible fabric connections for ductwork connected to air handling equipment or air inlet and outlet devices. Flexible fabric connections installed at equipment exterior to the building shall be rated for UV exposure and suitable for exterior use per ASTM G155 leasing requirements. Metal for these connections shall be aluminum or stainless steel, galvanized connections shall not be allowed.

3.2 SEALING SEAMS, JOINTS, AND PENETRATIONS

A. Seal ductwork in accordance with the SMACNA Manual except for the following:

1. Ductwork Specified to be Insulated: Conform with Seal Class A for all pressure classes.
2. Cooking Equipment Exhaust Ductwork: Conform with NFPA 96.
3. Horizontal Ductwork for Dishwashing, and Other Scullery Equipment Exhausts
    a. Continuously solder transverse joints vaportite along bottom, and up both sides two (2) inches minimum.
    b. Continuously solder longitudinal seams vaportite if seams are approved to be located at bottom of duct.
4. Exhaust ductwork joints shall not use sheetmetal screws or other fasteners that protrude into the ductwork to catch lint and debris. Ducts shall insert and adjoin to the next duct or fitting in the direction of airflow. Seal all joints and seams vapor tight with ductwork foil tape.
    a. Commercial dryers or dryer exhaust systems serving multiple appliances shall utilize flanged and gasketed connections.

3.3 HANGERS FOR DUCTS, UNDER 2 INCHES W.G.

A. Install hangers for ducts as specified in the SMACNA Manual, with the following exceptions:

1. Rectangular ducts up to 42 inches wide, not having welded or soldered seams, and supported from overhead construction; extend strap hangers down over each side of the duct and turn under bottom of duct a minimum of two (2) inches. Secure hanger to duct with three (3) full thread sheet metal screws, one (1) in the bottom and two (2) in the side of the duct.
2. Rectangular ducts 43 inches wide and over, and all sizes of duct with welded or soldered seams, and supported from overhead construction; use trapeze hangers.
3. Prime coat plain steel rods threaded at the site immediately after installation with metal primer.
4. Dryer exhaust ductwork shall be supported at 48 inch intervals.

3.4 HANGERS FOR DUCTS, 2 INCHES W.G. AND OVER

A. Install hangers for ducts as specified in the SMACNA Manual, with the following exceptions:

1. Support rectangular ducts with welded seams, regardless of size, by means of trapeze hangers, framed all four (4) sides. Provide minimum 1 x 1 x 1/8 inch angle iron framing for duct having a maximum side dimension up to and including 36 inches in size. Install framing snug to all four (4) sides of duct.

3.5 UPPER HANGER ATTACHMENTS

A. General

1. Secure upper hanger attachments to structural steel or steel bar joists wherever possible.
2. Do not use drive-on beam clamps, flat bars or bent rods, as upper hanger attachments.
3. Do not attach hangers to steel decks which are not to receive concrete fill.
4. Do not attach hangers to precast concrete planks less than 2-3/4 inches thick.
5. Avoid damage to reinforcing members in concrete construction.
6. Metallic fasteners installed with electrically operated or powder driven tools may be used as upper hanger attachments, in accordance with the SMACNA Manual, with the following exceptions:
    a. Do not use powder driven drive pins or expansion nails.
    b. Do not attach powder driven or welded studs to structural steel less than 3/16 inch thick.
    c. Do not support a load, in excess of 250 lbs from any single welded or powder driven stud.
    d. Do not use powder driven fasteners in precast concrete.

B. Attachment to Steel Frame Construction: Provide intermediate structural steel members where required by ductwork support spacing. Select steel members for use as intermediate supports based on a minimum safety factor of five (5).

1. Secure upper hanger attachments to steel bar joists at panel points of joists.
2. Do not drill holes in main structural steel members.

C. Attachment to Concrete Filled Steel Decks

1. New Construction: Install metal deck ceiling bolts.
2. Existing Construction: Install welding studs (except at roof decks).
3. Do not attach hangers to decks less than 2-1/2 inches thick.

D. Attachment to Existing Cast-In Place Concrete

1. Secure hangers to overhead construction with self drilling type expansion anchors and machine bolts.
2. Secure hanger attachments required to be supported from wall or floor construction with single unit expansion anchors or self drilling type expansion anchors and machine bolts.

E. Attachment to Cored Precast Concrete Decks (Flexicore, Dox Plank, Spancrete, etc.): Toggle bolts may be installed in cells for the support of ducts up to a maximum of 60 inches in width.

F. Attachment to Hollow Block or Hollow Tile Filled Concrete Decks

1. New Construction: Omit block or tile and pour solid concrete with cast-in-place inserts.
2. Existing Construction: Break out block or tile to access and install machine bolt anchors at highest practical point on side of web.

G. Attachment to Waffle Type Concrete Decks

1. New Construction: Install cast-in-place inserts.
2. Existing Construction: Install machine bolt expansion anchors at highest practical point on side of web.

H. Attachments to Precast Concrete Tee Construction

1. Secure hangers to tees by any of the following methods:
   a. Tee hanger inserts between adjacent flanges.
   b. Install double unit expansion anchors and machine bolts at highest practical point on side of web.

I. Attachment to Wood Construction

1. Secure strap hangers to the sides of wood beams with one (1) No. 18 x 1-1/2 inch long (minimum) wood screws or two (2) No. 16 x 1-1/2 inch long (minimum) drive screws. Do not hammer in wood screws.
2. Secure rod hangers to angle iron clip angles, bolted or screwed to the sides of the wood beams with 3/8 inch bolts or 3/8 inch lag screws. Install hanger rods with a threaded end through a hole in the angle, secured with a double nut, one (1) above and one (1) below the angle. Do not use lag screws in wood beams, having a nominal face width under 2 inches. Install bolts or lag screws in the side of beams at mid-point or above.
3. Pre-drill holes for lag screws 1/8 inch in diameter less than the root diameter of the lag screw thread.
4. Where wood trusses are approved to support ductwork, hangers may be attached only to the bottom chord. Method of attachment must be specifically approved.
5. Do not secure hanger attachments to nailing strips resting on top of steel beams.

3.6 DUCT RISER SUPPORTS, UNDER 2 INCHES W.G.

A. Support vertical round ducts by means of double-ended split steel pipe riser clamps bearing on floor slabs or adjacent structural members, at every other floor through which the riser passes.

B. Unless otherwise specified or shown on the drawings, support vertical rectangular ducts by means of two steel angles, secured to duct and resting on floor slab or adjacent structural steel member, at every other floor through which the duct passes. Size supports as follows:

MAX. SIDE DIMENSION (inches)	SUPPORT ANGLE (inches)	SECURE TO DUCT WITH	MIN BEARING AT EACH END (inches)

36	1 x 1 x 1/8	Screws	2
48	1-1/2 x 1-1/2 x 1/8	Bolts	3
60	2 x 2 x 1/8	Bolts	3
61 - up	2-1/2 x 2-1/2 x 3/16	Bolts	4

3.7 DUCT RISER SUPPORTS, 2 INCHES W.G. AND OVER

A. Support vertical round ducts by means of double-ended split steel pipe riser clamps welded to the ducts and bearing on floor slabs or adjacent structural members, at every other floor through which the riser passes.

B. Support vertical rectangular ducts by means of two steel angles or channels, anchor bolted to floor slab or adjacent structural member at every other floor through which the riser passes. Secure steel angles or channels to a transverse joint by means of 3/8 inch bolts, or by welding. Size supports as follows:

MAXIMUM SIDE DIMENSION (inches)	SUPPORT ANGLE (inches)	SUPPORT CHANNEL (inches)	MINIMUM BEARING AT EACH END (inches)
36	1 x 1 x 1/8	1 x 1/2 x 1/8	2
48	1-1/2 x 1-1/2 x 1/8	1-1/2 x 3/4 x 1/8	3
60	2 x 2 x 1/8	2 x 1 x 1/8	3
61 - up	2-1/2 x 2-1/2 x 3/16	2 x 1 x 3/16	4

3.8 VIBRATION ISOLATION FOR DUCTWORK

A. Install vibration isolation in accordance with the manufacturer's printed installation instructions, unless otherwise specified.

B. Install in locations shown or scheduled on the Drawings.

C. High Velocity Ductwork Installed within Mechanical Equipment, Machine and Penthouse Mechanical Equipment Rooms: Provide combination rubber and spring type isolators, designed for insertion in a split hanger rod for overhead supported ductwork and double rubber-in-shear isolators for floor supported ductwork. Provide isolators designed for a static deflection of 1/2 inch.

3.9 INSTALLATION

A. Installation shall meet or exceed all applicable federal, state, and local requirements, referenced standards, and conform to codes and ordinances of authorities having jurisdiction.

B. All installation shall be in accordance with manufacturer's published recommendations.

C. Cleanliness

1. Before installing ductwork, wipe ductwork to a visibly clean condition.
2. During construction, provide temporary closures of metal or taped polyethylene on open ductwork and duct taps to prevent construction dust or contaminants from entering ductwork system. Seal ends of ductwork prior to installation to keep ductwork interior clean. Remove closures only for installation of the next duct section.
3. During duration of construction, maintain the integrity of all temporary closures until air systems are activated.

4. Provide openings in ductwork where required to accommodate thermometers, controllers, and other devices. Provide pitot tube openings where required for testing of systems, complete with metal can with spring device or screw to ensure against air leakage. Where openings are provided in insulated ductwork, install insulation material inside a metal ring. Sleeve of pitot tube opening shall be no more than one inch long. Opening shall be one inch wide to accept pitot tube.
5. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.
6. Set plenum doors 6 to 12 inches above floor. Arrange door swings so that fan static pressure holds door in closed position.
7. Provide residue traps in kitchen hood exhaust ducts at base of vertical risers with provisions for cleanout. Use polished stainless steel for ductwork exposed to view and mill stainless steel for ducts where concealed.
8. All visible welds in ductwork between biosafety cabinets, canopy hoods and fume hoods and the ceiling shall be ground and polished.
9. Slope duct toward grilles for moisture-laden ducts. Provide drain and trap at elbow of main moisture exhaust duct system.

D. Exposed Ductwork

1. Remove all markings, stickers, and labels.
2. Completely clean the exterior of all ducts prior to painting, duct is to be painted prior to project completion.
3. All exposed ductwork shall have a 'paintgrip' finish to allow for normal paint application without additional field labor by the painter. See architectural drawings for areas with exposed ceiling to be painted.
4. Any ductwork deemed in unsightly by the Architect/Engineer/Owner will be replaced at the Contractor's expense.

E. Dryer Exhaust Duct

1. All dryer exhaust duct, terminations, and components shall meet the requirements of the Mechanical Code.
2. Do not fasten supports to ductwork with screws or fasteners that penetrate and protrude into the ductwork.
3. Provide fire-stopping around duct penetration in fire-resistance-rated walls or provide a noncombustible wall receptacle for clothes dryer exhaust duct connections.
4. Install an exterior termination approved for use with dryer exhaust applications. Provide with a gravity backdraft damper to prevent debris and pest intrusion. Do not install any mesh screens, cages, grids, or bars over the outlet termination.
5. Exterior termination shall be installed not less than 3 feet in any direction from doors, windows, outside air intakes, attic soffit vents, or any other building openings.
6. For installations of ductwork exceeding 35 feet of equivalent length, install a permanently label within 6 feet of the equipment duct connection that lists the installed installed equivalent length.
7. Commercial dryers shall have ductwork installed with 6" clearance to combustibles.
8. Commercial dryer exhaust duct branches connecting the appliance to the exhaust mains shall be limited to 8 feet in length.
9. Commercial dryer fittings and transitions shall be listed and labeled for clothes dryer applications.

F. Hangers and Supports

1. All ductwork supports shall be in accordance with Table 4-1 (rectangular duct) and Table 4-2 (round duct) of the SMACNA Standards, with all supports directly anchored to the building structure.
2. Rectangular duct shall have at least one pair of supports on minimum 8'-0" (eight feet) centers. All horizontal round and flat oval ducts shall have ducts hangers spaced 10'-0" (ten feet) maximum.
3. Lower attachment of hanger to duct shall be in accordance with Table 4-4 of the SMACNA Standards.
4. Vertical ducts shall be supported where they pass through the floor lines with 1-1/2 inch x 1-1/2 inch x 1/4 inch angles for duct widths up to 60 inches. Above 60 inches in width, the angles must be increased in strength and sized on an individual basis considering space requirements.
5. Hanger straps on duct widths 60 inches and under shall lap under the duct a minimum of 1 inch and have minimum of one fastening screw on the bottom and two on the sides.
6. Hanger straps on duct widths over 60 inches shall be bolted to duct reinforcing with 3/8 inch bolts minimum.

3.10 DUCTWORK SYSTEM CLEANING

A. If the system has been operated without schedule filters or if the integrity of temporary closures has been compromised, Contactor shall have ductwork cleaned according to National Air Duct Cleaners Association (NADCA) Standards by a Certified Regular Member of the NADCA.

B. For ductwork supplying Clean Rooms or patient care areas, also sanitize the ductwork interior per NADCA standards with a biocidal agent approved by the EPA for use in HVAC systems.

C. Before turning the installation over to the Owner, Contractor shall certify that the air handling systems have only been operated with scheduled filters in place. Otherwise, Contractor shall present evidence that the ductwork cleaned as required above.

3.11 TESTING

A. A minimum of 25% of all medium and high pressure duct systems (positive or negative) shall be pressure tested according to SMACNA test procedures (HVAC Air Duct Leakage Test Manual) and ASHRAE Standard 90.1 requirements. The ductwork to be tested shall be 25% of the lineal feet of ductwork mains starting at the air handling unit or fan.

1. Notify Owner minimum seven (7) calendar days in advance of leakage testing.
2. Design pressure for testing ductwork shall be determined from the maximum pressure generated by the fan at the nominal motor horsepower selected.
3. Total allowable leakage shall not exceed 1 percent of the total system design airflow rate.
4. When partial sections of the duct system are tested, the summation of the leakage for all sections shall not exceed the total allowable leakage.
5. Leaks identified during leakage testing shall be repaired by:
    a. Complete removal of the sealing materials.
    b. Thorough cleaning of the joint surfaces.
    c. Installation of multiple layers of sealing materials.
6. The ductwork system to be tested, shall exclude connections downstream of the terminal units (i.e., ductwork shall be capped immediately prior to the terminal units, and tested as described above).

7. After testing has proven that ductwork is installed and performs as specified, the terminal units shall be connected to ductwork and connections sealed with extra care. Contractor shall inform the Owner when joints may be visually inspected for voids, splits, or improper sealing of the joints. If any leakage exists in the terminal unit connections/joints after the systems have been put into service, leaks shall be repaired as specified for other leaks.

B. All low-pressure duct systems (positive or negative) shall be inspected for visible and audible signs of leakage.

C. Leaks identified by inspection shall be repaired by

1. Complete removal of the sealing materials.
2. Thorough cleaning of the joint surfaces.
3. Installation of multiple layers of sealing materials.

D. Discrepancies found during testing and balancing between duct traverses and diffuser/grille readings shall result in re-inspection, repair and retest until discrepancies are eliminated.

E. Ductwork leakage testing and/or inspection shall be performed prior to installation of external ductwork insulation.

END OF SECTION 23 31 13

SECTION 23 33 00
DUCTWORK ACCESSORIES

PART 1 - GENERAL

1.1 SCOPE

A. Perform all Work required to provide and install the ductwork accessories indicated by the Contract Documents with supplementary items necessary for proper installation.

B. Equipment Included in This Section

1. Airflow Control Dampers and Spin-In Fittings
2. Fire Dampers, Smoke Dampers, and Combination Fire and Smoke Dampers
3. Flexible Duct
4. Flexible Duct Elbow Supports
5. Flexible Duct Connections
6. Duct Access Doors
7. Screens
8. Duct Test Holes
9. Turning Vanes
10. Remote Balancing Dampers

1.2 REFERENCES

A. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.

B. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this Project.

C. All materials, installation and workmanship shall comply with the applicable requirements and standards addressed within the following references:

1. AMCA 500D – Laboratory Method of Testing Dampers for Rating
2. AMCA 500L – Laboratory Method of Testing Louvers for Rating
3. NFPA 90A - Installation of Air Conditioning and Ventilating Systems
4. NFPA 101 - Life Safety Code
5. SMACNA - HVAC Duct Construction Standards
6. UL 33 - Heat Responsive Links for Fire-Protection Service
7. UL 555 – Standard for Fire Dampers
8. UL 555C – Standard for Ceiling Radiation Dampers
9. UL 555S – Standard for Smoke Dampers

1.3 SUBMITTALS

A. Product Data

1. Provide product data for shop fabricated assemblies including, but not limited to, volume control dampers, duct access doors, and duct test holes. Provide product data for hardware used.

B. Record Documents

1. Fire Dampers: The damper manufacturer's literature submitted for approval prior to the installation shall include performance data developed from testing in accordance with AMCA 500D standards and shall show the pressure drops for all sizes of dampers required at anticipated air flow rates. Maximum pressure drop through fire damper shall not exceed 0.05-inch water gauge.

2. Combination Fire/Smoke Dampers: Assign identification numbers for each damper with corresponding number noted on Drawings. Provide air quantity, size, free area of damper, pressure drop and proposed velocity through each damper. Provide manufacturer's data of damper and its accessories or options. At Owner's request, provide two (2) dampers (18 inch x 12 inch) for the purpose of illustrating damper operation to Owner's operating and maintenance personnel.

PART 2 - PRODUCTS

2.1 GENERAL

A. All materials shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.

2.2 AIR FLOW CONTROL DAMPERS

A. Acceptable Manufacturers

1. Greenheck
2. Nailor Industries
3. Pottorff
4. Ruskin
5. Tamco
6. United Enertech
7. Louvers & Dampers, Inc.
8. NCA Manufacturing
9. Air Balance

B. Furnish and install dampers where shown on the Drawings and wherever necessary for complete control of airflow, including all supply, return, outside air, and exhaust branches, "division" in main supply, return and exhaust ducts, and each individual air supply outlet. Where access to dampers through a permanent suspended ceiling (gypsum board) is necessary, the Contractor shall be responsible for the proper location of the access doors.

C. Dampers larger than three (3) square feet in area shall be controlled by a self-locking splitter damper assembly.

D. Volume damper blades shall not exceed 48 inches in length or twelve inches in width and shall be of the opposed interlocking type. The blades shall be of not less than No. 16 gauge galvanized steel supported on one-half inch diameter rust-proofed axles. Axle bearings shall be the self-lubricating ferrule type.

E. Volume dampers and other manual dampers shall be carefully fitted, and shall be manually controlled by damper regulators as follows:

1. On exposed non-insulated ductwork the locking quadrant shall be made with a base plate of 16-gauge cold-rolled steel and a heavy die cast handle designed with a 3/8 inch bearing surface. A 1/4 inch-20 zinc plated wing nut shall firmly lock the handle in place.

2. On exposed externally insulated ductwork the regulator shall be 4-1/4 inch diameter, for 1/2 inch rod, designed for use on duct with insulation thickness specified for duct, and shall have four (4) 3/16 inch holes provided to rivet or screw regulator to the duct surface. The flange that covers the raw edge of the insulation shall be high enough so that it slightly compresses the insulation and holds insulation in place. The handle shall be 3/8 inch above the flange, and shall easily turn without roughing up the insulation.

3. On concealed ductwork above inaccessible ceilings, the regulator shall be 2-5/8 inch diameter chromium plated cover plate that telescopes into the base, for 1/2 inch rod. Regulator shall be cast into a box for mounting in ceilings. Base shall be 1-1/2 inch deep. The cover shall be secured by two (2) screws that can be easily removed for damper adjustment.

4. Furnish and install end bearings for the damper rods on the end opposite the quadrant.

F. Spin-in fittings may be used for duct taps to air devices and shall include dampers on all ducts to air devices (diffusers and grilles) even though a volume damper is specified for the air device. Spin-in fittings shall be similar to Flexmaster FLD with BO3 including a 2 inch build-out, nylon bushings, locking quadrant similar to Duro Dyne KR-3, and a 3/8 inch square rod connected to the damper with U-bolts. Spin-in fittings shall be sealed at the duct tap with sealant as specified herein. Determine location of spin-in fittings after terminal units are hung or after location of light fixtures are confirmed to minimize flexible duct lengths and sharp bends.

2.3 FIRE DAMPERS

A. Acceptable Manufacturers

1. Greenheck
2. Nailor Industries
3. Pottorff
4. Ruskin
5. United Enertech
6. Air Balance
7. NCA Manufacturing
8. Leader Industries

B. Each fire damper shall be constructed and tested in accordance with Underwriters Laboratories Safety Standard 555, latest edition. Dampers shall possess a 1-1/2 hour or 3 hour (as appropriate for the construction shown in the architectural Drawings) protection rating 165° F fusible link, and shall bear a U.L. label in accordance with Underwriters' Laboratories labeling procedures. Construct fire dampers such that damper frame material and curtain material are galvanized.

C. Fire dampers shall be curtain blade ”C” type and damper shall be constructed so that the blades and frame are out of the air stream to provide 100 percent free area of duct in which the damper is housed. NOTE: (Blades only out of the airstream represents “B” type damper which is not 100% free area).

D. Equip fire dampers for vertical or horizontal installation as required by location shown on Drawings. Install fire dampers in wall and floor openings utilizing steel sleeves, angles and other materials and practices as required to provide an installation equivalent to that utilized by the manufacturer when the respective dampers were tested by Underwriters Laboratories. Mounting angles shall be minimum 1-1/2 inch by 1-1/2 inch by 16 gauge and bolted, tack welded or screwed to the sleeve at maximum spacing of 12 inches and with a minimum of two (2) connections at all sides. Mounting angles shall overlap at least equal to the duct gauge as defined by

the appropriate SMACNA Duct Construction Standard, latest edition, and as described in NFPA 90A. The entire assembly, following installation, shall be capable of closure with airflow in both directions at 4 inch water gauge static pressure at temperatures up to and withstanding 350° F.

E. All fire dampers shall be dynamic rated type.

F. Completely seal the damper assembly to the building components using manufacturer recommended material(s).

2.4 COMBINATION FIRE/SMOKE DAMPERS

A. Acceptable Manufacturers

1. Greenheck
2. Nailor Industries
3. Pottorff
4. Ruskin
5. United Enertech
6. NCA Manufacturing
7. Air Balance

B. Provide one (1) damper motor for each 12 square feet of damper area.

C. Each combination fire/smoke damper shall be 1-1/2 hour fire rated under UL Standard 555, Current Edition, and shall be further classified by Underwriters Laboratories as a Leakage Rated Damper for use in smoke control systems under the latest version of UL555S, and bear a UL label attesting to same. Damper manufacturer shall have tested and qualified with UL, a complete range of damper sizes covering all dampers required by this Specification. Testing and UL qualifying a single damper size is not acceptable. The leakage rating under UL555S shall be no higher than Leakage Class II 20 CFM per square foot at 4 inches water gauge pressure). Maximum air pressure drop through each combination fire/smoke damper shall not exceed 0.10-inch water gauge at the design air quantity. (Note that this may require a larger damper than the connected duct size.) All ratings shall be dynamic.

D. Damper frame shall be minimum 20-gauge galvanized steel formed into a structural hat channel shape with tabbed corners for reinforcement, as approved in testing by Underwriters Laboratories. Bearings shall be integral high surface area non electrolytic materials construction to incorporate a friction free frame blade lap seal, or molybdenum disulfide impregnated stainless steel or bronze oilite sleeve type turning in an extruded hole in the frame or an extruded frame raceway. Dampers may be either parallel or opposed blade type. Blades shall be constructed with a minimum of 14-gauge equivalent thickness. Blade edge seal material shall be able to withstand 450° F. Jamb seals shall be flexible stainless steel compression type.

E. In addition to the leakage ratings specified herein, combination fire/smoke dampers and their operators shall be qualified under UL555S to an elevated temperature of 350° F. Electric operators shall be installed by the damper manufacturer at the time of damper fabrication. Damper and operator shall be supplied as a single entity that meets all applicable UL555 and UL555S qualifications for both dampers and operators. Manufacturer shall provide a factory-assembled sleeve. Sleeve shall be minimum 20-gauge for dampers where neither width nor height exceeds 48 inches or 16-gauge where either dimension equals or exceeds 48 inches.

F. As part of the UL qualification, dampers shall have demonstrated a capacity to operate (open and close) under HVAC system operation conditions, with pressures at least 4 inches water gauge in the closed position, and 2000 fpm air velocity at 350° F in the open position.

G. Each combination fire/smoke damper, except as noted hereinafter, shall be equipped with a UL Classified firestat/releasing device. The firestat/releasing device shall electrically lock the

damper in a closed position when the duct temperatures exceed 165° F and still allow the appropriate authority to operate the damper as may be required for smoke control functions. Damper must be operable while the temperature is above 350° F. Actuator/operator package shall include two (2) damper position indicator switches linked directly to damper blade to provide capability of remotely indicating damper position. One (1) switch shall close when the damper is fully open, and the other switch shall close when the damper is fully closed. The firestat/releasing device and position indicator switches shall be capable of interfacing electrically with the smoke detectors, building fire alarm system, and remote indicating/control stations or building automation system (BAS).

H. Damper releasing device shall be mounted within the airstream. Device shall be activated and the damper shall close and lock when subjected to duct temperatures in excess of approximately 350° F.

I. Motors for operation of smoke dampers shall be smoke system fail safe, spring return normally open supplies and normally closed returns, or as indicated on the Drawings, and shall be furnished and installed by the damper manufacturer as required by the U.L. rating mentioned above. Motors shall be electric to match the type of temperature control system specified elsewhere in this Specification. Furnish all required relays, EP switches, wiring piping and other labor and material necessary to completely interconnect the smoke detector system.

J. Furnish each damper in a square or rectangular configuration. Furnish and install sleeves manufactured by the approved damper manufacturer for each damper. Construct sleeves with square or rectangular to square, rectangular, round, or oval adapters as required. Dampers shall be installed in the sleeves in accordance with manufacturer's U.L. installation instructions. The entire assembly, following installation, shall operate smoothly and be capable of withstanding 6 inch water gauge static pressure.

K. Each combination fire/smoke damper shall be equipped with a Damper Test Switch. The damper test switch will have the ability to "cycle test" the fire/smoke damper by pushing and holding the test button until the damper has cycled.

L. All combination fire/smoke dampers shall be dynamic type.

M. Completely seal the damper assembly to the building components using manufacturer recommended material(s).

2.5 SMOKE DAMPERS

A. Acceptable Manufacturers

1. Greenheck
2. Nailor Industries
3. Pottorff
4. Ruskin
5. United Enertech

B. Provide one (1) damper motor for each 12 square feet of damper area.

C. Each smoke damper shall be dynamic rated type and shall be further classified by Underwriters Laboratories as a Leakage Rated Damper for use in smoke control systems under the latest version of UL555S, and bear a UL label attesting to same. Damper manufacturer shall have tested, and qualified with UL, a complete range of damper sizes covering all dampers required by this Specification. Testing and UL qualifying a single damper size is not acceptable. Leakage rating under UL555S shall be no higher than Leakage Class II (20 CFM per square foot at 4 inches water gauge pressure). Maximum air pressure drop through each smoke damper shall not exceed 0.10-inch water gauge at the design air quantity. (Note that this may require a larger damper than the connected duct size.) All ratings shall be dynamic.

D. Damper frame shall be minimum 20-gauge galvanized steel formed into a structural hat channel shape with tabbed corners for reinforcement, as approved in testing by Underwriters Laboratories. Bearings shall be stainless steel sleeve type turning in an extruded hole in the frame or an extruded frame raceway. Dampers shall be opposed blade type. Blades shall be airfoil shaped double skin construction. Blade edge seal material shall be silicone rubber designed to withstand 450° F. Jamb seals shall be Stainless Steel metal compression type.

E. In addition to the leakage ratings specified herein, smoke dampers and their operators shall be qualified under UL555S to an elevated temperature of 350° F. Electric operators shall be installed by the damper manufacturer at the time of damper fabrication. Damper and operator shall be supplied as a single entity that meets all applicable UL555 and UL555S qualifications for both dampers and operators. Manufacturer shall provide factory-assembled sleeve. Sleeve shall be minimum 20-gauge for dampers where neither width nor heights exceeds 48 inches or 16-gage where either dimensions equals or exceeds 48 inches.

F. As part of the UL qualification, dampers shall have demonstrated a capacity to operate (open and close) under HVAC system operation conditions, with pressures of at least 4 inches water gauge in the closed position, and 2000 fpm air velocity in the open position.

G. The damper must be operable while the temperature is above 350° F. The actuator/operator package shall include two (2) damper position indicator switches linked directly to damper blade to provide capability of remotely indicating damper position. One (1) switch shall close when the damper is fully open, and the other switch shall close when the damper is fully closed. Position indicator switches shall be capable of interfacing electrically with the smoke detectors, building fire alarm systems, and remote indicating/control stations (BAS).

H. Motors for operation of smoke dampers shall be smoke system fail safe, spring return normally open supplies and normally closed returns, or as indicated on the Drawings, and shall be furnished and installed by the damper manufacturer as required by the UL rating mentioned above. Motors shall be electric to match the type of temperature control system specified elsewhere in this Specification. Furnish all required relays, EP switches, wiring piping and other labor and material necessary to completely interconnect the smoke detector system.

I. Furnish each damper in a square or rectangular configuration. Furnish and install sleeves manufactured by the approved damper manufacturer for each damper. Construct sleeves with square or rectangular to square, rectangular, round, or oval adapters as required. Install dampers in the sleeves in accordance with manufacturer's UL installation instructions. The entire assembly, following installation, shall be capable of closure with airflow in both directions at 4 inch water gauge static pressure at temperatures up to and withstanding 350° F.

J. Each smoke damper shall be equipped with a damper test switch. The damper test switch will have the ability to "cycle test" the fire/smoke damper by pushing and holding the test button until the damper has cycled.

K. All smoke dampers shall be dynamic type.

L. Completely seal the damper assembly to the building components.

2.6 FLEXIBLE DUCTS

A. Acceptable Manufacturers

1. Flexmaster U.S.A., Inc.
2. McGill AirFlow LLC.
3. Ward Industries, Inc.; a division of Hart & Cooley, Inc.
4. Thermaflex

B. Insulated, Flexible Duct:

1. Certifications:
    a. UL 181,
    b. ETL Class 1
    c. NFPA 90A and 90B
    d. Greenguard
2. Construction:
    a. Single ply inner liner constructed of chlorinated polyethylene
    b. Corrosion resistant galvanized steel core
    c. Fibrous glass insulation with a minimum value of R-6.
    d. Polyethylene vapor barrier film
3. Pressure Rating: 6-inch wg positive and 2-inch wg negative
4. Maximum Air Velocity: 5000 fpm
5. Temperature Range: -10° F to 160° F
6. Flame spread rating less than 25
7. Smoke developed rating of less than 50

2.7 FLEXIBLE DUCT ELBOW SUPPORTS

1. Acceptable Manufacturers
    a. Build Right Products - FlexRight
    b. Thermaflex – FlexFlow Elbow
    c. RPS - FlowRite
2. Construction
    a. Universal-mount, 1-piece, fully adjustable, radius-forming brace to support 4-inch through 16-inch diameter flexible air ducts.
    b. Classified: UL 2043.
    c. Material: 100 percent recycled copolymer polypropylene.
    d. Support Frame Radius: 8 inches.
    e. Compliance for Flexible Duct Radius:
        1) SMACNA HVAC Duct Construction Standards.
        2) ASHRAE Advanced Energy Design Guides.
        3) ADC Flexible Duct Performance and Installation Standards.

2.8 FLEXIBLE CONNECTIONS

A. Where ducts connect to equipment, flexible connections shall be made using “Flexmaster TL-M” or “Ventglas” fabric that is temperature-resistant, fire-resistant, waterproof, mildew-resistant and practically airtight, weighing approximately thirty ounces (30 oz.) per square yard.

B. Material used outdoors shall be resistant to ultra-violet sunrays. There shall be a minimum of 1/2" slack in the connections, and a minimum of 2 1/2" inches distance between the edges of the ducts. This does not apply to air handling units with internal isolation. A more rugged flexible material that is resistant to ultra-violet rays needs to be used when connecting an exhaust fan or exhaust air plenum to ductwork.

2.9 DUCT ACCESS DOORS

A. Acceptable Manufacturers
   1. Greenheck
   2. Kees
   3. Nailor Industries
   4. Pottorff
   5. Ruskin

B. Furnish and install in the ductwork, hinged rectangular, or round "spin-in" access doors to provide access to the following items:
   1. Major changes of direction in horizontal ducts connected to cooking equipment hoods and vertical grease duct risers as required by code for system cleaning. Refer to NFPA 96 and Specification Section 233113 for additional requirements.
   2. Motor operated dampers.
   3. Manually operated volume control devices.
   4. Fire, fire/smoke, and smoke dampers.
   5. Mixed air plenums
   6. In-line damper actuators installed in air stream.
   7. Heating coils (install upstream)
   8. Duct mounted humidifiers (upstream and downstream)
   9. Airflow stations
   10. Air filters replacement doors
   11. All locations where operating parts of any kind are installed in the ductwork and elsewhere as indicated on the plans.

C. Access doors are not required, where a manually operated damper has an exposed damper regulator, with an indicating quadrant.

D. Where ductwork is insulated, access doors shall be double skin doors with 1” of insulation in the door.

E. Door Size
   1. Door opening shall be adequately sized and positioned to allow for maintenance / replacement of any components located inside the ductwork. Based on the maximum duct dimension the following access door size minimum requirements are as follows:
      a. 8” max duct dimension - One (1)-Hand or Inspection Access: 8” x 6” access door
      b. 12” max duct dimension - Two (2)-Hand Access: 12” x 10” or 10” diameter access door
      c. 18” max duct dimension - Head and Hand Access: 16” x 12” or 16” diameter access door
      d. 26” max duct dimension - Head and Shoulders Access: 24” x 16” or 22” diameter access door
      e. 30” max duct dimension - Body Access: 26” x 14” or 24” diameter access door
      f. All other sizes - Body plus Ladder Access: 26” x 18” or 26” diameter access door

2. For duct access doors smaller than 16” x 12” Ventlok No. 90 sash style latches shall be used. For duct access doors 16” x 12” or larger Ventlok No. 260 latches shall be used.

3. A minimum of two latches are required for all access doors are required. Provide additional latches as needed to ensure the access door is sealing properly and there is not noticeable air leakage or air noise associated with the access door.

F. All access doors shall have a continuous gasket.

G. Round access doors shall be "Inspector Series" spin-in type door as manufactured by Flexmaster USA.

H. Where access doors are installed above a gyp board ceiling, this Contractor shall be responsible for providing and installing a ceiling access door of adequate size to utilize the access door and position it in the proper location.

2.10 SCREENS

A. Furnish and install screens on all duct, fan, etc., openings furnished by this Contractor which lead to, or are located outdoors.

B. Screens shall be No. 16 gauge, 1/2" mesh in removable frame as noted on drawings. Mesh and frame to be galvanized steel or aluminum as noted on the drawings.

C. Provide safety screens meeting OSHA requirements for protection of maintenance personnel on all fan inlets and fan outlets to which no ductwork is connected.

2.11 TURNING VANES

A. Acceptable Manufacturers

1. Ductmate Industries, Inc.
2. Duro Dyne Inc.
3. METALAIRE, Inc.
4. SEMCO Incorporated.
5. Hart & Cooley, Inc.

B. Manufactured Turning Vanes for Metal Ducts: Curved blades of galvanized sheet steel; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.

1. Acoustic Turning Vanes: Fabricate airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill.

C. Manufactured Turning Vanes for Nonmetal Ducts: Fabricate curved blades of resin-bonded fiberglass with acrylic polymer coating; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.

D. Contractor fabricated turning vanes are acceptable provided they meet the requirements in this section.

E. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 2-3, "Vanes and Vane Runners," and 2-4, "Vane Support in Elbows."

F. Vane Construction: Single wall for ducts up to 48 inches wide and double wall for larger dimensions.

2.12 REMOTE DAMPER OPERATORS

A. Acceptable Manufacturers

1. Pottorff; a division of PCI Industries, Inc.
2. Ventfabrics, Inc.
3. Young Regulator Company

4. United Enertech

B. Description: Cable system designed for remote manual damper adjustment.

C. Tubing: Brass

D. Cable: Stainless steel

E. Wall-Box Mounting: Recessed, 2 inches deep Surface

F. Wall-Box Cover-Plate Material: Stainless steel

G. Coordinate the location of the wall box with Architect / Engineer prior to installation.

H. Required Locations:

1. Diffusers installed in hard ceilings.
2. Where dampers are not accessible due to congested ceilings.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.

B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.

C. Volume Dampers

1. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.
2. Install steel volume dampers in steel ducts.
3. Install aluminum volume dampers in aluminum ducts.
4. Set dampers to fully open position before testing, adjusting, and balancing.
5. Position damper adjacent to the branch connection to the main when possible. Locate as far as from the opening it serves in all other instances.

D. Test Holes

1. Install test holes at fan inlets and outlets and elsewhere as indicated.
2. Install duct test holes where required for testing and balancing purposes.
3. Install test holes in locations as required to measure pressure drops across each item in the system, e.g., outside air louvers, filters, fans, coils, intermediate points in duct runs, etc.

E. Fire, Fire / Smoke, Smoke Dampers

1. Install fire, fire / smoke and smoke dampers according to UL listing.
2. Provide fire dampers, and combination fire and smoke dampers at locations indicated, where ducts and outlets pass through fire rated components. Install with required perimeter mounting angles, sleeves, breakaway duct connections, corrosion resistant springs, bearings, bushings and hinges.
3. Fire and combination fire and smoke damper access panels shall be labeled with the words “Fire Damper” in letters not less than 1 inch (25 mm) in height.

4. Install each fire and combination fire and smoke damper square and true to the building. The installation shall not place pressure on the damper frame, but shall enclose the damper as required by UL555 and UL555S.

F. Duct Access Doors

1. Install duct access doors on sides or bottoms of ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:
    a. On both sides of duct coils.
    b. Upstream from duct filters.
    c. At outdoor-air intakes and mixed-air plenums.
    d. At drain pans and seals.
    e. Downstream from manual volume dampers, control dampers, backdraft dampers, and equipment.
    f. Adjacent to and close enough to fire or smoke dampers, to reset or reinstall fusible links. Access doors for access to fire or smoke dampers having fusible links may be pressure relief access doors. If pressure relief access doors are used, they shall be outward operation for access doors installed upstream from dampers and inward operation for access doors installed downstream from dampers.
    g. At each change in direction and at maximum 50-foot spacing.
    h. Upstream or downstream from duct silencers.
    i. Control devices requiring inspection.
    j. Elsewhere as indicated.
2. Install access doors with swing against duct static pressure.
3. Label access doors according to Division 23 Section "Mechanical Identification" to indicate the purpose of access door.

G. Flexible Connections

1. Install flexible connectors to connect ducts to equipment.
2. Flexible fabric connections installed at equipment exterior to the building shall be rated UV exposure and suitable for exterior use per ASTM G155 testing requirements. Metal for these connections shall be aluminum or stainless steel, galvanized connections shall not be allowed.
3. For fans developing static pressures of 5-inch wg and more, cover flexible connectors with loaded vinyl sheet held in place with metal straps.
4. Provide flexible connections immediately adjacent to equipment in ducts associated with fans and motorized equipment. Cover connections to medium and high pressure fans with leaded vinyl sheet, held in place with metal straps.
5. Install thrust limits at centerline of thrust, symmetrical on both sides of equipment. Attach thrust limits at centerline of thrust and adjust to a maximum of 1/4-inch movement during start and stop of fans.

H. Flexible Duct

1. Connect terminal units to supply ducts directly or with maximum 36-inch lengths of flexible duct. Do not use flexible ducts to change directions.
2. Fittings on terminal units and on sheet metal duct shall have flexible duct core slipped over duct and coupling or clamp tightened, then connection sealed with sealant.

Insulation of flexible duct shall be slipped over connection to point where insulation abuts terminal unit or insulation on duct.

3. These insulation connections shall be sealed by embedding fiberglass tape in the sealant and coating with more sealant to provide a vapor barrier.
4. The terminal ends of the duct core shall be secured by compression coupling or stainless steel worm gear type clamp.
5. Connect diffusers to ducts directly or with maximum 60-inch lengths of flexible duct clamped or strapped in place.
6. Support flexible ducts as per SMACNA standards to prevent sags, kinks and to have 90 degree turns.

I. Flexible Duct Elbow Supports

1. Install flexible duct elbow supports in accordance with manufacturer's instructions.
2. Install flexible duct elbow supports over outer jacket of flexible ducts to form smooth, 90-degree bends to eliminate flexible duct kinks and airflow restrictions.
3. Make bends in flexible ducts with minimum of 1-duct diameter centerline radius.
4. Install flexible duct elbow supports at flexible duct 90-degree bends at following locations:
   a. Diffusers.
   b. Grilles.
   c. Registers.
   d. Duct take-offs and taps.
   e. Air devices with round inlets and outlets.
   f. HVAC equipment with round inlets and outlets.
   g. As indicated on the Drawings.

J. Balancing Dampers

1. Provide balancing dampers at points on low pressure supply, return, and exhaust systems where branches are taken from larger ducts as required for air balancing.
2. Provide all dampers furnished by the BAS Provider in strict accordance with manufacturer’s written installation instruction and requirements of these Specifications.

K. Backdraft Dampers

1. Provide backdraft dampers on exhaust fans or exhausts ducts where indicated. Install dampers so that they will open freely.

L. General Installation

1. All installation shall be in accordance with manufacturer’s published recommendations.
2. Furnish and install Ventlok No. 699 instrument test holes in the return air duct and in the discharge duct of each fan unit.
3. Access doors as specified elsewhere shall be provided for access to all parts of the fire and combination fire and smoke dampers. Doors shall open not less than 90 degrees following installation and shall be insulated type where installed in insulated ducts.

3.2 TESTING

A. After each fire damper, smoke damper and combination fire and smoke damper has been installed and sealed in their prescribed openings and prior to installation of ceilings, Contractor shall, as directed by Owner, activate part or all dampers as required to verify “first-time” closure.

B. Activation of damper shall be accomplished by manually operating the resettable link, disconnecting the linkage at the fire damper fusible link, and manually operating the fire/smoke damper through the electronic controls as appropriate.

C. Failure of damper to close properly and smoothly on the first attempt will be cause to replace the entire damper assembly.

D. Coordinate smoke damper system interlock requirements with the fire alarm system.

END OF SECTION

SECTION 23 34 25
HVAC POWER VENTILATORS

PART 1 - GENERAL

1.1 SCOPE

A. Perform all work required to provide and install the Power Ventilators indicated by the Contract Documents with supplementary items necessary for proper installation.

B. Equipment Included in This Section:

1. Ceiling-mounting ventilators.
2. In-line centrifugal fans.

1.2 REFERENCES

A. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.

B. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this Project.

C. All materials, installation and workmanship shall comply with the applicable requirements and standards addressed within the following references:

1. AFBMA 9 - Load Ratings and Fatigue Life for Ball Bearings
2. AFBMA 11 - Load Ratings and Fatigue Life for Roller Bearings
3. AMCA 99 - Standards Handbook
4. ACMA 203 - Fan Application Manual - Field Performance Measurements
5. AMCA 204 - Balance Quality and Vibration Levels For Fans
6. AMCA 210 - Laboratory Methods of Testing Fans for Aerodynamic Performance Rating
7. AMCA 300 - Reverberant Room Method for Sound Testing of Fans
8. AMCA 301 - Methods for Calculating Fan Sound Ratings from Laboratory Test Data
9. NEMA MG1 - Motors and Generators
10. NFPA 70 - National Electrical Code
11. SMACNA - HVAC Duct Construction Standards - Metal and Flexible
12. UL 705 – Power Ventilators

1.3 SUBMITTALS

A. Product Data: Include rated capacities, furnished specialties, and accessories for each type of product indicated and include the following:

1. Certified fan performance curves with system operating conditions indicated
2. Certified fan sound-power ratings
3. Motor ratings and electrical characteristics, plus motor and electrical accessories
4. Material thickness and finishes, including color charts
5. Dampers, including housings, linkages, and operators
6. Roof curbs
7. Fan speed controllers

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1. Wiring Diagrams: Power, signal, and control wiring.
2. Design Calculations: Calculate requirements for selecting vibration isolators and seismic restraints and for designing vibration isolation bases.
3. Vibration Isolation Base Details: Detail fabrication, including anchorages and attachments to structure and to supported equipment. Include auxiliary motor slides and rails, and base weights.

C. Coordination Drawings: Reflected ceiling plans and other details, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:
1. Roof framing and support members relative to duct penetrations.
2. Ceiling suspension assembly members.
3. Size and location of initial access modules for acoustical tile.
4. Ceiling-mounted items including light fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.

D. Field quality-control test reports.

E. Operation and Maintenance Data: For power ventilators to include in emergency, operation, and maintenance manuals.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Performance Ratings: Conform to AMCA 210 and bear the AMCA Certified Rating Seal.

C. Sound Ratings: AMCA 301, tested to AMCA 300, and bear AMCA Certified Sound Rating Seal. The sound power levels must not exceed those indicated on Drawings.

D. Fabrication: Conform to AMCA 99.

E. Performance Base: 50 feet above sea level.

F. Fans shall be capable of operating stably at reduced loads imposed by means of variable speed drives.

G. NEMA Compliance: Motors and electrical accessories shall comply with NEMA standards.

H. UL Standard: Power ventilators shall comply with UL 705.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver fans as factory-assembled unit, to the extent allowable by shipping limitations, with protective crating and covering.

B. Disassemble and reassemble units, as required for moving to final location, according to manufacturer's written instructions.

C. Lift and support units with manufacturer's designated lifting or supporting points.

1.6 COORDINATION

A. Coordinate size and location of structural-steel support members.

B. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.

C. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 07 Section "Roof Accessories."

1.7 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Belts: Two (2) sets for each belt-driven unit.

PART 2 - PRODUCTS

2.1 CEILING-MOUNTED VENTILATORS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Broan Mfg. Co., Inc.
2. Greenheck
3. Loren Cook Company
4. NuTone Inc.
5. Pennbarry
6. Soler & Palau
7. Captiveaire

C. Description: Centrifugal fans designed for installing in ceiling or wall or for concealed in-line applications.

D. Housing: Steel, lined with acoustical insulation.

E. Fan Wheel: Centrifugal wheels directly mounted on motor shaft. Fan shrouds, motor, and fan wheel shall be removable for service.

F. Grille: Plastic louvered grille with flange on intake and thumbscrew attachment to fan housing.

G. Electrical Requirements: Junction box for electrical connection on housing and receptacle for motor plug-in.

H. Accessories

1. Variable-Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent.
2. Manual Starter Switch: Single-pole rocker switch assembly with cover and pilot light.
3. Time-Delay Switch: Assembly with single-pole rocker switch, timer, and cover plate.
4. Motion Sensor: Motion detector with adjustable shutoff timer.
5. Ceiling Radiation Damper: Fire-rated assembly with ceramic blanket, stainless-steel springs, and fusible link.
6. Filter: Washable aluminum to fit between fan and grille.
7. Isolation: Rubber-in-shear vibration isolators.
8. Manufacturer's standard roof jack or wall cap, and transition fittings.

I. Capacities and Characteristics:

1. As scheduled on Drawings

2.2 IN-LINE CENTRIFUGAL FANS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Acme
2. Greenheck
3. Loren Cook Company
4. Pennbarry
5. Soler & Palau
6. Captiveaire

C. Description: In-line, direct-driven centrifugal fans consisting of housing, wheel, outlet guide vanes, fan shaft, bearings, motor and disconnect switch, drive assembly, mounting brackets, and accessories.

D. Housing: Split, spun aluminum with aluminum straightening vanes, inlet and outlet flanges, and support bracket adaptable to floor, side wall, or ceiling mounting.

E. Direct-Driven Units: Motor mounted in airstream, factory wired to disconnect switch located on outside of fan housing; with wheel, inlet cone, and motor on swing-out service door.

F. Belt-Driven Units: Motor mounted on adjustable base, with adjustable sheaves, enclosure around belts within fan housing, and lubricating tubes from fan bearings extended to outside of fan housing.

G. Fan Wheels: Aluminum, airfoil blades welded to aluminum hub.

H. Accessories

1. Variable-Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent.
2. Volume-Control Damper: Manually operated with quadrant lock, located in fan outlet.
3. Companion Flanges: For inlet and outlet duct connections.
4. Fan Guards: 1/2- by 1-inch mesh of galvanized steel in removable frame. Provide guard for inlet or outlet for units not connected to ductwork.
5. Motor and Drive Cover (Belt Guard): Epoxy-coated steel.

I. Capacities and Characteristics

1. As scheduled on Drawings
2. Vibration Isolators:
   a. As scheduled on Drawings

2.3 MOTORS

A. Comply with requirements in Division 23 Section "Common Motor Requirements for HVAC Equipment."

B. Enclosure Type: Totally enclosed, fan cooled.

2.4 SOURCE QUALITY CONTROL

A. Sound-Power Level Ratings: Comply with AMCA 301, "Methods for Calculating Fan Sound Ratings from Laboratory Test Data." Factory test fans according to AMCA 300, "Reverberant Room Method for Sound Testing of Fans." Label fans with the AMCA-Certified Ratings Seal.

B. Fan Performance Ratings: Establish flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests and ratings according to AMCA 210, "Laboratory Methods of Testing Fans for Rating."

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install power ventilators level and plumb.

B. Support units using mounts and isolators as scheduled on drawings having a static deflection as scheduled. Vibration- and seismic-control devices are specified in Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment."

1. Secure vibration and seismic controls to concrete bases using anchor bolts cast in concrete base.

C. Install floor-mounting units on concrete bases. Concrete, reinforcement, and formwork requirements are specified in Division 03 Section "Cast-in-Place Concrete."

D. Install floor-mounting units on concrete bases designed to withstand, without damage to equipment, the seismic force required by code. Concrete, reinforcement, and formwork requirements are specified in Division 03 Section "Cast-in-Place Concrete."

E. Secure roof-mounting fans to roof curbs with cadmium-plated hardware. Refer to Division 07 Section "Roof Accessories" for installation of roof curbs.

F. Ceiling Units: Suspend units from structure; use steel wire or metal straps.

G. Support suspended units from structure using threaded steel rods and hangers/supports having a static deflection as scheduled on Drawings. Vibration-control devices are specified in Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment."

H. Install units with clearances for service and maintenance.

I. Label units according to requirements specified in Division 23 Section "Identification for HVAC Piping and Equipment."

3.2 CONNECTIONS

A. Duct installation and connection requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors. Flexible connectors are specified in Division 23 Section "Air Duct Accessories."

B. Install ducts adjacent to power ventilators to allow service and maintenance.

C. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

D. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.3 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:

1. Verify that shipping, blocking, and bracing are removed.

2. Verify that unit is secure on mountings and supporting devices and verify connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.

3. Verify that cleaning and adjusting are complete.

4. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align and adjust belts, and install belt guards.

5. Adjust belt tension.

6. Adjust damper linkages for proper damper operation.

7. Verify lubrication for bearings and other moving parts.
8. Verify that manual and automatic volume control and fire and smoke dampers in connected ductwork systems are in fully open position.
9. Disable automatic temperature-control operators, energize motor and adjust fan to indicated rpm, and measure and record motor voltage and amperage.
10. Shut unit down and reconnect automatic temperature-control operators.
11. Remove and replace malfunctioning units and retest as specified above.

B. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.4 ADJUSTING

A. Adjust damper linkages for proper damper operation.

B. Adjust belt tension.

C. Refer to Division 23 Section "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing procedures.

D. Replace fan and motor pulleys as required to achieve design airflow.

E. Lubricate bearings.

END OF SECTION

SECTION 23 37 00
AIR INLETS AND OUTLETS

PART 1 - GENERAL

1.1 SCOPE

A. Perform all Work required to provide and install the air inlets and outlets indicated by the Contract Documents with supplementary items necessary for proper installation.

B. Equipment Included in This Section:

1. Grilles, Registers and Diffusers

1.2 REFERENCES

A. Equipment and Installation shall meet the requirements outlined in the following references:

1. ACGIH: American Conference of Governmental Industrial Hygienists
2. AMCA: Air Movement and Control Association
3. NFPA: National Fire Protection Association
4. SMACNA: Sheet Metal and Air Conditioning Contractors National Association, Inc.
5. UL: Underwriters Laboratories, Inc.
6. AMCA 500 – Test Method for Louvers, Dampers and Shutters
7. ANSI/NFPA 90A – Installation of Air Conditioning and Ventilating Systems

   ASHRAE 70 – Method of Testing for Rating the Air Flow Performance of Outlets and Inlets

1.3 SUBMITTALS

A. Product Data: (For Each Product)

1. Catalog cut-sheets
2. Indicate materials of construction, finish and mounting details
3. Mounting details
4. Installation instructions
5. Performance data (at actual operating conditions)
   a. Throw and drop
   b. Static-pressure drop
   c. Noise ratings
6. Inlet and Outlet Schedule: Indicate drawing designation, room location, quantity, model number, size, and accessories furnished.

B. Submit color and finish samples for all louvers.

1.4 QUALITY ASSURANCE

A. All materials shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.

B. Grilles, registers and diffusers shall be as scheduled on the Drawings. Grilles, registers and diffusers shall be provided with sponge rubber or soft felt gaskets where noted on the Drawings. Grilles, slot diffusers and laminar flow bars shall not be internally insulated.

C. If a manufacturer other than the one scheduled is used, the sizes shown on the Drawings shall be checked for performance, noise level, face velocity, throw, pressure drop, etc., before the submittal is made. Selections shall meet the manufacturer's own published data for the above performance criteria. The throw shall be such that the velocity at the end of the throw in the five (5) foot occupancy zone will not exceed 50 fpm or be less than 25 fpm except where indicated otherwise. Noise levels shall not exceed those published in ASHRAE for the type of space being served (NC level).

D. Locations of air distribution devices on Drawings are approximate and shall be coordinated with other trades to make symmetrical patterns and shall be influenced by the established general pattern of the lighting fixtures or architectural reflected ceiling plan, but primarily located to maintain proper air distribution. Where called for on Drawings, grilles, registers and diffusers shall be provided with deflecting devices and manual dampers. These grilles, registers, and diffusers shall be the standard product of the manufacturer, and subject to review by the Architect.

E. Provide a frame compatible with the type of ceiling or wall in which the devices are installed. Refer to Architectural Drawings for exact type of ceiling specified.

F. Coordinate color and finish of the devices with the Architect.

PART 2 - PRODUCTS

2.1 GRILLES, REGISTERS, AND DIFFUSERS

A. Acceptable Manufacturers

1. Anemostat
2. Carnes
3. Krueger
4. Nailor
5. Price
6. Titus
7. Tuttle & Baily

B. Square Panel Face diffuser – Supply and Return

1. Architectural diffuser with a square panel face, centered within a square housing. The exposed surface of the face panel shall be smooth, flat and free of visible fasteners.
2. The diffuser shall have a 22-gauge steel face panel that captures a secondary 22-gauge panel. The panel shall project a maximum of 1/4" below the outside border of the diffuser.
3. For area of high moisture content or requiring non-ferrous materials, the diffuser shall be constructed of 22-gauge aluminum. This includes a 22-gauge aluminum panel that captures a secondary panel.
4. The face panel size shall be a minimum of 18" x 18" for 24" x 24" diffusers and 9" x 9" for 12" x 12" diffusers.
5. Accessories:
    a. Drawings that depict two-way and three-way throw options are achieved with the use of filler panel (where required) for directional throw diffusers.
    b. Opposed blade volume dampers shall be provided with the diffuser, if noted on the Drawings. The damper shall be operational from the face of the diffuser.

c. Although the manufacturers show this model being used only as a supply air device, this same diffuser can also be used as a return air device. The neck connection shall be the largest available neck size provided by the manufacturer.

C. Perforated Face Ceiling diffusers – Return and Exhaust

1. Perforated face with back pan, removable face, and neck sizes as indicated on Drawings. Diffuser is available with round or square neck sizes.
2. Perforated face to consist of 3/16” diameter holes on 1/4" staggered centers. A minimum of 51% free area shall be available.
3. Fabricate completely of 22-gauge steel with a baked enamel off-white finish.
4. The diffuser shall have a 22-gauge steel face panel that captures a secondary 22-gauge panel. The panel shall project a maximum of 1/4" below the outside border of the diffuser.
5. For areas of high moisture content or requiring non-ferrous materials, the diffuser shall be constructed of 22-gauge aluminum.
6. Accessories:
   a. Opposed blade volume dampers shall be provided with the diffuser, if noted on the Drawings. The damper shall be operational from the face of the diffuser.

D. Perforated Face Ceiling Diffusers – Supply

1. Perforated face with fully adjustable pattern and removable face.
2. Perforated face to consist of 3/16” diameter holes on 1/4" staggered centers. A minimum of 51% free area shall be available.
3. Fabricate completely of 22-gauge steel with a baked enamel off-white finish.
4. The diffuser shall have a 22-gauge steel face panel that captures a secondary 22-gauge panel. The panel shall project a maximum of 1/4" below the outside border of the diffuser.
5. For areas of high moisture content or requiring non-ferrous materials, the diffuser shall be constructed of 22-gauge aluminum.
6. Provide multi-louvered equalizing grid where noted on Drawings.
7. Accessories:
   a. Opposed blade volume dampers shall be provided with the diffuser, if noted on the Drawings. The damper shall be operational from the face of the diffuser.

E. Registers and Grilles – Supply

1. Aluminum or Steel, as scheduled.
2. 1 1/4" wide borders to have a minimum of thickness of 0.032” for sizes under 24” x 24”. Larger sizes shall be constructed of 0.040” or thicker material.
3. Screw holes to be used for mounting, shall be countersunk.
4. Blades shall be spaced on 3/4" centers.
5. Opposed blade damper with removable key operator, operable from face, shall only be provided with registers or as noted on the Drawings.

F. Registers and Grilles – Return and Exhaust

1. Aluminum or Steel, as scheduled.
2. 1 1/4" wide borders to have a minimum thickness of 0.032” for sizes under 24” x 24”. Larger sizes shall be constructed of 0.040” or thicker material.

3. Screw holes to be used for mounting, shall be countersunk.
4. Blades shall be spaced on 3/4" centers.
5. Opposed blade damper with removable key operator, operable from face shall only be provided with registers or as noted on the Drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General

1. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.
2. All installation shall be in accordance with manufacturer's published recommendations.

B. Diffusers

1. Check location of air outlets and inlets and make necessary adjustments in position to conform to architectural features, reflected ceiling plans, symmetry, and lighting arrangement.
2. Install air outlets and inlets to ductwork with airtight connection.
3. Provide balancing dampers on duct take-off to diffusers, grilles and registers, regardless of whether dampers are specified as part of the diffuser, grille, or register assembly.
4. Provide all specialties and frames for air distribution devices as required for proper installation in ceiling type as indicated on Architectural Drawings. Provide all cutting and patching of T-bars, gypsum board, and other ceiling systems as required for installation of air devices.

C. Special Requirements

1. Paint ductwork visible behind air outlets and inlets matte black. Refer to Division 09.

END OF SECTION

SECTION 23 54 00

CONDENSING FURNACES

PART 1 - GENERAL

1.1 SCOPE

A. Perform all Work required to provide and install the following equipment indicated by the Contract Documents with supplementary items necessary for proper installation.

B. Equipment Included in This Section:

1. Gas-fired condensing furnaces and accessories
2. Concentric vent and air intake termination kit
3. Roof termination flashing kit
4. Temperature Controls Thermostats
5. Air filters and frame assembly
6. DX Evaporator Coil Unit
7. Air Cooled Condensing Unit
8. Refrigeration line sets, components, and devices

1.2 REFERENCES

A. Metal Ductwork 233113

B. Air Inlets and Outlets 233700

C. Refrigerant Piping 232300

D. Ductwork Accessories 233300

E. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

F. ARI 210 Standard for Unitary Air Conditioning Equipment

G. US Department of Energy (DOE)

H. Gas Appliance Manufacturers Association (GAMA)

I. National Fire Protection Association (NFPA)

1.3 SUBMITTALS

A. Product Data is to indicate:

1. Manufacturer, model number, series number, and size clearly marked.
2. Rated capacities, operating characteristics, furnished specialties, and accessories.
3. Performance ratings for heating, cooling, fan airflows at various static pressures
4. Provide for all items of Scope included.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1. Wiring Diagrams: Power, signal, and control wiring.
2. Equipment, piping and connections, together with valves, strainers, control assemblies, thermostatic controls, auxiliaries and hardware and recommended ancillaries which are mounted, wired and piped ready for final connection to building system, its size and recommended bypass connections.

3. Piping, valves and fittings shipped loose showing final location in assembly.
4. Control equipment shipped loose, showing final location in assembly.
5. Field wiring diagrams.
6. Dimensions, internal and external construction details, installation clearances recommended method of installation, sizes and location of mounting bolt holes.
7. Detailed composite wiring diagrams for control systems showing factory installed wiring and equipment on packaged equipment or required for controlling devices or ancillaries, accessories, controllers.

C. Operation and Maintenance Data: Include in emergency, operation, and maintenance manuals for each of the following:
1. Furnace and accessories
2. Concentric vent and air intake termination kit
3. Temperature Controls Thermostats
4. Air filters.
5. DX Evaporator Coil Unit
6. Air Cooled Condensing Unit
7. Refrigeration line sets, components, and devices

1.4 QUALITY ASSURANCE

A. Qualifications
a. Installer experienced in performing work of this section who has specialized in installation of work similar to that required for this project.
b. Manufacturer Qualifications: Manufacturer capable of providing field service representation during construction and approving application method.

B. Pre-installation Meetings: Conduct pre-installation meeting to verify project requirements, manufacturer's installation instructions and manufacturer's warranty requirements. Comply with Division 1 Project Management and Coordination (Project Meetings.)

C. Warranty: Special warranty specified in this Section.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

E. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1-2004, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."

F. ASHRAE/IESNA 90.1-2004 Compliance: Applicable requirements in ASHRAE/IESNA 90.1-2004, Section 6 - "Heating, Ventilating, and Air-Conditioning."

G. Comply with NFPA 70.

1.5 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.

B. Coordinate installation of concentric termination kits, curbs, supports, and roof penetrations. These items are specified in Division 07 Section "Roof Accessories."

1.6 WARRANTY

A. Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace the following components of furnaces that fail in materials or workmanship within specified warranty period, commencing on Date of Substantial Completion:

1. Furnace Heat Exchanger: ten (10) years.
2. Integrated Ignition and Blower Control Circuit Board: one (1) year.
3. Draft-Inducer Motor: one (1) year
4. Refrigeration Compressors: five (5) years.
5. Evaporator and Condenser Coils: one (1) year.

1.7 DELIVERY, STORAGE, AND HANDLING

A. General: Comply with Division 1 Product Requirements.

B. Ordering: Comply with manufacturer’s ordering instructions and lead time requirements to avoid construction delays.

C. Packing, Shipping, Handling and Delivery:

1. Deliver materials in manufacturer’s original, unopened, undamaged containers with identification labels intact.
2. Ship, handle and unload units according to manufacturer’s instructions.

D. Storage and Protection

1. Store materials protected from exposure to harmful weather conditions.
2. Factory shipping covers to remain in place until installation.

PART 2 - PRODUCTS

2.1 GAS-FIRED FURNACES, CONDENSING

A. Acceptable Manufacturers

1. Bryant
2. Carrier
3. Daikin
4. Lennox
5. Trane

B. Performance

1. See scheduled performance values and model information on drawings.
2. Minimum rated AFUE: 94%.

C. General Requirements for Gas-Fired, Condensing Furnaces: Factory assembled, piped, wired, and tested; complying with ANSI Z21.47/CSA 2.3, "Gas-Fired Central Furnaces," and with NFPA 54.

D. Cabinet

1. Up flow air delivery or horizontal air delivery, as noted on the Drawings.
2. Sealed combustion, direct vent.
3. Heavy Gauge cold-rolled steel
4. Adjustable locations for flue outlet and air inlet
5. Gas piping inlets and electrical inlets on both sides

6. Complete service access from the front of the unit
7. Cabinet interior around heat exchanger shall be factory-installed foil-faced insulation.
8. Flanges on exterior of supply air opening for duct connection.
9. Gasketed blower compartment.
10. Lift-out panels shall expose burners and all other items requiring access for maintenance.
11. Safety interlock switch to automatically shut off power to unit when blower compartment access door is removed.
12. Factory pre-painted external cabinets in manufacturer's standard color.

E. Fan
1. Centrifugal, direct drive
2. Special Motor Features: Electronically controlled motor (ECM) controlled by integrated furnace/blower control.
3. Factory statically and dynamically balanced, resilient mounted.
4. Assembly easily removable for servicing.
5. Speeds easily changed on integrated furnace control board.
6. Fan Motors: Comply with requirements in Division 15 Section 15170 Motors.

F. Type of fuel: Natural gas

G. Heat Exchanger
1. Primary: Heavy gauge aluminized steel, 3-pass crimped seam, clamshell design. Designed for normal expansion and contraction with maximum efficiency and minimum resistance to air flow.
2. Secondary: Condenser coil constructed of aluminum fins fitted to stainless steel tubes, factory tested for leaks.
3. Condensate drain header box assembly located on front of secondary heat exchanger coil.
4. All components mounted in heavy-gauge steel frame.
5. Entire heat exchanger assembly laboratory life-cycle tested.

H. Burner
1. Aluminized steel
2. Assembly removable as single component from unit
3. Gas Valve: 100 percent safety, two-stage, 24 volt main gas valve, main shutoff valve, pressure regulator, safety pilot with electronic flame sensor, limit control, transformer, and combination ignition/fan timer control board.
4. Ignition: Electric pilot ignition, with hot-surface igniter or electric spark ignition.
5. Redundant combination, dual gas valves.
6. Compact control to contain manual shutoff, automatic electric valves, and gas pressure regulation.

I. Gas-Burner Safety Controls
1. Electronic Flame Sensor: Prevents gas valve from opening until pilot flame is proven; stops gas flow on ignition failure.
2. Flame Rollout Switch: Factory installed on burner box, prevents burner operation, with manual reset.

3. Limit Control:
    a. Fixed stop at maximum permissible setting; de-energizes burner on excessive bonnet temperature; automatic reset.
    b. Primary limit and Secondary limit required.

J. Combustion-Air Inducer: Two (2)-speed centrifugal fan with thermally protected motor and sleeve bearings pre-purges heat exchanger and vents combustion products; pressure switch prevents furnace operation if combustion-air inlet or flue outlet is blocked.

K. Furnace Controls
1. Solid-state board integrates ignition, heat, cooling, and fan speed; adjustable fan-on and fan-off timing; terminals for connection to accessories diagnostic light with viewport.
2. Solid-state furnace control board containing all necessary controls and relays to operate furnace.
3. Ignition control LED's to indicate status and aid in troubleshooting.
4. Field wiring makeup boxes.
5. 24 volt transformer, factory installed.

L. Accessories
1. Combination Combustion-Air Intake and Vent: Concentric PVC plastic fitting to combine combustion-air inlet and vent through roof or sidewall as shown on Drawings. Provide roof flashing kit as required. Coordinate with General Contractor and roofing manufacturer.
2. PVC Plastic Vent Materials:
    a. PVC Plastic Pipe: Schedule 40, complying with ASTM D 1785.
    b. PVC Plastic Fittings: Schedule 40, complying with ASTM D 2466, socket type.
    c. PVC Solvent Cement: ASTM D 2564.
3. Condensate Collection:
    a. Header box on end of secondary heat exchanger collects flue gas condensate for disposal through condensate collars. Hose connects header box drains to the condensate collars.
    b. Condensate collars on each side of cabinet for field installation of condensate trap. Active collar is used, other one to be plugged.
    c. Flue condensate trap assembly mounted outside the conditioned air stream.

2.2 THERMOSTATS

A. Manufacturers: Matching condensing furnace manufacturer

B. Solid-State Thermostat
1. Wall-mounted, programmable, microprocessor-based unit with automatic switching from heating to cooling, preferential rate control.
2. Seven-day programmability with minimum of four temperature presets per day, vacation mode, and battery backup protection against power failure for program settings.
3. Thermostat to engage 1st stage of heating or cooling initially, followed by 2nd stage, with adjustable dead-band and time duration parameters.
4. Controls to modulate fan speed to in conjunction with stages of heating/cooling to maintain space temperature setpoint.

C. Control Wiring
1. Unshielded twisted-pair cabling.

2. Plenum rated cabling, meeting 25/50 Fire/Smoke rating.
3. Minimum of no. 24 AWG, 100 ohm, four pair.
4. Cable Jacket Color: blue

D. Controls shall comply with requirements in ASHRAE/IESNA 90.1-2004, "Controls."

2.3 AIR FILTERS AND FRAME

A. Manufacturers: As provided by condensing furnace manufacturer.

B. Disposable Filters: Pleated 2” thick fiberglass media with ASHRAE 52.2 MERV rating of 6 or higher.

C. Side filter rack kit:

1. Frame size to accommodate nominal 24”x25”x2” air filters, interior guide rails to accept filters by sliding in from front.
2. Sheet metal frame to connect to furnace return air intake flange at side of furnace cabinet.
3. With hasped and hinged access door, gasketed full perimeter of door.

2.4 REFRIGERATION COMPONENTS

A. Manufacturers: Matching condensing furnace manufacturer.

B. General Refrigeration Component Requirements:

1. Refrigeration compressor coils, and specialties shall be designed to operate with CFC-free refrigerants.
2. Energy Efficiency: Equal to or greater than prescribed by ASHRAE/IESNA 90.1-2004, "Energy Standard for Buildings except Low-Rise Residential Buildings."

C. Refrigerant DX Evaporator Coil

1. Copper tubes mechanically expanded into aluminum fins. Comply with ARI 210/240, "Unitary Air-Conditioning and Air-Source Heat Pump Equipment." Match size with furnace.
2. Include condensate drain pan with accessible drain outlet complying with ASHRAE 62.1-2004. Pitch drain pans in two (2) directions towards the outlet, with a slope of at least 1/8” per foot.
3. Provide factory installed thermostatic expansion valve and refrigerant leak detection system.
4. Refrigerant Coil Enclosure: Steel, matching furnace and evaporator coil, with access panel and flanges for integral mounting at or on furnace cabinet and galvanized sheet metal drain pan coated with black asphaltic base paint.

D. Refrigerant Line Kits

1. Annealed-copper suction and liquid lines factory cleaned, dried, pressurized with nitrogen, sealed, and with suction line insulated.
2. Provide in standard lengths for installation without joints, except at equipment connections.
3. Suction line insulation: Flexible Elastomeric: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I, 1” thick.

E. Air-Cooled Refrigerant Compressor Condensing Unit

1. Casing:
   a. Steel, finished with baked enamel, with removable panels for access to controls,

b. Weep holes for water drainage, and mounting holes in base.

c. Provide brass service valves, fittings, and gage ports on exterior of casing.

2. Compressor:

a. Hermetically-sealed, multi-speed scroll type, resiliently mounted integral with condenser.

b. Crankcase heater, with positive lubrication.

c. Vibration isolation mounts for compressor.

d. Compressor motor shall have thermal and current-sensitive overload devices, start capacitor, relay, and contactor.

e. High pressure control, hard start kit, motor thermal overload protection, service valves, and drier.

f. Multi-speed compressor motors shall have manual-reset high-pressure switch and automatic-reset low-pressure switch.

g. Refrigerant: R-454B or R-32.

3. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins, complying with ARI 210/240, and with liquid sub-cooler.

4. Fan: Aluminum-propeller type, directly connected to motor.

5. Motor: Permanently lubricated, with integral thermal-overload protection.

6. Low Ambient Kit: Permits operation down to 45° F.

F. Performance Capacities and Characteristics

a. See scheduled values on drawings for refrigerant evaporator coil and air-cooled condensing unit performance and operation conditions required.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Verify substrate conditions, which have been previously installed under other sections, are acceptable for product installation in accordance with manufacturer's instructions

C. Examine factory-installed insulation before furnace installation. Reject units that are wet, moisture damaged, or mold damaged.

D. Examine roughing-in for gas and refrigerant piping systems to verify actual locations of piping connections before equipment installation.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install gas-fired furnaces and associated fuel and vent features and systems according to NFPA 54.

B. Install Furnaces accordance with manufacturers' instructions and regulations of authorities having jurisdiction

C. Base-Mounted Units: Secure units to substrate. Provide optional bottom closure base if required by installation conditions.

D. Controls: Install thermostats at mounting height of 60 inches above floor.

E. Wiring Method: Install control wiring in accessible ceiling spaces and in conduit inside masonry unit walls or gypsum board partitions. Stub conduit out above wall with burr-free elbow. Conceal control wiring except in unfinished spaces.

F. Install ground-mounted, compressor-condenser components on reinforced concrete base. Use minimum 3000 PSF concrete, or similar spec grade to that for building foundation. Coordinate pad location and elevation with General Contractor. Coordinate anchor installation with concrete base. See drawings for pad sizes and reinforcing required.

3.3 CONNECTIONS

A. Gas piping installation requirements are specified in Division 23 Section titled Natural Gas Piping. Drawings indicate general arrangement of piping, fittings, and specialties. Connect gas piping with union or flange and appliance connector valve.

B. Install piping adjacent to equipment to allow service and maintenance.

C. Vent and Outside-Air Connection, Condensing, Gas-Fired Furnaces: Connect plastic piping vent material to furnace connections and extend outdoors. Terminate vent outdoors with a concentric termination kit and in an arrangement that will protect against entry of birds, insects, and dirt.

1. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
    a. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
    b. PVC Pressure Piping: Join schedule number ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.
2. Slope pipe vent back to furnace or to outside terminal.

D. Connect ducts to furnace with flexible connector. Comply with requirements in Division 23 Section "Ductwork Accessories."

E. Connect refrigerant tubing kits to refrigerant coil in furnace and to air-cooled, compressor-condenser unit.

F. Comply with manufacturer’s requirements for field installation and joint construction of refrigerant piping line kits.

G. Pipe cooling coil and flue vent condensate drains from unit to floor drain full size. Provide P-trap for cooling coil condensate, min. 3” trap depth. Provide removable couplings or unions for easy disassemble for cleaning and service.

3.4 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:

1. Perform electrical test and visual and mechanical inspection.
2. Leak Test: After installation, charge systems with refrigerant and oil and test for leaks. Repair leaks, replace lost refrigerant and oil, and retest until no leaks exist.
3. Operational Test: After electrical circuitry has been energized, start units to confirm proper operation, product capability, and compliance with requirements.
4. Verify that fan wheel is rotating in the correct direction and is not vibrating or binding.
5. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

B. Verify that vibration isolation and flexible connections properly dampen vibration transmission.

3.5 STARTUP SERVICE

A. Complete installation and startup checks according to manufacturer's written instructions and perform the following

1. Inspect for physical damage to unit casings.
2. Verify that access doors move freely and are weathertight.
3. Clean units and inspect for construction debris.
4. Verify that all bolts and screws are tight.
5. Adjust vibration isolation and flexible connections.
6. Verify that controls are connected and operational.

B. Start unit according to manufacturer's written instructions and complete manufacturer's operational checklist.

C. Measure and record airflows.

D. Verify proper operation of capacity control device.

3.6 ADJUSTING

A. Adjust initial temperature and humidity set points.

B. Set controls, burner, and other adjustments for optimum heating performance and efficiency. Adjust heat-distribution features, including balancing dampers, bandwith and deadband of space temperature, and controls to provide optimum heating performance and system efficiency.

3.7 CLEANING

A. After completing installation, clean furnaces internally according to manufacturer's written instructions.

B. Install new filters in each furnace within fourteen (14) days after Substantial Completion.

3.8 DEMONSTRATION

A. Train owner's maintenance personnel to adjust, operate, and maintain condensing units. Refer to Division 01 Section "Demonstration and Training" and Division 15 Section 230500.

END OF SECTION

SECTION 23 81 26

SPLIT SYSTEM AIR CONDITIONERS

PART 1 - GENERAL

1.1 SCOPE

A. Perform all Work required to provide and install the split system air conditioning units indicated by the Contract Documents with supplementary items necessary for proper installation

B. Equipment Included in This Section

1. Split system air conditioner system with Variable Speed Inverter Compressor technology. The system shall consist of a horizontal discharge, single phase outdoor unit and a matched capacity indoor section that shall be equipped with a wired wall mounted and/or wireless handheld remote controller.

C. The indoor units shall be one (1) of the following configurations

1. Wall-mounted
    a. 9,000 – 36,000 Btuh
    b. Minimum 14.0 SEER
2. Ceiling-mounted recessed cassette
    a. 12,000 – 42,000 Btuh
    b. Minimum 13.6 SEER
3. Ceiling surface mounted
    a. 24,000 – 42,000 Btuh
    b. Minimum 14.4 SEER
4. Concealed ducted type
    a. 12,000 – 42,000 Btuh
    b. Minimum 13.8 SEER

1.2 REFERENCES

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. ASHRAE Compliance

1. Fabricate and label refrigeration system to comply with ASHRAE 15, "Safety Standard for Refrigeration Systems."

C. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1 (adopted version).

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings: For computer-room air conditioners. Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Wiring Diagrams: For power, signal, and control wiring.

C. Color Samples: For unit cabinet, discharge grille, and exterior louver and for each color and texture specified.

D. Coordination Drawings: Plans, elevations, and other details, drawn to scale, using input from Installers of the items involved.

E. Field quality-control reports.

F. Operation and Maintenance Data: For computer-room air conditioners to include in emergency, operation, and maintenance manuals.

G. Warranty: Sample of special warranty.

1.4 QUALITY ASSURANCE

A. The units shall be tested by a Nationally Recognized Testing Laboratory (NRTL) and shall bear the ETL label.

B. All wiring shall be in accordance with the National Electrical Code (N.E.C.) and local codes as required.

C. The units shall be rated in accordance with Air-conditioning, Heating, and Refrigeration Institute's (AHRI) Standard 210 and bear the ARI Certification label.

D. The units shall be manufactured in a facility registered to ISO 9001 and ISO 14001, which is a set of standards applying to environmental protection set by the International Standard Organization (ISO).

1.5 WARRANTY

A. The units shall have a manufacturer's parts and defects warranty for a period five (5) year from date of installation. The compressor shall have a warranty of seven (7) years from date of installation. If, during this period, any part should fail to function properly due to defects in workmanship or material, it shall be replaced or repaired at the discretion of the manufacturer. This warranty does not include labor.

1.6 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Filters: One (1) set of filters for each unit.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

1. Daikin
2. Fujitsu
3. LG
4. Mitsubishi Electric
5. Panasonic
6. Samsung
7. Lennox

2.2 OUTDOOR UNITS - GENERAL

A. The outdoor unit shall be compatible with the four different types of indoor units as noted above. The connected indoor unit shall be of the same capacity as the outdoor unit.

B. The outdoor unit shall be equipped with a control board that interfaces with the indoor unit to perform all necessary operation functions.

C. Outdoor unit shall be capable of operating at -13° F ambient temperature with wind baffle.

D. The outdoor unit shall be able to operate with a maximum height difference of 100 feet (30 meters) between indoor and outdoor units.

E. The system shall have the following maximum tubing length restrictions between indoor and outdoor units. Line size changes, traps or additional oil will not be required using these parameters.

1. 9,000 – 18,000 Btuh: 100 feet
2. 24,000 – 42,000 Btuh: 165 feet

F. The outdoor unit shall be completely factory assembled, piped, and wired. Each unit must be test run at the factory.

G. Outdoor unit sound level shall not exceed:

Capacity	Max dBA
12,000 / 18,000 Btuh	46
24,000 / 30,000 / 36,000 Btuh	48
42,000 Btuh	51

2.3 OUTDOOR UNITS – CONSTRUCTION

A. Cabinet

1. The casing shall be constructed from galvanized steel plate, finished with an electrostatically applied, thermally fused acrylic or polyester powder coating for corrosion protection and have a Munsell 3Y 7.8/1.1 finish.
2. Mounting feet shall be provided and shall be welded to the base of the cabinet and be of sufficient size to afford reliable equipment mount and stability.
3. Easy access shall be afforded to all serviceable parts by means of removable panel sections.
4. The fan grill shall be of ABS plastic.
5. Cabinet mounting and construction shall be sufficient to withstand 155 MPH wind speed conditions for use in Hurricane condition areas. Mounting, base support, and other installation to meet Hurricane Code Conditions shall be by others.

B. Fan

1. AC fan motor or DC fan motors are acceptable and will vary based on unit capacity.
2. The fan blade(s) shall be of aerodynamic design for quiet operation, and the fan motor bearings shall be permanently lubricated.
3. The outdoor unit shall have horizontal discharge airflow. The fan shall be mounted in front of the coil, pulling air across it from the rear and dispelling it through the front. The fan shall be provided with a raised guard to prevent external contact with moving parts

C. Coil

1. The L shaped condenser coil shall be of copper tubing with flat aluminum fins to reduce debris build up and allow maximum airflow. The coil shall be protected with an integral metal guard.

2. Refrigerant flow from the condenser shall be controlled by means of an electronic linear expansion valve (LEV) metering device. The LEV shall be control by a microprocessor controlled step motor.

D. Refrigerant Lines

1. All refrigerant lines between outdoor and indoor units shall be of annealed, refrigeration grade copper tubing, ACR Type, meeting ASTM B280 requirements.

2. Lines shall be individually insulated in twin-tube, flexible, closed-cell, CFC-free (ozone depletion potential of zero), elastomeric material for the insulation of refrigerant pipes and tubes. Insulation to have a thermal conductivity equal to or better than 0.27 BTU-inch/hour per Sq Ft / °F, a water vapor transmission equal to or better than 0.08 Perm-inch and superior fire ratings such that insulation will not contribute significantly to fire and up to 1" thick insulation shall have a - Flame-Spread Index of less than 25 and a Smoke-development Index of less than 50 as tested by ASTM E 84 and CAN / ULC S-102.

E. Compressor

1. The compressor for units with a capacity between 12,000 and 36,000 Btuh shall be a DC twin-rotor rotary compressor with Variable Speed Inverter Drive Technology.

2. The compressor for units with a capacity of 42,000 Btuh shall be a Frame Compliant Scroll compressor with Variable Speed Inverter Drive Technology.

3. The compressor shall be driven by inverter circuit to control compressor speed. The compressor speed shall dynamically vary to match the room load for significantly increasing the efficiency of the system which shall result in significant energy savings.

4. To prevent liquid from accumulating in the compressor during the off cycle, a minimal amount of current shall be automatically, intermittently applied to the compressor motor windings to maintain sufficient heat to vaporize any refrigerant. No crankcase heater is to be used.

5. The outdoor unit shall have an accumulator and high pressure safety switch. The compressor shall be mounted to avoid the transmission of vibration.

F. Electrical

1. The electrical power of the unit shall be 208 volts or 230 volts, single phase, 60 hertz. The unit shall be capable of satisfactory operation within voltage limits of 198 volts to 253 volts.

2. Power for the indoor unit shall be supplied from the outdoor unit.

3. The outdoor unit shall be controlled by the microprocessor located in the indoor unit.

2.4 INDOOR UNITS – GENERAL

A. The indoor units shall be factory assembled, wired and tested. Contained within the unit shall be all factory wiring and internal piping, control circuit board and fan motor.

B. The unit, in conjunction with the wired, wall mounted controller shall have a self-diagnostic function, 3-minute time delay mechanism, an auto restart function, and a test run switch.

C. Indoor unit and refrigerant pipes shall be purged with dry nitrogen before shipment from the factory.

D. Fans

1. The indoor unit fan shall have multiple high performance, double inlet, forward curve fans driven by a single motor.

2. The fans shall be statically and dynamically balanced and run on a motor with permanently lubricated bearings.

3. The indoor fan shall consist of four (4) speeds: Low, M1, M2, and Hi plus AUTO fan setting. The fan shall have a selectable Auto fan setting that will adjust the fan speed based on the difference between controller set-point and sensed space temperature.

E. Filter: Return air shall be filtered by means of an easily removable washable filter. An optional MERV 8 filter shall be furnished

F. Coil

1. The evaporator coil shall be of nonferrous construction with pre-coated aluminum strake fins on copper tubing.

2. The multi-angled heat exchanger shall have a modified fin shape that reduces air resistance for a smoother, quieter airflow.

3. All tube joints shall be brazed with PhosCopper or silver alloy. The coils shall be pressure tested at the factory.

4. A condensate pan and drain shall be provided under the coil. An optional drain lift mechanism, capable of lifting condensate 23-5/8”(600mm) above the drain pan, shall be provided

5. Condensate Pump: Externally mounted, plenum rated pump.

G. Electrical

1. The electrical power of the unit shall be 208 volts or 230 volts, 1 phase, 60 hertz. The system shall be capable of satisfactory operation within voltage limits of 198 volts to 253 volts.

2. The power to the indoor unit shall be supplied from the outdoor unit.

H. Control

1. The control system shall consist of a minimum of two (2) microprocessors, one (1) on each indoor and outdoor unit, interconnected by a single non-polar two-wire cable.

2. Field wiring shall run directly from the indoor unit to the wall mounted controller with no splices. The microprocessor located in the indoor unit shall have the capability of monitoring return air temperature and indoor coil temperature, receiving and processing commands from the wired controller, providing emergency operation and controlling the outdoor unit. The control voltage from the wired controller to the indoor unit shall be 12/24 volts, DC. The control signal between the indoor and outdoor unit shall be pulse signal 24 volts DC. Up to two wired controllers shall be able to be used to control one unit.

3. The system shall be capable of automatic restart when power is restored after power interruption. The system shall have self-diagnostics ability, including total hours of compressor run time. Diagnostics codes for indoor and outdoor units shall be displayed on the wired controller panel.

2.5 INDOOR UNIT – WALL MOUNTED

A. The cabinet shall be formed from high strength molded plastic with smooth finish, flat front panel design with access for filter.

B. Cabinet color shall be white. The unit shall be wall mounted by means of a factory supplied, pre-drilled, mounting plate.

2.6 INDOOR UNIT – CEILING MOUNTED RECESSED CASSETTE

A. The cabinet shall be formed from galvanized sheet metal coated with high-density foam insulation. Cabinet shall be for recessed mounting and provided with four (4) corner mounting supports behind removable corner pockets in Grille assembly allowing adjustment of mounting height from front of unit.

B. The cabinet panel shall have provisions for a field installed filtered outside air intake.

C. There shall be a knock-out to provide a branch air duct for conditioning a secondary space.

D. There shall be an optional multi-function casement which will mount between the unit cabinet and the Grille assembly to provide a second field installed filtered outside air intake and provide a mount for a high-efficiency filter element.

E. A separate grill assembly shall be attached to the front of the cabinet to provide supply air vanes in four directions and a center mounted return air section. The four-way grill shall be fixed to bottom of cabinet allowing two, three or four-way blow. The grill vane angles shall be individually adjustable from the wired remote controller to customize the airflow pattern for the conditioned space. Grill assembly color shall be white.

2.7 INDOOR UNIT – SURFACE MOUNTED CEILING

A. The casing shall be ABS plastic and have a white finish.

B. Cabinet shall be designed for suspension mounting from above and horizontal operation.

C. Indoor unit shall have removable mounting brackets. A mounting template with suspension bolt locations shall be furnished with indoor unit. Mounting bolts or threaded rod of 3/8” diameter shall be used to suspend unit and unit shall not require direct contact with ceiling or panel for proper operation.

D. Mounting support shall be of sufficient strength and design to support full weight of indoor unit.

E. The rear cabinet panel shall have knock-out provisions for a field installed filtered 4-5/16 diameter ventilation air intake connection.

2.8 INDOOR UNIT – DUCTED TYPE

A. The cabinet shall be space saving, low profile, horizontal, ducted type. Formed cabinet shall be constructed of G-60 galvanized steel with factory applied foam surface insulation to prevent condensation on outer surfaces.

B. The cabinet shall be provided with four mounting brackets to accommodate suspension from threaded rod or structural support located on the side panels in all four corners. Brackets shall be suitable for supporting the weight of the indoor unit.

C. The indoor unit cabinet shall be equipped with a ducted air outlet and ducted rear return air connection. Units shall have selectable rear or bottom return as a standard feature.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install units level and plumb, maintaining manufacturer's recommended clearances.

B. Air-Cooled Refrigerant Condenser Mounting: Install using elastomeric pads. Comply with requirements for vibration isolation devices specified in Division 23 Section "Vibration Controls for HVAC Piping and Equipment."

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to machine to allow service and maintenance.

C. Drainage Connections: Comply with applicable requirements in Division 22 Section "Domestic Water Piping." Provide adequate connections for condensate drains.

D. Refrigerant Piping: Comply with applicable requirements in Division 23 Section "Refrigerant Piping." Provide shutoff valves and piping.

3.3 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

B. Tests and Inspections

1. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.

2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. After startup service and performance test change filters.

END OF SECTION

SECTION 23 82 00

TERMINAL HEATING EQUIPMENT

PART 1 - GENERAL

1.1 SCOPE

A. Perform all work required to provide and install the following Terminal Heating Devices indicated by the Contract Documents with supplementary items necessary for proper installation.

B. Equipment Included in This Section

1. Electric Terminal Heat
    a. Unit Heaters
    b. Cabinet Unit Heaters
    c. Perimeter Radiant Heaters
    d. Radiant Ceiling Panel Heaters
    e. Duct Mounted Heating Coils
2. Hot Water Terminal Heat
    a. Unit Heaters
    b. Cabinet Unit Heaters
    c. Perimeter Radiant Heaters
    d. Radiant Ceiling Panels
    e. Duct Mounted Heating Coils
3. Gas Fired Terminal Heat
    a. Unit Heaters
    b. Radiant Tube Heaters
    c. Duct Furnaces

1.2 SUBMITTALS

A. Product Data: Catalog cuts, specifications, installation and maintenance instructions for each type of heater specified.

B. Schedule: List manufacturer, unit type, model number, and performance data for each unit heater.

1.3 QUALITY ASSURANCE

A. Regulatory Requirements: Heaters shall be UL listed.

B. Certification: Affidavit from finned tube radiation manufacturer certifying that element has been tested in accordance with the requirements of IBR Testing and Rating Standard for finned tube radiation.

1.4 MAINTENANCE

A. Special Tools: One (1) tool for each type and size vandal resistant fastener.

PART 2 - PRODUCTS

2.1 CONFIGURATION AND PERFORMANCE

A. Refer to the equipment schedules for additional configuration and performance requirements.

2.2 ELECTRIC TERMINAL HEAT

A. Electric Unit Heaters

1. Acceptable Manufacturers
   a. Berko
   b. Brasch
   c. Indeeco
   d. King Electric
   e. Markel
   f. Modine
   g. Q-Mark
   h. Raywall
   i. Redd-I
   j. Stelpro
   k. Trane
   l. TPI Corp
2. Unit Casing: Constructed of steel sheet formed, reinforced, and braced for rigidity, with steel louvers or deflectors with sufficient rigidity to prevent vibration at all fan speeds.
   a. Materials:
      1) Galvanized Steel Sheet: ASTM A 653, coating designation G90.
      2) Cold-Rolled Steel Sheet: ASTM A 366, cleaned, degreased and phosphatized.
   b. Factory Finish: Minimum two (2) coat baked enamel finish on exposed surfaces, color as directed.
3. Provide with discharge nozzle for units to throw air from the specified mounting height to the floor or as specified on the drawings. At a minimum, units shall include the following:
   a. Horizontal Delivery Units: Adjustable horizontal and vertical louvers.
   b. Vertical Delivery Units: Louvered deflector mounted outside fan orifice.
4. Provide all necessary mounting hardware to support the heater.
5. Electric-Resistance Heating Elements: Nickel-chromium heating wire, free from expansion noise and 60-Hz hum, embedded in magnesium oxide refractory and sealed in steel or corrosion-resistant metallic sheath with fins no closer than 0.16 inch. Element ends shall be enclosed in terminal box. Fin surface temperature shall not exceed 550° F at any point during normal operation.
6. Circuit Protection: One (1)-time fuses in terminal box for overcurrent protection and limit controls for high-temperature protection of heaters.
7. Wiring Terminations: Stainless-steel or corrosion-resistant material.
8. Fan Assembly (Refer to schedule for fan type)
   a. Fan (Propeller): Multiple blade propeller type, statically and dynamically balanced, and directly connected to electric motor.
   b. Fan (Blower): Double width, double inlet (DWDI), forward curved, belt driven,assembly with spider ball bearings.

9. Motor: Single phase, totally enclosed electric motor of the permanent split capacitor or shaded pole type, with resilient mounting, terminal box for wiring connections, built-in overload protection, and ball or sleeve bearings with oilers, or permanently lubricated bearings.
10. Refer to schedule for control type and electrical requirements for the unit.

B. Electric Cabinet Unit Heaters
1. Acceptable Manufacturers
   a. Berko
   b. Brasch
   c. Indeeco
   d. King Electric
   e. Markel
   f. Q-Mark
   g. Raywall
   h. Redd-I
   i. Stelpro
   j. Trane
   k. TPI Corp
2. Unit Casing: Constructed of steel sheet formed, reinforced and braced for rigidity, with stamped grilles.
   a. Materials:
      1) Galvanized Steel Sheet: ASTM A 653, coating designation G90.
      2) Cold-Rolled Steel Sheet: ASTM A 366, cleaned, degreased and phosphatized.
   b. Factory Finish: Minimum two (2) coat baked enamel finish on exposed surfaces, color as directed.
   c. Insulation: Insulate interior surfaces of casing panels with 1/2 inch glass fiber meeting NFPA 90A requirements.
   d. Vertical Units: Minimum 18 gauge construction with removable front panel.
   e. Horizontal Units: Minimum 18 gauge construction with hinged bottom panel.
3. Electric-Resistance Heating Elements: Nickel-chromium heating wire, free from expansion noise and 60-Hz hum, embedded in magnesium oxide refractory and sealed in steel or corrosion-resistant metallic sheath with fins no closer than 0.16 inch. Element ends shall be enclosed in terminal box. Fin surface temperature shall not exceed 550° F at any point during normal operation.
   a. Circuit Protection: One (1)-time fuses in terminal box for overcurrent protection and limit controls for high-temperature protection of heaters.
   b. Wiring Terminations: Stainless-steel or corrosion-resistant material.
4. Fan Assembly: Blow thru design.
   a. Fans: Forward curved centrifugal type, double width, statically and dynamically balanced, and directly connected to electric motor.
5. Motors: Three (3) speed, single phase electric motors of the permanent split capacitor or shaded pole type, with resilient mounting, built-in overload protection with automatic

reset, and ball or sleeve bearings with accessible oilers, or permanently lubricated bearings.

6. Filter Section: Built-in filter frame mounted at air inlet with disposable air filters.
    a. Vertical Units: Filters removable without removing front panel for cabinet type units.
    b. Horizontal Units: Filters removed by pivoting hinged bottom panel.
7. Refer to schedule for cabinet style, control type and electrical requirements for the unit.

C. Electric Baseboard Radiators
1. Acceptable Manufacturers
    a. Berko
    b. Brasch
    c. Indeeco
    d. King Electric
    e. Markel
    f. Q-Mark
    g. Raywall
    h. Redd-I
    i. Stelpro
    j. Trane
    k. TPI Corp
    l. Jaga
2. Description: Factory-packaged units constructed according to UL 499, UL 1030, and UL 2021.
3. Heating Elements: Nickel-chromium-wire heating element enclosed in metallic sheath mechanically bonded to fins, with high-temperature cutout and sensor running the full length of the element. Element supports shall eliminate thermal expansion noise.
4. Enclosures: Minimum 14 gauge thick steel, removable front cover.

D. Electric Radiant Ceiling Panels
1. Acceptable Manufacturers
    a. Berko
    b. Brasch
    c. Indeeco
    d. King Electric
    e. Markel
    f. Q-Mark
    g. Raywall
    h. Redd-I
    i. TPI Corp
2. Description: Sheet-metal-enclosed panel with heating element suitable for the following installation types.
    a. Lay-in installation flush with T-bar ceiling grid

b. Surface mounting

c. Recessed mounting flush with gyp board ceiling

3. Unit to comply with UL 2021.

4. Panel: Minimum 0.0276-inch-thick, galvanized-steel sheet back panel riveted to minimum 0.0396-inch-thick, galvanized-steel sheet front panel with fused-on crystalline surface.

5. Heating Element to be one of the following configurations:

a. Powdered graphite sandwiched between sheets of electric insulation

b. Insulated resistive wires

6. Electrical Connections: Non-heating, high-temperature, insulated-copper leads, factory connected to heating element.

7. Finish type to be one of the following. Refer to schedule for additional requirements.

a. Exposed-Side Panel Finish: Apply silk-screened finish to match appearance of Architect-selected acoustical ceiling tiles.

b. Exposed-Side Panel Finish: Factory prime coated, ready for field painting.

C. Exposed-Side Panel Finish: Baked-enamel finish.

8. Surface-Mounting Trim: Sheet metal with baked-enamel finish.

9. Refer to schedule for control type and electrical requirements for the unit.

E. Electric heating coil

1. Acceptable Manufacturers

a. Brasch

b. Chromalox

c. Indeeco

d. Thermolec

2. Heater shall be duct mounted and open element or finned tubular construction. Heater to be flanged or slip-in style. Provide all necessary mounting hardware for installation.

3. Voltage, physical size, wattage, number of steps and with accessories as noted on the drawings or specified. Heater shall be of design for mounting in a horizontal air flow through heater.

4. Resistance coils shall be fabricated of 80 percent nickel and 20 percent chromium wire, insulated by means of best quality ceramic terminal insulators and bushings from rigid, reinforced aluminized steel frame. Provide coil support brackets, reinforced with stiffening ribs and gussets, on maximum 4 inch centers. All coil terminals and fasteners shall be stainless steel.

5. Provide heaters with an automatic reset thermal cutout for primary protection installed in the control circuit and heat limiters installed in the power legs for secondary protection. Protection devices shall be serviceable through heater terminal box, without removing heater from duct.

6. Provide heater with integral terminal box, for making connections and enclosing accessories. Fabricate box from heavy gage aluminized steel, with a dust tight cover. Furnish continuous hinged type door, when fuses are installed in box. Provide insulated terminal boxes for installation in air-conditioning ducts running through warm, humid, non-conditioned spaces. All exposed surfaces shall be given a factory applied two coat baked enamel finish.

F. Air flow switch: Provide a remote airflow switch located downstream from heater, in the positive pressure ductwork, with an adjustable pressure range from 0.07 inch to 5.0 inch W.C. Switch shall be of the combined static and velocity pressure type.

G. Refer to schedule for element type, duct installation type and control type for the unit.

2.3 HYDRONIC TERMINAL HEAT

A. Hydronic Unit Heaters

1. Acceptable Manufacturers
    a. Daikin
    b. Modine
    c. Sigma
    d. Sterling
    e. Trane
    f. Jaga
2. Unit Casing: Constructed of steel sheet formed, reinforced, and braced for rigidity, with steel louvers or deflectors with sufficient rigidity to prevent vibration at all fan speeds.
3. Materials:
    a. Galvanized Steel Sheet: ASTM A 653, coating designation G90.
    b. Cold-Rolled Steel Sheet: ASTM A 366, cleaned, degreased and phosphatized.
4. Factory Finish: Minimum two (2) coat baked enamel finish on exposed surfaces, color as directed.
5. Provide with discharge nozzle for units to throw air from the specified mounting height to the floor or as specified on the drawings. At a minimum units shall include the following:
    a. Horizontal Delivery Units: Adjustable horizontal and vertical louvers.
    b. Vertical Delivery Units: Louvered deflector mounted outside fan orifice.
6. Provide all necessary mounting hardware to support the heater.
7. Heating Coil – Verify type of coil required based on equipment schedules
    a. Hydronic Heating Coils: Mechanically bonded aluminum fins with seamless copper tubing for hot water under 200 psig and steam under 75 psig; and red or admiralty brass tubing for hot water over 200 psig and steam over 75 psig; and factory tested at 300 psig air pressure under water.
8. Steam Coils: Copper distributing tube, with mechanically bonded aluminum fins spaced no closer than 0.1 inch, rated for a minimum working pressure of 75 psig.
9. Fan Assembly (Refer to schedule for fan type)
    a. Fan (Propeller): Multiple blade propeller type, statically and dynamically balanced, and directly connected to electric motor.
    b. Fan (Blower): Double width, double inlet (DWDI), forward curved, belt driven,assembly with spider ball bearings.
10. Motor: Single phase, totally enclosed electric motor of the permanent split capacitor or shaded pole type, with resilient mounting, terminal box for wiring connections, built-in overload protection, and ball or sleeve bearings with oilers, or permanently lubricated bearings.
11. Refer to schedule for control type and electrical requirements for the unit.

B. Hydronic Cabinet Unit Heaters

1. Acceptable Manufacturers
    a. Daikin
    b. Enviro-Tec
    c. IEC
    d. Johnson Controls
    e. Modine
    f. Sigma
    g. Sterling
    h. Trane
    i. Jaga
2. Unit Casing: Constructed of steel sheet formed, reinforced and braced for rigidity, with stamped grilles.
    a. Materials:
        1) Galvanized Steel Sheet: ASTM A 653, coating designation G90.
        2) Cold-Rolled Steel Sheet: ASTM A 366, cleaned, degreased and phosphatized.
3. Factory Finish: Minimum two (2) coat baked enamel finish on exposed surfaces, color as directed.
4. Insulation: Insulate interior surfaces of casing panels with 1/2 inch glass fiber meeting NFPA 90A requirements.
5. Vertical Units: Minimum 18 gauge construction with removable front panel.
6. Horizontal Units: Minimum 18 gauge construction with hinged bottom panel.
7. Heating Coil – Verify type of coil required based on equipment schedules
    a. Hydronic Heating Coils: Mechanically bonded aluminum fins with seamless copper tubing for hot water under 200 psig and steam under 75 psig; and red or admiralty brass tubing for hot water over 200 psig and steam over 75 psig; and factory tested at 300 psig air pressure under water.
8. Steam Coils: Copper distributing tube, with mechanically bonded aluminum fins spaced no closer than 0.1 inch, rated for a minimum working pressure of 75 psig.
9. Fan Assembly: Blow thru design.
    a. Fans: Forward curved centrifugal type, double width, statically and dynamically balanced, and directly connected to electric motor.
    b. Motors: Three (3) speed, single phase electric motors of the permanent split capacitor or shaded pole type, with resilient mounting, built-in overload protection with automatic reset, and ball or sleeve bearings with accessible oilers, or permanently lubricated bearings.
10. Filter Section: Built-in filter frame mounted at air inlet with disposable air filters.
    a. Vertical Units: Filters removable without removing front panel for cabinet type units.
    b. Horizontal Units: Filters removed by pivoting hinged bottom panel.
11. Refer to schedule for cabinet style, control type and electrical requirements for the unit.

C. Hydronic Radiant Heat – Finned Tube

1. Acceptable Manufacturers
    a. Sigma
    b. Sterling
    c. Trane
    d. Jaga
2. Copper tube with aluminum fin heating elements housed in steel enclosure. Elements rated for 185 psi working pressure at 300° F.
3. 18 gauge powder coated painted steel enclosure with 'pencil-proof' outlet grilles. Enclosure shall snap together and have hairline joints. Provide all endcaps, joint covers, and accessory enclosures necessary to conceal heating elements, piping, and hydronic specialties.
4. Galvanized steel supports to mount equipment from wall or floor. Supports shall allow for thermal pipe expansion. Secure supports as recommended by manufacturer.

D. Hydronic Radiant Heat – Flat Panel

1. Acceptable Manufacturers
    a. Runtal
    b. Sigma
    c. Sterling
2. One-piece all-welded steel construction, consisting of flattened hot water heating tubes welded to headers at each end, plus a front set of inactive tubes for added thermal protection, with a total depth of no more than 2-3/4". Radiator shall include an integral heavy gauge (0.09" minimum) all-welded perforated flat top grille which covers the entire radiator from the front inactive tubes to within ¼" of the wall. The headers shall include all necessary inlet, outlet and vent connections as required. Standard connection sizes are 1/2" NPT tapered thread for supply and return piping, and 1/8" for the vent connection. Internal baffling is provided where required for proper water flow.
3. Working pressure-85 PSI maximum, Test Pressure-110 PSI maximum
4. No less than 32 fins per foot. Fins shall start within 1" of the headers, and shall be spot-welded three times per tube.
5. Finish painted with a gloss powder coat finish, for a total paint thickness of 2-3 mils (0.002" - 0.003"). The color shall be selected form either standard or 'premium' colors at no additional cost. Final color selection shall be by the Architect.
6. All cabinet and accessories shall be securely connected with no exposed fasteners.
7. Provide end caps, corner pieces, adjustable extensions, etc. as required for proper appearance and service.
8. Provide removable cabinet sections at all control valves. It shall not be necessary to remove several sections to maintain control valves.
9. Cabinet size, element length, and element size shall meet the scheduled capacities, but not be less than the sizes scheduled.

E. Hydronic Radiant Ceiling Panels

1. Acceptable Manufacturers
    a. Flaktwoods
    b. Sigma

c. Sterling

d. Zehnder Rittling

2. Panel: 0.040” aluminum sheet formed to a nominal 24” x 48” or 24” x 24” panel per the drawings. Panel shall be mounted in a lay-in ceiling grid.

3. Pipe: 0.50” I.D. nominal copper pipe bonded to the aluminum panel. Pipe shall have a minimum of six (6) passes per panel.

4. Insulation: 1” thick, 0.75 lb/ft² fiberglass insulation provided with the panel. Contractor to field install insulation if not provided by manufacturer.

5. Finish: Perforated face with two (2) coats of baked enamel paint. Color selection by architect.

F. Hydronic Duct Mounted Heating Coils

1. Acceptable Manufacturers

a. Aerofin

b. Daikin

c. Heatcraft

d. Johnson Controls

e. Precision Coils

f. RAE

g. Temtrol

h. Thermotek

i. Trane

j. USA Coil

2. Provide counter-flow hot water coils as scheduled.

3. Rate coils in accordance with ARI certified data. Select coil to provide capacity in accordance with water flow and temperatures scheduled on Drawings with maximum water pressure drop through coil as scheduled and a maximum velocity in tubes of eight (8) feet per second. Provide coil with maximum face velocity of 375 fpm for constant volume applications and 400 fpm for variable volume applications or as indicated otherwise on Drawings.

4. Provide 5/8” outside diameter copper tube coils, staggered in direction of airflow, with aluminum plate fins, maximum six (6)-row and nine (9) fins per inch with copper headers. Steel pipe water connections shall be welded to copper headers with silica-bronze weld to prevent dielectric corrosion of dissimilar metals and extend the life of the coils. If additional rows are required pipe coils in series and provide access section between coils.

5. Provide coils with plate fin wall thickness of 0.006-inch and tubes of minimum wall thickness of 0.035”. Connect tubes to header that provides equal flow to all tubes and provide single point connections for supply and return piping per coil. Factory test all coils to 325 psig and forward coil test reports to the Engineer with submittal documentation.

6. Coil Casings:

a. Construct coil section so coils can be removed without affecting structural integrity of casing. Completely enclose connections, coil headers, and return bends.

b. Provide Type 304 stainless steel coil frame with intermediate casing supports as required.

2.4 GAS FIRED TERMINAL HEAT

A. Gas Fired Unit Heaters

1. Acceptable Manufacturers
    a. Detroit Radiant
    b. Lennox
    c. Modine
    d. Reznor
    e. Sterling
    f. Trane
2. Unit Casing: Constructed of steel sheet formed, reinforced, and braced for rigidity, with steel louvers or deflectors with sufficient rigidity to prevent vibration at all fan speeds.
3. Materials:
    a. Galvanized Steel Sheet: ASTM A 653, coating designation G90.
    b. Cold-Rolled Steel Sheet: ASTM A 366, cleaned, degreased and phosphatized.
4. Factory Finish: Minimum two (2) coat baked enamel finish on exposed surfaces, color as directed.
5. Provide with discharge nozzle for units to throw air from the specified mounting height to the floor or as specified on the drawings. At a minimum units shall include the following:
    a. Horizontal Delivery Units: Adjustable horizontal and vertical louvers.
    b. Vertical Delivery Units: Louvered deflector mounted outside fan orifice.
6. Provide all necessary mounting hardware to support the heater.
7. Gas Fired Heat Exchanger:
    a. The heat exchanger(s) shall be made of 18 gauge aluminized steel tubes and headers (opt 409 stainless steel). The thermal efficiency of the unit(s) shall be a minimum of 80% efficient for all air flow ranges. Each heat exchanger tube shall be individually and directly flame-fired. The heat exchanger tube shall be crimped to allow for thermal expansion and contraction. The flue collector box shall be made of 20 gauge aluminized steel.
    b. The heat exchanger(s) seams and duct connections shall be certified to withstand 0.9" W.C. external static pressure without burner flame disturbance.
    c. The burner(s) shall be in-shot type, directly firing each heat exchanger tube individually and is (are) designed for good lighting characteristics without noise of extinction for both natural and propane gas.
    d. The ignition controller(s) shall be 100% shut-off with continuous retry. The gas pressure shall be between 6-7" W.C for natural gas. (opt) The gas pressure shall be 11-14" W.C. for propane gas.
    e. The solid state ignition system shall directly light the gas by means of a direct spark igniter each time the system is energized.
    f. The unit gas controls shall be provided with the following:
        1) (option) Single-stage gas controls with a single-stage combination gas control, an ignition control, and a single-stage low voltage thermostat. The unit fires at 100% full fire based on a call for heat from a room thermostat.
        2) (option) Two-stage gas controls with a two-stage combination gas control, an ignition control, and a two-stage low voltage thermostat. The unit fires at

50% fire on low stage or 100% fire on high stage of the unit based on the call for heat from either a room or duct thermostat.

g. An automatic reset high limit switch mounted in the air stream to shut off the gas supply in the event of overheating.

h. A time delay relay that delays the start of the air mover to allow the heat exchanger a warm-up period after a call for heat. The time delay relay shall also continue the air mover operation after the thermostat has been satisfied to remove any residual heat in the heat exchanger.

i. The unit shall be orificed for up to 2000' elevation above sea level.

8. Fan Assembly (Refer to schedule for fan type)

a. Fan (Propeller): Multiple blade propeller type, statically and dynamically balanced, and directly connected to electric motor.

b. Fan (Blower): Double width, double inlet (DWDI), forward curved, belt driven, assembly with spider ball bearings.

9. Motor: Single phase, totally enclosed electric motor of the permanent split capacitor or shaded pole type, with resilient mounting, terminal box for wiring connections, built-in overload protection, and ball or sleeve bearings with oilers, or permanently lubricated bearings.

10. Refer to schedule for control type and electrical requirements for the unit.

2.5 GAS FIRED RADIANT TUBE HEATERS

1. Acceptable Manufacturers

a. Detroit Radiant

b. Roberts Gordan

c. Schwank

2. Low intensity infrared heating system consisting of burner, controls, heating elements, and heat reflectors. Burner shall be sealed combustion type designed for ducted combustion air and exhaust.

3. Casing: The controls, combustion air blower and burner shall be housed in a water-resistant casing, providing weatherproof protection. The burner and control box casing shall be constructed of minimum 20 gauge aluminized steel with a baked enamel finish.

4. Heat Exchanger: The heat exchanger tubes and combustion chamber shall be constructed of minimum 16 gauge, 4" O. D. aluminized steel. The first combustion tube for gas inputs 150,000 Btuh and greater shall be 16 gauge 4" O.D. titanium aluminized steel. The heat exchanger tubes must be used in conjunction with reflectors. The reflector can be adjusted from 0° to 45° from the horizontal plane. Reflectors shall be of bright polished aluminum.

5. Controls: Input power to the infrared heater(s) shall be 115V/60Hz/1ph. Heater(s) shall be equipped with a direct four (4) trial (three (3) retrial), 100% shut-off hot surface ignition control system with a separate flame sensor. Infrared heater(s) shall be equipped with a 115V/25V control transformer. Provide with low voltage thermostat. Thermostat shall operate on 25V. Heater(s) will be equipped with a pre-purge mode, a differential pressure switch, and an indicator light to prove proper operation of the combustion air blower. All controls shall be rated for a maximum inlet pressure of 1/2 PSI gas pressure.

6. Motor: Each heater shall have a single motor. The combustion air blower motor shall be totally enclosed in the control box and the motor shall be protected by a thermal overload switch.

B. Gas Fired Duct Furnace

1. Acceptable Manufacturers
    a. Lennox
    b. Modine
    c. Reznor
    d. Sterling
    e. Thermotek
    f. Trane
2. Furnace section with 80% minimum efficiency provided by an indirect-fired heat exchanger with dimpled tube pattern for efficient heat transfer.
3. The unit casing shall be designed for the venting/ combustion air arrangement to be separated from the room atmosphere. The unit shall have a factory mounted power exhauster enclosed in the unit casing to prevent the motor from being subjected to the room atmosphere. The unit shall also include a factory mounted differential pressure switch designed to prevent pilot and main burner ignition until positive venting has been proven. All duct furnaces doors shall be fully gasketed to prevent infiltration of the room air into the combustion process. A removable gasketed door shall contain both the vent and combustion air connection collars to allow for servicing of the power exhauster.
4. The unit shall include a factory supplied dual or concentric vent kit with caps.
5. The heat exchanger(s) shall be made of 20 gauge aluminized 409 stainless steel tubes and headers. The flue collector box shall be made of 20 gauge aluminized steel.
6. The bottom of the unit shall be angled for draining any condensation to the corners of the unit. The condensation shall be removed through openings in the bottom pan. The drain pan shall be constructed of 20 gauge aluminized steel.
7. The unit gas controls shall be provided with the following:
    a. Single-stage Two-stage Modulating gas controls with ignition control.
    b. Interface with the building automation system to allow for the unit to be enabled / disabled, setpoint adjusted, discharge air temperature monitoring and alarm monitoring.
    c. Stand-alone control with a low voltage thermostat.
8. The unit shall be supplied with a disconnect switch to disconnect power to the unit for servicing. A single step down transformer shall be provided for all unit controls.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install the Work of this section in accordance with the manufacturer's printed installation instructions, unless otherwise specified.

B. Finned Tube Radiation

1. Enclosure Panel Lengths for Wall-to-Wall, Wall-to-Column, and Column-to-Column Installations:
    a. Left and right end panels shall be equal in length.
    b. Intermediate panels between left and right and panels shall be equal in length.
    c. Intermediate panels shall be longer in length than end panels.

d. Intermediate panel lengths shall be consistent throughout an entire room and entire building.

e. Front and back panels for elements mounted in front of glass where back of radiant will be exposed.

2. Secure finned tube radiation wall mounting strips, backplates, and brackets to wall construction with fasteners on maximum 2'-0" centers.

3. Enclosures: Install access panels for each control, shutoff and balancing valve installed in enclosure.

4. Enclosure accessories and access panels which attach to enclosure panel by means of slip joints only require vandal resistant fasteners to be installed in end caps.

5. Pitch elements in direction of flow.

C. Gas Fired Radiant Tube Heaters

1. Install units per manufacturer's instructions. Maintain required clearance to combustibles.

D. Gas Fired Terminal Heat

1. Install gas vent piping per the requirements in Division 23 Section "Chimneys, Breechings and Stacks".

END OF SECTION

SECTION 26 05 00

COMMON WORK RESULTS

PART 1 - GENERAL

1.1 SCOPE

A. The work under this section includes basic electrical requirements, which are applicable to all Division 26, 27 and 28 sections.

B. Overview of Work

1. Demolition/Relocation/Modification
2. Power Distribution
3. Branch Power
4. Equipment Connections
5. Lighting and Lighting Controls
6. Low Voltage Systems (such as: fire alarm, nurse call, etc.)
7. Commissioning

C. In these documents, “Contractor” refers to the Electrical Contractor and all their subcontractors, unless listed otherwise. The division of Work with the electrical scope is the responsibility of the lead Electrical Contractor.

D. The Contractor is responsible for providing and installing fully functional systems.

E. If the Work is shown on the drawings or noted in the specifications, it shall be included by the Contractor.

F. If equipment is provided by the Contractor, it shall be installed by the Contractor, unless noted otherwise.

G. Drawings are necessarily diagrammatic by their nature and are not intended to show every connection in detail or every conduit in its exact location. Carefully investigate structural and finish conditions and coordinate the separate trades in order to avoid interference between the various phases of Work. Organize and lay out Work so that it will be concealed in furred chases and suspended ceilings, etc., in finished portions of the building, unless specifically noted to be exposed. Install all Work parallel or perpendicular to building lines unless otherwise noted.

H. The intent of the Drawings is to establish the types of systems and functions; not to set forth each item essential to the functioning of the system. Install the Work complete, including minor details necessary to perform the function indicated. Review pertinent Drawings and adjust the Work to conditions shown. Where discrepancies occur between Drawings, Specifications, and actual field conditions, immediately notify the Architect and Engineer for interpretations.

I. All sizes as given are minimum except as noted.

J. All materials shall be new (unless noted or stated otherwise) and free of defect.

K. All work shall be subject to the Architect’s, Engineer’s, and Owner’s observations from the commencement of work until the acceptance of the completed work.

1.2 RELATED WORK

A. Applicable provisions of Division 0 and Division 1 govern work under this Section.

1.3 REFERENCES

A. All work shall conform to the most current version of all applicable codes and standards or the version adopted by the jurisdiction.

B. Codes

1. International Building Code
2. International Fire Protection Code
3. International Energy Conservation Code
4. NFPA – National Fire Protection Association
    a. NFPA 70 (National Electric Code)
    b. NFPA 72 (National Fire Alarm and Signaling Code)
    c. NFPA 101 (Life Safety Code)
5. State or City Codes for the Des Moines, Iowa

C. Standards
1. ANSI

D. Governing Bodies
1. Owner's Insurance Company
2. State Fire Marshall
3. AHJ – Authority Having Jurisdiction
4. UL - Underwriters Laboratories
5. FM - Factory Mutual

1.4 SUBMITTALS

A. The review of Shop Drawings by the Engineer is for general conformance with the design concept of the project and general compliance with the information given in the Contract Documents. Corrections or comments made on the shop drawings during this review do not relieve the contractor from compliance with the requirements of the Plans and Specifications. Approval of a specific item shall not include approval of an assembly of which the item is a component. The Contractor is responsible for: dimensions to be confirmed and correlated at the jobsite; information that pertains solely to the fabrication processes or to the means, methods, techniques, sequences and procedures of construction; coordination with the Work of all trades; and for performing all work in a safe and satisfactory manner.

B. Refer to individual technical Specification sections for specific submittal requirements.

C. Submission of Shop Drawings electronically in .PDF format is required.

D. The Engineer will review one (1) resubmittal for each product. If additional resubmittals are required, the Contractor shall be responsible to bear the cost for the Engineer to recheck and handle the additional shop drawing submittals. Documents will not be reviewed until payment is agreed upon.

E. Contractor may request electronic files from the Engineer if needed to complete their Shop Drawings. An Electronic File Request Form will be sent to the contractor if files are requested and must be completed and signed before the AutoCAD files are released to the Contractor.

F. All submittals for equipment and materials shall be reviewed and approved by the Engineer prior to the fabrication or release by the contractor. This includes the coordination of equipment between trades. The release, purchase, installation or fabrication of any items prior to the contractor receiving an approved shop drawing will be at the contractor's own risk. Any rework that results will be provided by the contractor at no cost to the Owner or design team.

G. Submittals must be reviewed and approved by the Contractor before submitting to the Engineer.

H. 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.

1.5 ELECTRONIC DOCUMENT RELEASE

A. Electronic versions of the bid documents will be made available to the contractors for use during the bidding process and to help generate fabrication drawings for various systems. A summary of the requirements for the various document types is listed below:

1. PDF
    a. Contact the Construction Manager or Architect to obtain a PDF version of the Bid Documents. No Document Release Form is required.
2. AutoCAD
    a. KEDbluestone Engineering can provide an AutoCAD version of the bid documents for the contractor to use for generating shop drawings and fabrication drawings. This will include plan drawings with the architectural background. The contractor is responsible for incorporating any modifications that occur during bidding by all disciplines. Details and schedules will not be included.
    b. A document release form (see attached) will be required to be completed by the contractor to determine the version of AutoCad and drawings required. No fee is associated with these drawings.
3. REVIT
    a. The REVIT drawings will be converted to AutoCAD and then transferred to the contractor.
    b. KEDbluestone Engineering can provide an AutoCAD version of the bid documents for the contractor to use for generating shop drawings and fabrication drawings. This will include plan drawings with the architectural background. The contractor is responsible for incorporating any modifications that occur during bidding by all disciplines. Details and schedules will not be included.
    c. A document release form (see attached) will be required to be completed by the contractor to determine the version of AutoCad and drawings required.
    d. Submittal of the document release form fee will be required prior to the AutoCAD files being transmitted.

1.6 SUBSTITUTIONS

A. All manufacturers listed as Acceptable Manufacturers in each specification section are considered equal to the basis of design. The basis of design is preferred and will take precedence. Any products from an alternate approved manufacturer need to meet the requirements and performance specified and shall be equal to the basis of design.

B. The Contractor may request permission for a substitution of any item (equipment or material), subject to the following conditions:

1. Submit substitution requests in writing to the Engineer, on a form supplied by the Engineer. A sample copy of this form is included at the end of this section. An electronic copy can also be provided to the Contractor by the Engineer.
2. Where equipment or accessories are used which differ in arrangement, configuration, dimensions, ratings, or engineering parameters from those indicated on the contractor 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 as well as any re-design costs incurred by the Architect or Engineer. The Contractor is also responsible for coordinating changes required by other trades.

3. Any requests for alternate manufacturers must be submitted to the Architect/Engineer at least ten (10) days prior to bid day. Incomplete substitution requests will not be considered.

C. Approval

1. No work involving requests for substitution shall commence without written approval on the provided form by the Engineer.

2. Any work started or material ordered/installed by the Contractor without written approval shall be removed/repaired at the sole expense of the contractor. The Contractor will also be responsible for any costs incurred by the Owner for such rework.

1.7 QUALITY ASSURANCE

A. Warranty

1. Equipment warranty shall be a minimum of one (1) year from date of factory supervised startup or from the date of substantial completion, whichever is later.

2. Contractor shall warranty all of their work for one (1) year from the date of substantial completion

B. These documents are diagrammatical in nature and intended to convey scope and general arrangement of the electrical and technology systems. Not all conduits, junction boxes, accessories, etc. are shown on Plan. If items are required to make a system fully operational but not shown on Plan or in these Specifications, they shall be included by the Contractor.

C. The intent of the Drawings is to establish the types of systems and functions; not to set forth each item essential to the functioning of the system. Install the Work complete, including minor details necessary to perform the function indicated. Review pertinent Drawings and adjust the Work to conditions shown. Where discrepancies occur between Drawings, Specifications, and actual field conditions, immediately notify the Architect and Engineer for interpretations.

D. It is the contractor's responsibility to determine all utility routing prior to purchase and installation of material.

E. For remodel or addition projects, the contractor shall visit and survey the site prior to submitting a bid. The contractor shall visit the site to understand the complexity of utility routing, phasing, staging, and all general installation. Submitting a bid means the contractor acknowledges the complexities of the project and has made provisions for overcoming these complexities in their bid.

F. The Contractor shall report any discrepancies between these documents and site conditions immediately to the Engineer prior to submitting a bid or starting work. Submittal of a bid indicates that the contractor and the contractor's subcontractors have carefully and thoroughly reviewed the Drawings, Specifications, and other construction documents and have found them complete and free from ambiguities and sufficient for the purposes intended.

G. Install all equipment per the manufacturer's requirements / recommendations.

H. No equipment provided or installed shall contain mercury.

I. Manufacturer / Supplier Inspection & Startup

1. The following equipment shall have a factory representative perform start-up. The procedure shall be documented and submitted to the design team and Owner. Include copies of startup reports in the Operations & Maintenance Manuals.

a. Lighting Control Systems, including occupancy sensor controls

J. All equipment shall be FM and UL listed where applicable.

1.8 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 the Engineer and the Owner. Any outage must be scheduled when the interruption causes the least interference with normal work 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 unless specifically noted in the Specifications or in the bidding requirements.

B. This Contractor shall restore any electrical services interrupted as a result of a lack of coordination to proper operation as soon as possible.

C. Contractor shall notify Owner of any utility service shutdown forty-eight (48) hours in advance. This includes power, telephone, cable TV, and other utilities related to this Contractor's scope of work.

1.9 REGULATORY AND UTILITY REQUIREMENTS

A. Contractor is responsible for coordinating all required site inspections by authorities having jurisdiction. Contractor shall notify General Contractor of all scheduled inspections seven (7) working days prior to site visit.

B. Contractor is responsible for paying for all fees, permits, and inspections that are required to complete their work.

1.10 PROTECTION OF FINISHED SURFACES

A. Furnish one (1) can of touch-up paint for each different color factory finish for equipment furnished by the Contractor. Deliver touch-up paint with other "loose and detachable parts" as covered in the General Requirements.

1.11 SEALING AND FIRESTOPPING

A. Sealing and firestopping of sleeves/openings between conduits, cable trays, wireways, troughs, etc. and the structural or partition opening shall be the responsibility of the contractor whose work penetrates the opening. The contractor responsible shall hire individuals skilled in such work to do the sealing and firestopping. These individuals hired shall normally and routinely be employed in the sealing and fireproofing occupation.

1.12 WORK BY OWNER AND/OR OWNER AGENCY

A. Asbestos abatement and PCB equipment (other than light fixture ballasts) removal and disposal, if required, will be by the Owner under separate contract.

B. Electrical testing not described in these contract documents will be by the Owner under separate contract(s).

1.13 OMISSIONS

A. No later than ten (10) days before bid opening, the Contractor shall call the attention of the Architect and Engineer to any materials or apparatus the Contractor believes to be inadequate and to any necessary items of work omitted.

1.14 DELIVERY, STORAGE, AND HANDLING

A. All equipment and materials shall be protected during shipment and storage against physical damage, vermin, dirt, corrosive substances, fumes, moisture, cold and rain.

B. Store equipment indoors in clean dry space with uniform temperature to prevent condensation. Equipment shall include but not be limited to enclosures, controllers, circuit protective devices, cables, wire, light fixtures, electronic equipment, and accessories.

C. During installation, equipment shall be protected against entry of foreign matter; and be vacuum-cleaned both inside and outside before testing and operating. Compressed air shall not be used to clean equipment. Remove loose packing and flammable materials from inside equipment.

D. Take such precautions as are necessary to protect apparatus and materials from damage. Damaged equipment shall be, as determined by the Owner and/or Engineer, placed in first class operating condition or be returned to the source of supply for repair or replacement.

E. Protect factory finish from damage during construction operations until acceptance of the Project. Restore any finishes that become stained or damaged to Owner's satisfaction.

1.15 DIVISION OF WORK AND COORDINATION

A. The Electrical Contractor is responsible for providing and installing power wiring up to equipment provided by others for a single point connection. Internal wiring of equipment provided by others shall be the responsibility of the manufacturer or the contractor responsible for providing and installing the equipment.

B. Controls, disconnect switches, starters, variable frequency drives, etc. shall be provided and installed by the contractor noted on the plans and in the specifications. It is the responsibility of the Contractor to request written clarification for any ambiguity regarding division of work and coordination at least ten (10) days prior to bid.

C. See Section 230900 for scope of wiring required for Temperature Control systems.

D. Utilities routed within the building shall be installed in an orderly manner. All work will be coordinated with other disciplines prior to installation. The following list ranks the priority of the utilities to be installed:

1. Light fixtures
2. Gravity piping
3. Ductwork
4. Cable tray
5. All other piping
6. Electrical conduits

E. 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.

F. Coordinate work with the Testing and Balancing (TAB) Contractor. Verify system completion to the TAB Contractor such as fire/smoke damper integration ready for testing, power provided to control panels and control devices as specified, and power provided to all equipment and dampers that are required to operate for testing and balancing. Assist the TAB Contractor as needed to complete their work.

G. Arrange for conduit and raceway spaces, chases, slots, and openings in building structure during progress of construction, to allow for electrical installations.

H. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

I. Coordinate requirements for access panels and doors for electrical items requiring access that are concealed behind finished surfaces. Access panels and doors are specified in Division 08 Section "Access Doors and Frames."

1.16 WORK PERFORMANCE

A. All electrical work must comply with the requirements of NFPA 70 (NEC), NFPA 70B, NFPA 70E, OSHA Part 1910 subpart J, OSHA Part 1910 subpart S and OSHA Part 1910 subpart K in addition to other references required by contract.

B. Job site safety and worker safety is the responsibility of the contractor.

C. Electrical work shall be accomplished with all affected circuits or equipment de-energized. When an electrical outage cannot be accomplished in this manner for the required work, the following requirements are mandatory:

1. Electricians must use full protective equipment (i.e., certified and tested insulating material to cover exposed energized electrical components, certified and tested insulated tools, etc.) while working on energized systems in accordance with NFPA 70E.
2. Electricians must wear personal protective equipment while working on energized systems in accordance with NFPA 70E.
3. Before initiating any work, a job specific work plan must be developed by the contractor. The work plan must include procedures to be used on and near the live electrical equipment, barriers to be installed, safety equipment to be used and exit pathways.
4. Work on energized circuits or equipment cannot begin until prior written approval is obtained from the Owner.

1.17 SALVAGE MATERIALS

A. No materials removed from this project shall be reused except as specifically noted or allowed on the Drawings. All materials removed shall become the property of, and shall be disposed of by, the Contractor except for items the Owner has designated they will keep.

1.18 OPERATION AND MAINTENANCE DATA

A. All operations and maintenance data shall comply with the submission and content requirements specified under section GENERAL REQUIREMENTS.

B. In addition to the general content specified under GENERAL REQUIREMENTS supply the following additional documentation as applicable:

1. Internal and interconnecting wiring and control diagrams with data to explain detailed operation and control of the equipment.
2. A control sequence describing start-up, operation, and shutdown.
3. Description of the function of each principal item of equipment.
4. Installation instructions.
5. Safety precautions for operation and maintenance.
6. Diagrams and illustrations.
7. Periodic maintenance and testing procedures and frequencies, including replacement parts numbers and replacement frequencies.
8. Performance data.
9. Where applicable, pictorial "exploded" parts list with part numbers. Emphasis shall be placed on the use of special tools and instruments. The list shall indicate sources of supply, recommended spare parts, and name of servicing organization.
10. List of factory approved or qualified permanent servicing organizations for equipment repair and periodic testing and maintenance, including addresses and factory certification qualifications.

1.19 RECORD DRAWINGS

A. The Contractor shall maintain at least one (1) copy of the Specifications and Drawings on the job site at all times.

B. The Architect will provide the Contractor with a suitable set of Contract Drawings on which daily records of changes and deviations from contract shall be recorded. 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 Contractor's field superintendent. No arbitrary mark-ups will be permitted.

D. At completion of the project, the Contractor shall submit the marked-up record drawings to the General Contractor prior to final payment.

PART 2 - PRODUCTS

2.1 GENERAL

A. Equipment and control systems should match, integrate, communicate or cooperate with Owner's existing systems, such as power monitoring systems, building automation, fire alarm, motor control centers, switchboards, breakers, transformers, and lighting dimming systems.

B. Conditions: Provide new products of manufacturers regularly engaged in production of such equipment. Provide the manufacturer's latest standard design for the type of product specified.

C. Space Limitations: Equipment selected shall conform to the building features and shall be coordinated with all components. Do not provide equipment that will not meet arrangement and space limitations.

D. Common Source: Equipment specified in Sections 262728 Disconnect Switches, 262730 Contactors, 262816 Enclosed Switches and Circuit Breakers, 262900 Motor Controllers shall be provided by the same manufacturer.

2.2 ACCESS PANELS AND DOORS

A. Provide access panels and/or doors where required to maintain access to the electrical installation and where noted on the Drawings.

B. Lay-in Ceilings

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

C. Plaster/Gypsum Walls and Ceilings

1. 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 application, 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; minimum size is 12" by 12".

2.3 IDENTIFICATION

A. See Electrical Section 260553 – Identification.

2.4 SEALING AND FIRESTOPPING

A. Fire and/or Smoke Rated Penetrations

1. Manufacturers
   a. 3M, STI/SpecSeal, Tremco, Hilti or approved equal.
2. All firestopping systems shall be by the same manufacturer.
3. Submittals
   a. Contractor shall submit product data for each firestop system. Submittals shall include product characteristics, performance and limitation criteria, test data, MSDS sheets, installation details and procedures for each method of installation applicable to this project. For non-standard conditions where no UL tested system exists, submit manufacturer's drawings for UL system with known performance for which an engineering judgement can be based upon.
4. Product
   a. Firestop systems shall be UL listed or tested by an independent testing laboratory approved by the Department of Commerce.

b. Use a product that has a rating not less than the rating of the wall or floor being penetrated. Reference architectural drawings for identification of fire and/or smoke rated walls and floors.

c. Contractor shall use firestop putty, caulk sealant, intumescent wrapstrips, intumescent firestop collars, firestop mortar or a combination of these products to provide a UL listed system for each application required for this project. Provide mineral wool backing where specified in manufacturer's application detail.

B. Non-Rated Penetrations

1. Conduit Penetrations Through Below Grade Walls

a. In exterior wall openings below grade, use a modular mechanical type seal consisting of interlocking synthetic rubber links shaped to continuously fill the annular space between the uninsulated conduit and the cored opening or a water-stop type wall sleeve.

2. Conduit and Cable Tray Penetrations

a. At conduit and cable tray penetrations of non-rated interior partitions, floors and exterior walls above grade, use urethane caulk in annular space between conduit and sleeve, or the core drilled opening.

PART 3 - EXECUTION

3.1 EXCAVATION AND BACKFILL

A. Perform all excavation and backfill work to accomplish indicated electrical systems installation in accordance with Division 31.

3.2 CONCRETE WORK

A. The Division 3 Contractor will perform all cast-in-place concrete 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.

3.3 CUTTING AND PATCHING

A. Refer to Division 1, General Requirements, Cutting and Patching.

3.4 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.

3.5 EQUIPMENT ACCESS

A. Install all conduit, raceways, 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 or drywall walls or ceilings, furnish the access doors to the General Contractor and reimburse the General Contractor for installation of those access doors.

3.6 COORDINATION

A. The Contractor shall cooperate with other trades 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 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. 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.

D. Coordinate clearances in front of and above electrical distribution equipment with other trades to avoid interference issues. Maintain clearances as defined in the National Electrical Code. Pipes, ducts, etc. shall not be installed above electrical distribution equipment.

E. Coordinate exact locations of floor boxes, furniture wall feeds, and power poles with the Owners' furniture vendor.

3.7 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 inches 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 a pipe clamp resting on the sleeve supports the pipe penetrating 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 core drilled opening as the sleeve.

3.8 SEALING AND FIRESTOPPING

A. Fire and/or Smoke Penetrations

1. Install approved product in accordance with the manufacturer's instructions where a raceway (i.e. cable tray, bus, cable bus, conduit, wireway, trough, etc.) penetrates a fire rated surface.

2. Where firestop mortar is used to infill large fire-rated floor openings that could be required to support weight, provide permanent structural forming. Firestop mortar alone is not adequate to support any substantial weight.

B. Non-Rated Surfaces

1. When the opening is through a non-fire rated wall, floor, ceiling or roof the opening must be sealed using an approved type of material.

2. Install escutcheons or floor/ceiling plates where conduit penetrates non-fire rated surfaces in occupied spaces. Occupied spaces for this paragraph include only those rooms with finished ceilings and the penetration occurs below the ceiling.

3. In exterior wall openings below grade, assemble rubber links of mechanical seal to the proper size for the conduit and tighten in place, in accordance with the manufacturer's instructions. Install so that the bolts used to tighten the seal are accessible from the interior of the building or vault.

4. At interior partitions, conduit penetrations are required to be sealed for all clean rooms, laboratories, and most hospital spaces, computer rooms, dormitory rooms, telephone/data/com rooms and similar spaces where the room pressure or odor transmission must be controlled. Apply sealant to both sides of the penetration in such a manner that the annular space between the conduit sleeve and the conduit is completely filled.

3.9 HOUSEKEEPING AND CLEAN UP

A. The Contractor shall clean up and remove from the premises, daily, 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 TESTING

A. Test Conditions

1. Place circuits and equipment into service under normal conditions, collectively and separately, as may be necessary to determine satisfactory operation. Perform specified tests in the presence of the Owner's representative(s). Furnish all instruments, wiring, equipment and personnel required for conducting tests. Demonstrate that the equipment operates in accordance with requirements of the Contract Documents. Special tests on certain items are specified hereinafter.
2. Where specified that the testing be performed by an independent testing company, an Owner-approved National Electrical Testing Association (NETA) certified testing company shall be used. Submit copies of test reports.
3. Prior to testing, Contractor shall submit to Owner for approval, installation verification Prefunctional Checklists and Functional Performance Test procedures. These shall be used for documentation as part of the commissioning process.
4. All instruments required for conducting the tests shall be NIST (National Institute for Standard and Technology) certified or traceable, and calibrated at the time of testing.

B. Test Dates: Schedule final acceptance sufficiently in advance of the Contract date to permit completion of any necessary adjustment or alterations within the number of days allotted for completion of the Contract. Provide written notification to Owner at least fourteen (14) calendar days in advance of Functional Performance Test dates.

C. Retests: If retesting is required due to initial failure, conduct retests of such time duration as may be necessary to assure proper functioning of adjusted or altered parts or items of equipment. Any resultant delay as a result of such necessary retests does not relieve the Contractor of Contractor’s responsibility under this Contract.

D. Circuit Verification: All 120-volt single-phase circuits shall be verified to match the Drawings and panel schedules by “ringing out" each circuit in the presence of the Owner’s representative(s).

3.11 OWNER TRAINING

A. All training provided for the Owner shall comply with the format, general content requirements and submission guidelines specified under Section 019101, or 019102.

B. Contractor to provide factory authorized representative and/or field personnel knowledgeable with the operations, maintenance and troubleshooting of the system and/or components defined within this section for a minimum period of 8 hours or for the duration noted in the technical Specifications.

3.12 NFPA 70E COMPLIANCE

A. The Electrical Contractor will be responsible for providing ARC Flash labeling for all electrical distribution equipment installed or modified as part of this contract. This includes but is not limited to: Identification of ARC Flash Boundaries, Application of Proper labels, and Identification of Proper Labels, and Identification of Proper Personal Protective Equipment.

B. The Contractor must ensure that personnel working on the equipment while energized are qualified to do so and are wearing the appropriate ARC Flash personal protective equipment. Documentation of this training is required.

E. The Electrical Contractor will include in his bid the cost to hire a qualified Engineer to perform the necessary ARC Flash study.

3.13 PROJECT CLOSEOUT REQUIREMENTS

A. Final project closeout tasks

1. Deliver all spare parts listed in each specification section. Deliver to Owner chosen location.
2. All equipment labeled per specifications.
3. All equipment cleaned and ready for use. Install new fuses in all equipment with fuses; do not use Owner's spare fuses.

B. Contractor requirements

1. Marked up drawings and specifications provided to Engineer for incorporation of as-built drawings or to serve as the as-built drawings depending on the project requirements. As-built drawings shall be clean and legible.
2. Operation and Maintenance (O & M) Manuals shall include the following:
    a. Contractor contact for warranty work
    b. Approved shop drawings, incorporating all review comments
    c. Warranty copies
    d. Equipment start-up reports
    e. Operation and maintenance instructions
3. Utility Rebate Forms
    a. Contractor shall submit completed energy rebate forms for each piece of equipment that is eligible for a rebate. Eligible equipment shall include, but not be limited to the following:
        1) Interior Lighting
        2) Exterior Lighting
        3) Occupancy Sensors
        4) Variable Frequency Drives
    b. Contractor to complete information regarding equipment. Submit form to Owner; Owner will complete Owner's contact information and send the completed form to the utility.

C. Three (3) final approved O & M Manuals shall be delivered to Owner. Each manual shall be an appropriately sized three (3) ring binder with a vinyl cover and printed spine and cover labels. Each section shall have a printed divider tab. Each section shall be listed in a table of contents at the beginning of the manual.

END OF SECTION

(ELECTRONIC DOCUMENT RELEASE FORM & SUBSTITUTION REQUEST FORMS ATTACHED)

Document Release Form

Information Requested:

Project Name:
Drawings Requested:

Media Type: (Check all that are applicable)

- ☐ AutoCAD DWG Files (Version _____)
- ☐ REVIT Files (Version _____)
- ☐ Adobe PDF Files
- ☐ Other

Requesting Party:

Name:

Company:

Signature:

Date:

Address 1:

Address 2:

Email Address:

Phone #:

KEDbluestone Use:

Form Sent By:

Date:

KEDbluestone Project #:

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SUBSTITUTION REQUEST FORM (DURING BIDDING)

We submit for your consideration the following product instead of the specified item for the following project:

PROJECT: _____

SPEC. SECTION	SPEC. TITLE	PARAGRAPH	SPECIFIED ITEM

Proposed Substitution: _____

MANUFACTURER	TRADE NAME	MODEL NO.

Attached data includes product description, specifications, drawings, photographs, and performance and test data adequate for evaluation of the request; applicable portions of the data are clearly identified.

Attached data also includes a description of changes to the Contract Documents that the proposed substitution will require for its proper installation.

The Undersigned certifies:

- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.
- Same warranty will be furnished for proposed substitution as for specified product.
- Same maintenance service and source of replacement parts, as applicable, is available.
- Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.
- Proposed substitution does not affect dimensions and functional clearances.
- Payment will be made for changes to building design, including Architectural and Engineering design, detailing, and construction costs caused by the substitution.

Submitted by:

_____

Signature

_____

Firm

_____

Telephone Email Date

Engineer's Review and Action

☐ Substitution Approved

☐ Substitution Approved As Noted
☐ Substitution Rejected
☐ Substitution Request Received Too Late

Signed by:

_____

Date

Supporting Data Attached:

☐ Drawings ☐ Product Data ☐ Samples ☐ Tests ☐ Reports ☐ Other _____

SUBSTITUTION REQUEST FORM (AFTER BIDDING)

We submit for your consideration the following product instead of the specified item for the following project:

PROJECT: _____

SPEC. SECTION SPEC. TITLE PARAGRAPH SPECIFIED ITEM

_____ _____ _____ _____

Proposed Substitution: _____

MANUFACTURER TRADE NAME MODEL NO.

_____ _____ _____

INSTALLER PHONE NO.

_____ _____

History: ☐ New Product ☐ 2-5 years old ☐ 5-10 years old ☐ More than 10 years old

Differences between proposed substitution and specified product: _____
_____
_____

Proposed substitution affects other parts of Work: ☐ No ☐ Yes; explain _____
_____

Proposed substitution changes Contract Time: ☐ No ☐ Yes [Add] [Deduct] _____ days

Savings to Owner for accepting substitution: $_____

The Undersigned certifies:

- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.
- Same warranty will be furnished for proposed substitution as for specified product.
- Same maintenance service and source of replacement parts, as applicable, is available.
- Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.
- Cost data as stated above is complete. Claims for additional costs related to accepted substitution which may subsequently become apparent are to be waived.
- Proposed substitution does not affect dimensions and functional clearances.
- Payment will be made for changes to building design, including Architectural and Engineering design, detailing, and construction costs caused by the substitution.
- Coordination, installation, and changes in the Work as necessary for accepted substitution will be complete in all respects.

Submitted by:

_____

Signature

_____

Firm

_____

Telephone Email Date

Engineer's Review and Action

☐ Substitution Approved
☐ Substitution Approved As Noted
☐ Substitution Rejected
☐ Substitution Request Received Too Late

Signed by:

_____

Date

Supporting Data Attached:

☐ Drawings ☐ Product Data ☐ Samples ☐ Tests ☐ Reports ☐ Other _____

SECTION 26 05 02

ELECTRICAL DEMOLITION FOR REMODELING

PART 1 - GENERAL

1.1 SCOPE

A. Perform all Work required to provide the following demolition indicated by the Contract Documents with supplementary items necessary for proper installation.

1.2 REFERENCES

A. Applicable provisions of Division 1 govern work under this Section.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. Materials and equipment for patching and extending work as specified in the individual Sections.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify field measurements and circuiting arrangements 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. Demolition drawings are based on casual field observation and/or existing record documents. It is the responsibility of the Contractor to visit the site prior to bidding and include any necessary demolition, or relocation of items required to complete the work. Any work not included shall be clarified with the submittal of the Contractor's bid. Report discrepancies to the Architect and Engineer before disturbing existing installation.

E. Beginning of demolition means installer accepts existing conditions.

3.2 PREPARATION

A. Disconnect electrical systems in structures, floors, walls, and ceilings scheduled for removal.

B. Coordinate utility service outages with the Owner, Architect, Engineer, and General Contractor. Also, if applicable, coordinate utility service outages with the local Utility Company.

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 safety systems must be maintained in operation at all times as required by the Owner. This includes security and safety lighting.

D. Existing Electrical Service: Maintain existing system in service until new system is complete and ready for service. Disable system only to make switchovers and connections. Obtain permission from the Owner at least 48 hours before partially or completely disabling system. Minimize outage duration. If required, make temporary connections to maintain service in areas adjacent to work area.

3.3 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. Accessible portions of abandoned Class 2, Class 3 and PLTC cables shall be removed in accordance with NEC 725.25. Where cables remain for future use they shall be tagged per the NEC.

F. Accessible portions of abandoned fire alarm cables shall be removed in accordance with NEC 760.25. Where cables remain for future use they shall be tagged per the NEC.

G. Accessible portions of abandoned fiber optic cables shall be removed in accordance with NEC 770.25. Where cables remain for future use they shall be tagged per the NEC.

H. Accessible portions of abandoned communication cables shall be removed in accordance with NEC 800.25. Where cables remain for future use they shall be tagged per the NEC.

I. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.

J. 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.

K. Disconnect and remove abandoned panelboards and distribution equipment.

L. Disconnect and remove electrical devices and equipment serving utilization equipment that has been removed.

M. Disconnect and remove abandoned luminaires. Remove brackets, stems, hangers, and other accessories.

N. Repair adjacent construction and finishes damaged during demolition and extension work.

O. Maintain access to existing electrical installations which remain active. Modify installation or provide access panel as appropriate.

P. 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.

3.4 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 <u>not</u> 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. <u>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.</u> 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 ten (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.

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 General Contractor or the Owner. 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.

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 General Contractor, in written form, a total count of these ballasts (or their total weight by barrel) and where they are stored.

10. When the ballast demolition is completed and all PCB ballasts are placed in drums ready to be picked up for disposal, the Owner or Owner's Agent will make arrangements for pickup and disposal of the PCB ballasts.

3.5 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.

B. 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. If the Contractor breaks more than 1% of the total lamps removed for the project, the Contractor will be charged the cost difference between disposal of broken lamps and disposal of unbroken lamps for all lamps broken in excess of 1% of the total lamps removed in the project.

C. The Contractor shall obtain containers from an approved lamp and ballast recycling vendor. Removed lamps shall be placed in containers provided by the Contractor and marked with the number and type of lamps. Containers shall be placed in storage in a location on the Owner's property (this may be in another building) arranged by the Owner's representative. The Contractor shall label the area as "Hazardous Material Storage - Mercury".

D. The Contractor shall provide to the General Contractor, in written form, a count of all stored lamps by type at the completion of the project.

E. The Owner will make arrangements for the lamps to be picked up.

3.6 CLEANING AND REPAIR

A. Clean and repair existing materials and equipment which remain or are to be reused.

B. Panelboards:

1. 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:

1. Remove existing luminaires for cleaning. Use mild detergent to clean all exterior and interior surfaces; rinse with clean water and wipe dry. Replace lamps, ballasts (if required) and broken electrical parts.

3.7 INSTALLATION

A. Install relocated materials and equipment under the provisions of other sections.

END OF SECTION

SECTION 26 05 04
CLEANING AND TESTING

PART 1 - GENERAL

1.1 SCOPE

A. Perform all Work required to provide the required cleaning, repair, adjustment, calibration, maintenance and testing of electrical equipment, as specified herein. This applies only to new electrical and existing electrical equipment being furnished, modified, worked on or serviced by this contractor for this project.

1.2 REFERENCES

A. Applicable provisions of Division 1 govern work under this Section.

PART 2 - PRODUCTS – (NOT USED)

PART 3 - EXECUTION

3.1 GENERAL INSPECTION AND CLEANING OF ALL ELECTRICAL EQUIPMENT

A. Inspect for physical damage and abnormal mechanical and electrical conditions.

B. Any item found to be out of tolerance, or in any other way defective as a result of the required testing, shall be reported to the Engineer. Procedure for repair and/or replacement will be outlined. After appropriate corrective action is completed the item shall be re-tested.

C. Compare equipment nameplate information with the latest single line diagram and report any discrepancies.

D. Verify proper auxiliary device operation and indicators.

E. Check tightness of accessible bolted electrical joints. Use torque wrench method.

F. Make a close examination of equipment and remove any shipping brackets, insulation, packing, etc. that may not have been removed during original installation.

G. Make a close examination of equipment and remove any dirt or other forms of debris that may have collected in existing equipment or in new equipment during installation.

H. Clean All Equipment:

1. Vacuum inside of panelboards, fire alarm panels, comm/data, security panel, etc.
2. Loosen attached particles and vacuum them away.
3. Wipe all insulators with a clean, dry, lint free rag.
4. Clean insulator grooves.
5. Inspect equipment anchorage.
6. Inspect equipment and bus alignment.
7. Check all heater elements for operation and control.
8. Lubricate nonelectrical equipment per manufacturer's recommendations.

3.2 GROUNDING SYSTEMS

A. Inspect the ground system for adequate termination at all devices.

3.3 INSTRUMENT TRANSFORMERS

A. Inspect for physical damage.

B. Inspect nameplate information for compatibility with one-line drawings.

C. Verify the transformers' connections with the system requirements.

D. Verify tightness of all bolted connections and assure adequate clearances exist from primary circuits to secondary circuit wiring and to grounds.

E. Verify that all required grounding and shorting connections exist and that those connections have good contact; i.e. sufficient surface area, good cleanliness, and proper pressure.

F. Test the proper operation of transformer withdrawal mechanism and the grounding operation when applicable.

G. Verify proper primary and secondary fuses and required sizes.

3.4 PROTECTIVE RELAYS

A. All relays shall be inspected for physical damage.

B. Inspect cover gaskets and cover glass for presence of foreign material and moisture and then clean.

3.5 METERING AND INSTRUMENTATION

A. Examine all devices for broken parts, damage and wire connection tightness.

B. Meter selector switches and/or buttons shall be inspected for proper application and operation.

3.6 CABLES

A. Visual and Mechanical Inspections:

1. Inspect exposed sections for physical damage.
2. Verify cable is supplied and connected in accordance with single line diagram.
3. Inspect for shield grounding, cable support and termination.
4. If cables are terminated through window type C.T.'s make an inspection to verify that neutrals and grounds are properly terminated for normal operation of protective devices.
5. Inspect for visual jacket and insulation condition.
6. Visible cable bends shall be checked against ICEA or manufacturer's minimum allowable bending radii -- 12 times the diameter for tape shielded cables.
7. Inspect for proper fireproofing in common cable areas.
8. There shall be NO tests performed on existing cable without specific direction from the Engineer.

B. Electrical Tests -- Below 600 Volts:

1. All secondary cables from the utility transformer(s) to the secondary switchboard(s) shall be subjected to insulation tests using a 500 vdc megger.
2. Visually inspect cables, lugs, connectors and all other components for physical damage and proper connections
3. Check all cable connectors for tightness (with a torque wrench) and clearances. Torque test conductor and bus terminations to manufacturer's recommendations.
4. Check for proper grounding resistance at all services and at transformers. Resistance shall be 5 ohms maximum.

C. Above 600 volts:

1. Above 600 volt testing will be performed under a separate contract.

3.7 PANELBOARDS

A. Torque all the connections per the manufacturers spec. Verify phase wires, color coding, separate neutral and mechanical bonding. Verify circuit breaker operation. Verify the directory is typed and reflects as-built conditions.

3.8 LIGHT FIXTURES

A. Check the bonding and proper lumen output and orientation where applicable. Verify that recessed fixtures are installed with hold down clips where required. Confirm operation of the fixture with the proper switch or sensor.

3.9 OCCUPANCY SENSORS

A. Confirm operation of the sensor per the manufacturers spec.

END OF SECTION

SECTION 26 05 19

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLE

PART 1 - GENERAL

1.1 SCOPE

A. Perform all Work required for furnishing and installing required wiring and cabling systems including pulling, terminating and splicing.

1.2 REFERENCES

A. Applicable provisions of Division 1 govern work under this Section

B. Section 260533 Raceway and Boxes

C. Section 260553 Identification

1.3 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

2.1 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. Conductors up to and including size 12 AWG shall be solid, conductors larger than 12 AWG shall be stranded.

E. 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.

2.2 BUILDING WIRE

A. Acceptable Manufacturers: American Insulated Wire Corp., BICC General Cable Industries Inc., Cerro Wire & Cable Co. Inc., Pirelli Cable Corp., Rome Cable Corp., or Southwire Co.

B. Single Conductor Insulated Wire.

1. FEP, THHN, THW, THW-2, THWN, THWN-2, XHH, XHHW, or XHHW-2: Wiring in dry or damp locations (except where special type insulation is required).

2. THWN, THWN-2, XHHW, XHHW-2, USE, or USE-2: Wiring in wet locations (except where type USE or USE-2 insulated conductors are specifically required, or special type insulation is required).

3. THHN, THWN or THWN-2: Wiring installed in existing raceway systems (except where special type insulation is required).

4. THHN, THW-2, THWN-2, XHHW, or XHHW-2: Wiring for electric discharge lighting circuits (fluorescent, HID), except where fixture listing requires wiring rated higher than 90° C.

5. THWN Marked “Gasoline and Oil Resistant”: Wiring to gasoline and fuel oil pumps.

6. USE or USE-2: Wiring indicated on the drawings to be direct burial in earth.
7. USE or USE-2 Marked “Sunlight Resistant”:
    a. Service entrance wiring from overhead service to the service equipment.
    b. Wiring exposed to the weather and unprotected (except where special type insulation is required).

2.3 METAL CLAD CABLE (TYPE MC)

A. Acceptable Manufacturers: Southwire, AFC Cable Systems Inc., Coleman Cable Co.

B. Comply with NFPA 70, Article 330.

C. Interlocked flexible galvanized steel armor sheath, conforming to UL requirements for type MC metal clad cable.

D. Insulated copper conductors, suitable for 600 volts, rated 90°C, one of the types listed in NFPA 70 Table 310.104(A) or of a type identified for use in Type MC cable.

E. Internal full size copper ground conductor with green insulation.

F. Connectors for MC cable: Bridgeport, Arlington Industries Inc.’s Saddle grip, or Thomas & Betts Co.’s Tite-Bite with anti-short bushings.

2.4 METAL CLAD FEEDER CABLE (TYPE MC)

A. Copper Conductors

1. Acceptable Manufacturers: Southwire Armorlite, AFC Cable Systems, Inc.
2. MC feeders with copper conductors are acceptable for use as services and feeders circuits #8 AWG and larger.
3. MC feeders shall be installed and may be used for all installations “permitted” under NFPA 70, Article 330.
4. All MC feeders must be UL Listed and passed all requirements of UL 1569.
5. Conductors shall be suitable for 600 volts, rated 90°C dry / 75°C wet, insulated with THHN/THWN-2 or XHHW-2 insulation with color codes as identified in this section. Equipment grounding conductor may be either bare or insulated copper conductor. For parallel installation copper equipment ground must be sized per NEC Table 250.122.
6. Interlocked flexible aluminum armor sheath, conforming to UL requirements for type MC metal clad cable.
7. Provide black blue gray flame retardant PVC jacketing.
8. Connectors for MC feeder cable: Bridgeport, Arlington, or Service Wire Co listed fo ruse with Metal-Clad cable, Type MC, employing interlocked aluminum tape.

2.5 NONMETALLIC SHEATHED CABLE (TYPE NM)

A. Acceptable Manufacturers: Southwire, Encore Wire.

B. Comply with NFPA 70, Article 334.

C. Conductors shall be UL-listed Type NM-B, suitable for operation at 600 volts in all installations as specified in the National Electrical Code.

D. Manufactured as 2, 3, or 4 conductor cable, with a bare ground wire. Copper conductors are annealed (soft) copper. Stranded conductors are compressed stranded. Conductor insulation is 90°C-rated polyvinyl chloride (PVC), nylon jacketed.

E. Cable jacket is color-coded for quick size identification; White 14 AWG, Yellow 12 AWG, Orange 10 AWG, and Black 8 AWG and 6 AWG.

2.6 MINERAL INSULATED CABLE (TYPE MI)

A. Acceptable Manufacturers: AFC Cable Systems' Type MI Cable, or BICC/Pyrotenax Mineral Insulated System 1850 Pyrotenax Cable.

B. Copper conductors.

C. Seamless copper sheath.

D. Two (2) hour fire resistive rating UL system classified, listed in UL Building Materials Directory product category Electrical circuit Protective Systems (FHIT), or Fire Resistive Cables (FHJR).

E. PVC or HDPE jacketing (where shown on drawings).

F. 600 volt rating.

G. Fittings and accessories as required for a complete system to suit listing and installation conditions.

2.7 WIRING CONNECTORS

A. Split Bolt Connectors: Not acceptable unless noted otherwise.

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. Spring Wire Connectors: Solderless spring type pressure connector with insulating covers for copper wire splices and taps. Use for conductor sizes 10 AWG and smaller.

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.

E. Mechanical Connectors:

1. Bolted type tin-plated; high conductivity copper alloy; spacer between conductors; beveled cable entrances.

F. Insulated Connector Blocks:

1. Conductor count, size, and entry configuration to match application.
2. UV rated.
3. Dual rated for use with copper or aluminum conductors.
4. 600 volt, 90° C termination rating.
5. Caps for sealing wrench access port.

G. Compression (crimp) Connectors:

1. 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.

2.8 TAGS

A. Precision engrave letters and numbers with uniform margins, character size minimum 3/16 inches high.

1. Phenolic: Two (2) color laminated engraver's stock, 1/16 inch minimum thickness, machine engraved to expose inner core color (white).
2. Aluminum: Standard aluminum alloy plate stock, minimum .032 inches thick, engraved areas enamel filled or background enameled with natural aluminum engraved characters.

2.9 WIRE MANAGEMENT

A. Cable Clamps and Clips, Cable Ties, Spiral Wraps, etc: Catamount/T&B Corp., or Ideal Industries Inc.

PART 3 - EXECUTION

3.1 GENERAL WIRING METHODS

A. Install electrical cable, wire and connectors as indicated, in accordance with the manufacturer's written instructions, the applicable requirements of NEC, and as required to ensure that products serve the intended functions.

B. Cables shall be selected on the basis of their purpose and UL listing.

1. Generally, use Types THWN, XHHW and THNN in building interiors and other dry locations.
2. Outdoors and in underground raceways, use Type THWN or other conductor type rated for wet location as required by NEC 300.5(B).
3. Conductors subject to abrasion, such as in lighting poles, shall be Type THWN or THHN.

C. All wire and cable shall be installed in conduit. Exceptions: Type MC, MI, or other type specifically indicated on the drawings not to be installed in raceways.

D. MC cable may be used in the following applications:

1. Branch circuit wiring in wood framed construction (wood joists and wood stud partitions):
   a. Install conductors parallel with joists or studs and attach to the side of these timbers by galvanized straps spaced not more than 6 feet apart.
   b. Install conductors through holes bored in the center of the timbers when running at right angles to joists or studs.
   c. Do not attach the conductors to the edge of joists or studs.
2. Branch circuit wiring in movable metal partitions and movable gypsum partitions.
   a. Install conductors in accordance with partition manufacturer's recommendations.
3. Branch circuit wiring in metal stud partitions:
   a. Install conductors parallel with studs and attach to the side by galvanized straps spaced not more than 6 feet apart.
   b. Install conductors through holes bored in the center of the metal member when running at right angles to studs.
      1) Conductors shall be protected by listed bushings or listed grommets covering all metal edges.
   c. Do not attach the conductors to the edge of studs.

E. Do not use wire smaller than 12 AWG for power and lighting circuits. Minimum size for control circuits shall be 14 AWG copper stranded.

F. All conductors shall be sized to prevent excessive voltage drop at rated circuit ampacity.

G. As a minimum use 10 AWG conductor for 20 ampere, 120 volt branch circuit home runs longer than 100 feet, and for 20 ampere, 277 volt branch circuit home runs longer than 200 feet.

H. Make conductor lengths for parallel conductors equal.

I. Splice only in junction or outlet boxes.

J. No conductor less than 10 AWG shall be installed in exterior underground conduit.

K. Neatly train and lace wiring inside boxes, equipment, and panelboards.

3.2 WIRING INSTALLATION IN RACEWAYS

A. Pull all conductors into a raceway at the same time. Use Listed wire pulling lubricant for pulling 4 AWG and larger wires and for other 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.

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.

3.3 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 spring type pressure connectors 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.

H. Protect wiring in device and junction boxes from paint overspray. Wiring covered with paint shall be removed and replaced where needed by the Contractor.

3.4 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Section 260504 Cleaning and Testing.

3.5 WIRE COLOR

A. For wire sizes 10 AWG and smaller - Wire shall be colored as indicated below.

B. For wire sizes 8 AWG and larger – Use colored wire, or identify wire with colored ½” or ¾” tape bands at all terminals, splices and boxes. Tape bands shall be installed at every 12” for the entire visible length. Colors to be as indicated below.

C. In existing facilities, use existing color scheme if it complies with NFPA 70.

D. In new facilities, use the following color scheme:

1. Black and red for single phase circuits at 120/240 volts
2. Phase A black, Phase B red and Phase C blue for circuits at 120/208 volts single or three phase.
3. Neutral Conductors: White for 120/208V and 120/240V systems, Gray for 277/480V systems. Where there are two or more neutrals in one conduit, each shall be individually identified with a different stripe.
4. Note: This includes fixture whips except for Listed whips mounted by the fixture manufacturer on the fixture and Listed as a System.

E. All switch legs shall be the same color as their associated circuit. Traveler conductors run between 3 and 4 way switches shall be colored pink or purple.

F. Ground Conductors: Green for 2 AWG and smaller. For 1 AWG and larger, identify with green colored wire, or with green tape at both ends and at all access points, such as panelboards, motor starters, disconnects and junction boxes.

G. More Than One Nominal Voltage System Within A Building: Permanently post the color coding scheme at each branch-circuit panelboard.

3.6 IDENTIFICATION

A. Identification Plaque: Where a building or structure is supplied by more than one service, or has any combination of feeders, branch circuits, or services passing through it, install a permanent plaque or directory at each service, feeder and branch circuit disconnect location denoting all other services, feeders, or branch circuits supplying that building or structure or passing through that building or structure and the area served by each. Minimum engraved plaque size of 8”x6”.

3.7 WIRE MANAGEMENT

A. Use wire management products to bundle, route, and support wiring in junction boxes, pullboxes, wireways, gutters, channels, and other locations where wiring is accessible.

3.8 BRANCH CIRCUITS

A. The use of single-phase, multi-wire branch circuits with a common neutral is not permitted. All branch circuits shall be furnished and installed with an individual accompanying neutral, sized the same as the phase conductors.

B. The use of a common neutral for modular furniture will be allowed with the following conditions:

1. (Three) 3-phase circuit breaker is used.
2. Neutral is sized 200% larger than phase conductor.

END OF SECTION

SECTION 26 05 23
CONTROL CABLES

PART 1 - GENERAL

1.1 SCOPE

A. Perform all Work required to provide and install the required remote control and signal cabling indicated by the Contract Documents with supplementary items necessary for proper installation.

1.2 REFERENCES

A. Applicable provisions of Division 1 govern work under this Section.

B. Section 260533 Raceway and Boxes.

C. Section 260553 Identification.

D. NFPA 70 National Electrical Code.

1.3 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

2.1 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.

2.2 REMOTE CONTROL AND SIGNAL CABLE

A. Refer to Division 28 for requirements for cable to be used on safety and security systems.

B. Refer to Division 27 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 (where required), and covered with an overall PVC jacket.
    a. 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.

2.3 WIRING CONNECTORS

A. Split Bolt Connectors: Not acceptable.

B. Spring Wire Connectors: Solderless spring type pressure connector with insulating covers for copper wire splices and taps. Use for conductor sizes 10 AWG and smaller.

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.

PART 3 - EXECUTION

3.1 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. 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.

C. Splice only in junction boxes.

D. Identify wire per section 260553.

E. Neatly train and lace wiring inside boxes, and equipment.

3.2 WIRING INSTALLATION IN RACEWAYS

A. Pull all conductors into a raceway at the same time.

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.

3.3 FREE-AIR CABLE INSTALLATION

A. Free-air installation is allowed for low voltage cabling associated with the following systems:

1. Fire alarm
2. Technology cabling (where cable tray is not available)
3. Control cables (DDC, digital lighting control system, etc.)

B. 'Free-Air' wiring runs shall avoid areas of high traffic (i.e. aisle way), open structure when possible, be run as close as possible to outlining walls and above accessible ceilings when possible.

C. Cabling shall be neatly run at right angles and be kept clear of other trades work.

D. Cabling shall be supported at a maximum of 4-foot intervals utilizing mounting bridal rings or J-hooks anchored to the wall, overhead structure, piping supports or structural steel beams. If cable sag at mid-span exceeds 12-inches, another support shall be provided. **Fire alarm cabling shall be installed in a dedicated support system of J-hooks and/or bridal rings separate from all other low voltage cabling**.

E. Mounting rings/hooks shall be designed to maintain cables bend to larger than the minimum bed radius (typically 4 x cable diameter).

F. Bundle cabling together, where possible, using Velcro straps. **The use of zip ties for cable bundling is NOT allowed**.

G. Cabling being routed above an inaccessible ceiling exceeding 6' in length shall be sleeved using raceway for ease of cable installation and replacement.

H. Cabling shall not be attached to or supported by other systems, including but not limited to: cabling, plumbing or piping, ductwork, suspended ceiling supports or electrical conduit. Additionally, cabling shall not be laid directly on the ceiling grid.

I. To reduce or eliminate Electro-Magnetic Interference (EMI), the following minimum separation distances for 'Free-Air' cabling installations shall be adhered to:

1. Twelve (12) inches from power lines of less than 5kV.
2. Eighteen (18) inches from lighting fixtures.
3. Thirty-nine (39) inches from transformers and motors.

J. A coil of six (6) feet in each cable shall be placed in the ceiling at each 'free-air' wire 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.

K. 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.

L. Cable manufacturers 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.

M. All exposed vertical cable extensions to devices located below the finished ceiling shall be in conduit.

N. Provide protection for exposed cables where subject to damage.

O. Use suitable cable fittings and connectors.

3.4 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 (2) feet (600 mm) of the conductor.

C. Use solderless spring type pressure 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.

F. Protect wiring in device and junction boxes from paint overspray. Wiring covered with paint shall be removed and replaced where needed by the Contractor.

3.5 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Section 260504.

END OF SECTION

SECTION 26 05 29
HANGERS AND SUPPORTS

PART 1 - GENERAL

1.1 SCOPE

A. Perform all Work required to provide and install the following hangers and supports indicated by the Contract Documents with supplementary items necessary for proper installation.

B. Equipment included in this Section

1. Conduit and equipment supports
2. Straps
3. Clamps
4. Steel channel, etc.
5. Fastening hardware for supporting electrical work.

1.2 REFERENCES

A. Applicable provisions of Division 1 govern work under this Section.

1.3 QUALITY ASSURANCE

A. Support systems shall be adequate for the weight of equipment and conduit, including wiring, which they carry.

PART 2 - PRODUCTS

2.1 ANCHORING DEVICES

A. Sleeve Anchors

1. Molly/Emhart's Parasleeve Series
2. Phillips' Red Head Dynabolt Series
3. Ramset's Dynabolt Series

B. Wedge Anchors

1. Hilti's Kwik Bolt Series
2. Molly/Emhart's Parabolt Series
3. Phillips' Red Head Trubolt
4. Ramset's Trubolt Series

C. Concrete Screw Anchors

1. Phillips' Red Head Tapcon

D. Non-Drilling Anchors

1. Hilti's Drop-In Anchor Series
2. Phillips' Red Head Multi-Set II Series
3. Ramset's Dynaset Series

E. Stud Anchors

1. Phillips' Red Head JS Series

2.2 CAST-IN-PLACE CONCRETE INSERTS

A. Continuous Slotted Type Concrete Insert, Galvanized:

1. Load Rating 1300 lbs./ft.: Kindorf's D-986

2. Load Rating 2400 lbs./ft.: Kindorf's D-980
3. Load Rating 3000 lbs./ft.: Hohmann & Barnard Inc.'s Type CS-H
4. Load Rating 4500 lbs./ft.: Hohmann & Barnard Inc.'s Type CS-HD

B. Threaded Type Concrete Insert: Galvanized ferrous castings, internally threaded.

C. Wedge Type Concrete Insert: Galvanized box-type ferrous castings, designed to accept bolts having special wedge shaped heads.

2.3 HAMMER SET ANCHOR

A. Zinc plated steel drive pin with expanding alloy body:
1. Phillips' Red Head HS Series
2. Hilti HIT Series
3. Ramset Shuredrive Series

2.4 MISCELLANEOUS FASTENERS

A. Except where shown otherwise on the Drawings, furnish fastener type, size, and grade required for proper installation of the Work. Select from the following:
1. Cadmium or Zinc Coated Fasteners: Dry locations.
2. Galvanized Fasteners: For exterior use, or for items anchored to exterior walls, except where stainless steel is indicated.
3. Stainless Steel Fasteners: Type 302 for interior Work; Type 316 for exterior Work; Phillips head screws and bolts for exposed Work unless otherwise specified.

2.5 HANGER RODS

A. Mild low carbon steel, unless otherwise specified; fully threaded or threaded each end, with nuts as required to position and lock rod in place. Unless galvanized or cadmium plated, provide a shop coat of red lead or zinc chromate primer paint.

B. 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.

2.6 "C" BEAM CLAMPS

A. With Conduit Hangers
1. For 1 Inch Conduit Maximum:
   a. B-Line Systems Inc.'s BG-8, BP-8 Series
   b. Caddy/Erico Products Inc.'s BC-8P and BC-8PSM Series
   c. GB Electrical Inc.'s HIT 110-412 Series
2. For 3 Inch Conduit Maximum:
   a. Appleton Electric Co.'s BH-500 Series beam clamp with H50W/B Series hangers
   b. Kindorf's 500 Series beam clamp with 6HO-B Series hanger
   c. OZ/Gedney Co.'s IS-500 Series beam clamp with H-OWB Series hanger
3. For 4 Inch Conduit Maximum:
   a. Kindorf's E-231 beam clamp and E-234 anchor clip and C-149 series lay-in hanger
   b. Unistrut Corp.'s P2676 beam clamp and P-1659A Series anchor clip with J1205 Series lay in hanger

B. For Hanger Rods
1. For 1/4 Inch Hanger Rods:

a. B-Line Systems Inc.'s BC
b. Caddy/Erico Products Inc.'s BC
c. GB Electrical Inc.'s HIT 110
d. Kindorf's 500, 510
e. Unistrut Corp.'s P1648S, P2398S, P2675, P2676

2. For 3/8 Inch Hanger Rods:
a. Caddy/Erico Products Inc.'s BC
b. Kindorf's 231-3/8, 502
c. Unistrut Corp.'s P1649AS, P2401S, P2675, P2676

3. For 1/2 Inch Rods:
a. Appleton Electric Co. BH-500 Series
b. Kindorf's 500 Series, 231-1/2
c. OZ/Gedney Co.'s IS-500 Series
d. Unistrut Corp.'s P1650AS, P2403S, P2676

4. For 5/8 Inch Rods: Unistrut Corp.'s P1651AS beam clamp and P1656A Series anchor clip.

5. For 3/4 Inch Rods: Unistrut Corp.'s P1653S beam clamp and P1656A Series anchor clip.

2.7 CHANNEL SUPPORT SYSTEM

A. Channel Material: 12 gauge steel.

B. Finishes
1. Phosphate and baked green enamel/epoxy.
2. Pre-galvanized.
3. Electro-galvanized.
4. Hot dipped galvanized.
5. Polyvinyl chloride (PVC), minimum 15 mils thick.

C. Fittings: Same material and finish as channel.

D. UL Listed Systems
1. B-Line Systems Inc.'s B-22 (1-5/8 x 1-5/8 inches), B-12 (1-5/8 x 2-7/16 inches), B-11 (1-5/8 x 3-1/4 inches).
2. Grinell Corp.'s Allied Power-Strut PS 200 (1-5/8 x 1-5/8 inches), PS 150 (1-5/8 x 2-7/16 inches), PS 100 (1-5/8 x 3-1/4 inches).
3. Kindorf's B-900 (1-1/2 x 1-1/2 inches), B-901 (1-1/2 x 1-7/8 inches), B-902 (1-1/2 x 3 inches).
4. Unistrut Corp.'s P-3000 (1-3/8 x 1-5/8 inches), P-5500 (1-5/8 x 2-7/16 inches), P-5000 (1-5/8 x 3-1/4 inches).
5. Versabar Corp.'s VA-1 (1-5/8 x 1-5/8 inches), VA-3 (1-5/8 x 2-1/2 inches).

2.8 MISCELLANEOUS FITTINGS

A. Side Beam Brackets
1. B-Line Systems Inc.'s B102, B103, B371-2
2. Kindorf's B-915

3. Versabar Corp.'s VF-2305, VF-2507

B. Pipe Straps (Heavy Duty Type):

1. Two (2) Hole Steel Conduit Straps:
   a. B-Line Systems Inc.'s B-2100 Series
   b. Kindorf's C-144 Series
   c. Unistrut Corp.'s P-2558 Series
2. One (1) Hole Malleable Iron Clamps:
   a. Kindorf's HS-400 Series
   b. OZ/ Gedney Co.'s 14-G Series, 15-G Series (EMT)

C. Deck Clamps: Caddy/Erico Products Inc.

D. Supporting Fasteners (Metal Stud Construction): Metal stud supports, clips and accessories as produced by Caddy/Erico Products Inc.

2.9 ROOFTOP SUPPORT SYSTEMS

A. Rooftop supports for conduit, cable tray or equipment shall be provided for installation without requiring roof penetrations, flashing or damage to the roofing material. Height-adjustable supports may be used where necessary. Support conduit a minimum of 4' above the roof surface.

B. Materials:

1. Support bases shall be made of an engineered material with appropriate additives for UV protection. All structural steel components shall be hot-dipped galvanized.
2. The support shall have a continuous bottom surface to provide even load distribution and minimize point loading of the roof membrane. The support base will have a radiused edge to enhance compatibility with roof membranes.
3. Coordinate static load rating of the support(s) with the specific application being served.
4. Accessories: Clamps, bolts, nuts, washers, and other devices as required for a complete system.

C. Applications:

1. Fixed Strut Supports: Size and load ratings for the application
2. Adjustable Strut Supports: Height adjustable, size and load ratings for the application
3. Adjustable Single Conduit Supports: Height adjustable, size and load ratings for the application
4. Bridge Assemblies:
   a. Suitable for multiple conduit runs, cable tray or equipment
   b. Size and load ratings for the application
5. Post Base Assemblies:
   a. For use with vertical sections of channel support systems
   b. Size, channel support configuration, and load ratings for the application
6. Manufacturers:
   a. Caddy/Pentair, Cooper B-Line, Mifab, Arlington, Rooftop Blox, Haydon, MAPA Products

PART 3 - EXECUTION

3.1 INSTALLATION

A. Where specific fasteners are not specified or indicated for securing items to in-place construction, provide appropriate type, size, and number of fasteners for a secure, rigid installation.

B. Install anchoring devices and other fasteners in accordance with manufacturer's printed instructions.

C. Make attachments to structural steel wherever possible.

3.2 FASTENER SCHEDULE

A. Material

1. Use cadmium or zinc coated anchors and fasteners in dry locations.
2. Use hot dipped galvanized or stainless steel anchors and fasteners in damp and wet locations.
3. For corrosive atmospheres or other extreme environmental conditions, use fasteners made of materials suitable for the conditions.

B. Types and Use: Unless otherwise specified or indicated use:

1. Cast-in-place concrete inserts in fresh concrete construction for direct pull-out loads such as shelf angles or fabricated metal items and supports attached to concrete slab ceilings.
2. Anchoring devices to fasten items to solid masonry and concrete when the anchor is not subjected to pull out loads, or vibration in shear loads.
3. Toggle bolts to fasten items to hollow masonry and stud partitions.
4. Metallic fasteners installed with electrically operated or powder driven tools for approved applications, except:
    a. Do not use powder driven drive pins or expansion nails.
    b. Do not attach powder driven or welded studs to structural steel less than 3/16 inch thick.
    c. Do not support a load, in excess of 250 lbs from any single welded or powder driven stud.
    d. Do not use powder driven fasteners in precast concrete
5. Metallic hammer set anchors may be used in wall and ceiling applications. Maximum conduit size supported with hammer set anchors is 1 Inch.

3.3 ATTACHMENT SCHEDULE

A. General: Make attachments to structural steel or steel bar joists wherever possible. Provide intermediate structural steel members where required by support spacing. Select steel members for use as intermediate supports based on a minimum safety factor of 5.

1. Make attachments to steel bar joists at panel points of joists.
2. Do not drill holes in main structural steel members.
3. Use "C" beam clamps for attachment to steel beams.

B. Where it is not possible to make attachments to structural steel or steel bar joists, use the following methods of attachment to suit type of construction unless otherwise specified or indicated on the drawings.

1. Attachment to Steel Roof Decking (No Concrete Fill):
    a. Decking With Hanger Tabs: Use deck clamps.

b. Decking Without Hanger Tabs:

1) Before Roofing Has Been Applied: Use 3/8 inch threaded steel rod welded to a 4 x 4 x 1/4 inch steel plate and installed through 1/2 inch hole in roof deck.

2) After Roofing Has Been Applied: Use welding studs, or self-drilling/tapping fasteners. Exercise extreme care when installing fasteners to avoid damage to roofing.

2. Attachment to Concrete Filled Steel Decks (Total thickness, 2-1/2 inches or more):

a. Before Fill Has Been Placed:

1) Use thru-bolts and fish plates.

2) Use welded studs. Do not support a load in excess of 250 pounds from a single welded stud.

b. After Fill Has Been Placed: Use welded studs. Do not support a load in excess of 250 lbs from a single welded stud.

3. Attachment to Cast-In-Place Concrete:

a. Fresh Concrete: Use cast-in-place concrete inserts.

b. Existing Concrete: Use anchoring devices.

4. Attachment to Cored Precast Concrete Decks:

a. New Construction: Use thru-bolts and fish plates before Construction Work Contractor has placed concrete fill over decks.

b. Existing Construction: Toggle bolts may be installed in cells for a maximum load of 100 lbs.

5. Attachment to Waffle Type Concrete Decks:

a. New Construction:

1) Use cast-in-place concrete inserts in fresh concrete.

2) If concrete fill has been applied over deck, thru-bolts and fish plates may be used where additional concrete or roofing is to be placed over the deck.

b. Existing Construction: Use anchoring devices.

6. Attachment to Precast Concrete Planks: Use anchoring devices, except do not make attachments to precast concrete planks less than 2-3/4 inches thick.

7. Attachment to Precast Concrete Tee Construction:

a. New Construction:
1) Use tee hanger inserts between adjacent flanges.
2) Use thru-bolts and fish plates, except at roof deck without concrete fill.

b. Existing Construction:
1) Use anchoring devices installed in webs of tees. Install anchoring devices as high as possible in the webs.

c. Do not use powder driven fasteners.

d. Exercise extreme care in drilling holes to avoid damage to reinforcement.

8. Attachment to Wood Construction: Use side beam brackets fastened to the sides of wood members to make attachments for hangers.

a. Under 15 lbs Load: Attach side beam brackets to wood members with two (2) No. 18 x 1-1/2” long wood screws, or two (2) No. 16 x 1-1/2” long drive screws.

b. Over 15 lbs Load: Attach side beam brackets to wood members with bolts and nuts or lag bolts. Do not use lag bolts in wooden members having a nominal thickness (beam face) under two (2) inches in size. Install bolts and nuts or lag bolts in the side of wood members at the mid-point of slightly above. Install plain washers under all nuts.

1) 15-30 lb load: 3/8" x 1-3/4" lag bolts or 3/8" diameter bolts.

2) 31-50 lb load: 1/2" x 2" lag bolts or 1/2" diameter bolts.

3) Over 50 lb load (to load limit of structure): 5/8" diameter bolts.

c. Bottom chord of wood trusses may be utilized as structural support, but method of attachment must be specifically approved.

d. Do not make attachments to the diagonal or vertical members of wood trusses.

e. Do not make attachments to the nailing strips on top of steel beams.

9. Attachment to Metal Stud Construction: Use supporting fasteners manufactured specifically for the attachment of raceways and boxes to metal stud construction.

a. Support and attach outlet boxes so that they cannot torque/twist by using one of the following:

1) Bar hanger assembly.

2) Box hanger with far side support.

3) Between stud mounting bracket.

3.4 CONDUIT SUPPORT SCHEDULE

A. Provide number of supports as required by National Electrical Code.

B. Use pipe straps and specified method of attachment where conduit is installed proximate to surface of wood or masonry construction.

1. Use hangers secured to surface with specified method of attachment where conduit is suspended from the surface.

C. Use "C" beam clamps and hangers where conduit is supported from steel beams.

D. Use deck clamps and hangers where conduit is supported from steel decking having hanger tabs.

1. Where conduit is supported from steel decking that does not have hanger tabs, use clamps and hangers secured to decking, utilizing specified method of attachment.

E. Use channel support system supported from structural steel for multiple parallel conduit runs.

F. Where conduits are installed above ceiling, do not rest conduit directly on runner bars, T-Bars, etc.

1. Conduit Sizes 2-1/2 Inches and Smaller: Support conduit from ceiling supports or from construction above ceiling.

2. Conduit Sizes Over 2-1/2 Inches: Support conduit from concrete deck, beams, joists, or trusses above ceiling.

3.5 LIGHTING FIXTURE SUPPORT SCHEDULE

A. General: Do not support fixtures from ceilings or ceiling supports unless it is specified or indicated on the drawings to do so.

1. Support fixtures with hanger rods attached to beams, joists, or trusses. Hanger rod diameter, largest standard size that will fit in mounting holes of fixture.

a. Where approved, channel supports may span and rest upon the lower chord of trusses and be utilized for the support of lighting fixtures.

b. Where approved, channel supports may span and be attached to the underside of beams, joists, or trusses and be utilized for the support of lighting fixtures.

2. Use two (2) nuts and two (2) washers on lower end of each hanger rod to hold and adjust fixture (one (1) nut and washer above top of fixture housing, one (1) nut and washer below top of fixture housing).

a. Where specified that an adequately supported outlet box is to support a fixture or be utilized as one (1) point of support, support the box so that it may be adjusted to bring the face of the outlet box even with surface of ceiling

B. Specific Installations Where Fixtures May Be Supported From New Ceilings Being Installed by the General Contractor:

1. Support surface mounted fixtures directly from plywood backed gypsum board ceilings.

2. Support surface mounted fixtures directly from framing or furring members of fire rated suspended ceilings (double gypsum board).

3. Support recessed mounted fixtures directly from furring members of furred gypsum board ceilings.

4. Support recessed mounted fixtures directly from the suspension system of suspended acoustical ceilings. Exception: Support each fixture weighing more than 50 pounds independent of the suspended ceiling grid.

5. Deliver documents that state actual fixture weights and indicate fixture locations to the General Contractor.

C. Number of Supports for Ceiling Mounted Lighting Fixtures: Provide at least the following number of supports. Provide additional supports when recommended by fixture manufacturer, or shown on the drawings.

1. Commercial and Industrial LED Fixtures:

a. Support individual fixtures less than two (2) feet wide at two (2) points.

b. Support continuous row fixtures less than two (2) feet wide at points equal to the number of fixtures plus one (1). Uniformly distribute the points of support over the row of fixtures.

c. Support individual fixtures two (2) feet or wider at four (4) corners.

d. Support continuous row fixtures two (2) feet or wider at points equal to twice the number of fixtures plus two (2). Uniformly distribute the points of support over the row of fixtures.

e. An adequately supported outlet box may be utilized as one point of support for fixtures weighing less than 50 pounds.

D. Number of Supports for Wall Mounted Lighting Fixtures: Provide at least the following number of supports. Provide additional supports when recommended by fixture manufacturer, or shown on the drawings.

1. Commercial and Industrial LED Fixtures:

a. Support individual fixtures two (2) feet long or less at two (2) points.

b. Support individual fixtures over two (2) feet long at three (3) points.

c. Support continuous row fixtures at points equal to twice the number of fixtures. Uniformly distribute the points of support.

d. An adequately supported outlet box may be utilized as one (1) point of support for fixtures weighing less than 50 pounds.

3.6 CHANNEL SUPPORT SYSTEM SCHEDULE

A. Use channel support system where specified or indicated on the drawings.

B. Channel supports may be used, as approved, to accommodate mounting of equipment.

C. Material and Finish:

1. Dry Locations: Use 12 gauge steel channel support system having any one of the specified finishes.

2. Damp Locations: Use 12 gauge steel channel support system having any one of the specified finishes except green epoxy/enamel.

3. Wet locations: Use 12 gauge steel channel support system having hot dipped galvanized, or PVC finish.

3.7 ROOFTOP SUPPORT SYSTEM

A. Install in accordance with manufacturer's instructions and recommendations.

B. Provide complete and adequate support of all conduit, cable tray, or equipment.

C. The use of wood blocks for supporting conduit, cable tray, or equipment is not permitted.

D. If gravel top roof, gravel must be removed around and under support.

E. Consult roofing manufacturer for roof membrane compression capacities. If necessary, a compatible sheet of roofing material (isolation pad) may be installed under rooftop support to disperse concentrated loads and add further membrane protection.

F. Use properly sized clamps to secure conduit, cable tray, or equipment.

END OF SECTION

SECTION 26 05 33
RACEWAYS AND BOXES

PART 1 - GENERAL

1.1 SCOPE

A. Perform all Work required to provide and install the following 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.

1.2 REFERENCES

A. Applicable provisions of Division 1 govern work under this section.

B. Section 260529 – Hangers and Supports.

C. Section 262726 – Wiring Devices.

D. Section 262702 – Equipment Wiring.

E. Section 270000 – Communications Cable and Equipment.

F. Section 283100 – Fire Detection and Alarm.

1.3 SUBMITTALS

A. Surface Raceway System: Submit product data and catalog sheets for all components.

B. Floor Boxes: Provide product data showing configurations, finishes, dimensions, and manufacturer's instructions.

PART 2 - PRODUCTS

2.1 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.

2.2 PVC COATED RIGID METAL CONDUIT

A. PVC Externally Coated Conduit: Rigid heavy wall, schedule 40, steel conduit with external 40 mil PVC coating. Conduit must be hot dipped galvanized inside and out including threads. The PVC coating bond to the galvanized steel conduit shall be stronger than the tensile strength of the coating itself.

B. Fittings and Conduit Bodies: Threaded type, material to match conduit. PVC coated fittings and couplings shall have specially formed sleeves to tightly seal to conduit PVC coating. The sleeves shall extend beyond the fitting or coupling a distance equal to the pipe outside steel diameter or two inches whichever is greater.

2.3 INTERMEDIATE METAL CONDUIT (IMC) AND FITTINGS

A. Conduit: Galvanized steel, threaded.

B. Fittings and Conduit Bodies: Use all steel threaded fittings and conduit bodies.

2.4 ELECTRICAL METALLIC TUBING (EMT) AND FITTINGS

A. Conduit: Steel, galvanized tubing.

1. Provide factory colored conduit as follows:
    a. Red – Fire alarm
    b. Blue – Low voltage
    c. Orange – Access control/security
    d. Green – Temperature controls

B. Fittings:

1. All steel, set screw, concrete tight. No push-on or indenter types permitted.
2. Raintight Fittings:
    a. All steel construction with zinc electroplate finish provides for durable corrosion resistance
    b. Distinct color to provide quick raintight identification
    c. Integral gasketed compression ring secures and seals for reliable installation
    d. Gasket on male threads of box connector seals installation for raintight connection between the box and the connector

C. Conduit Bodies: All steel threaded conduit bodies.

2.5 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 265113).

2.6 LIQUIDTIGHT FLEXIBLE METAL CONDUIT AND FITTINGS

A. Conduit: flexible, steel, galvanized, spiral strip with an outer Liquidtight, nonmetallic, 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.

2.7 ELECTRICAL NONMETALLIC TUBING (ENT) AND FITTINGS

A. Conduit: ENT (smurf tube), UL listed and NEC recognized.

B. Fittings: One (1) piece quick connect fittings for 1/2 inch to 1 inch size and schedule 40 cemented fittings for larger size. When installed in concrete, fittings shall be suitable for damp locations and shall be concrete–tight, stub-ups and stub-downs kits shall meet manufacturer's recommendations.

2.8 RIGID NONMETALLIC 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.

2.9 HIGH DENSITY POLYETHYLENE

A. Minimum Size: Two (2) inch, unless noted otherwise

B. Acceptable Manufacturers

1. Carlon
2. Chevron Phillips Chemical Company
3. Approved equal

C. Materials used for the manufacture of polyethylene pipe and fittings shall be extra high molecular weight, high-density polyethylene resin. The material shall be listed by PPI (Plastic Pipe Institute).

D. The pipe shall contain no recycled compound except that generated in the manufacturer's own plant from resin of the same raw material, including both the base resin and coextruded resin. The pipe shall be homogeneous throughout and free of visible cracks, holes, voids, foreign inclusions, or other defects that may affect the wall integrity.

2.10 HDPE FITTINGS AND CONDUIT BODIES

A. Directional Bore and Plow Type Installation: Electrofusion or Universal Aluminum threaded couplings. Tensile strength of coupled pipe must be greater than 2,000 lbs.

B. For all other type of installation: Coupler must provide a watertight connection. The tensile strength of coupled pipe must be greater than 1,000 lbs.

C. E-loc type couplings are not acceptable in any situations.

2.11 CONDUIT SUPPORTS

A. See Section 260529.

2.12 SURFACE METAL RACEWAY

A. Description: Sheet metal channel with fitted cover, suitable for use as surface metal raceway.

B. Size: As shown on Drawing.

C. Finish: Ivory enamel.

D. Fittings: Couplings, elbows, and connectors designed for use with raceway system.

E. Boxes and Extension Rings: Designed for use with raceway systems.

2.13 SURFACE NONMETAL RACEWAY

A. Description: Nonmetallic channel with fitted cover, suitable for use as surface raceway.

B. Size: As shown on Drawing.

C. Color: Ivory

D. Fittings: Couplings, elbows, and connectors designed for use with raceway system.

E. Boxes and Extension Rings: Designed for use with raceway systems.

2.14 MULTI-OUTLET ASSEMBLY

A. Description: Sheet metal channel with fitted cover, with pre-wired receptacles, suitable for use as a multi-outlet assembly.

B. Size: As indicated on Drawing.

C. Receptacles: Provide covers and accessories to accept convenience receptacles type 5-20R, single receptacle.

D. Finish: Ivory enamel.

E. Fittings: Couplings, elbows, outlet and device boxes, and connectors designed for use with multi-outlet system.

2.15 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 inch male fixture studs where required.

C. Concrete Ceiling Boxes: Concrete type.

D. Cast Boxes: Cast ferroalloy, or aluminum type deep type, gasketed cover, threaded hubs.

2.16 FLOOR BOXES

A. Floor Boxes for Installation in Cast-In-Place Concrete Floors: Full adjustable, formed steel.

B. Formed steel boxes in slab-on-grade applications shall be epoxy coated.

2.17 PULL AND JUNCTION BOXES

A. Pull boxes and junction boxes shall be minimum 4 inch square by 2 1/8th inches deep for use with 1 inch conduit and smaller. On conduit systems using 1 1/4 inch conduit or larger, pull and junction boxes shall be sized per NEC but not less than 4 11/16 inch square.

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 twenty-four (24) inches 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. Fiberglass or Concrete Handholes:

1. With weatherproof cover of non-skid finish shall be used for underground installations.
2. Size, type, weight rating, and labeling shall be as noted on the drawings.

G. The use of box extension rings is discouraged. If they must be used only one ring per box is allowed and wiring must extend a minimum of 6" beyond the front edge of the extension ring.

H. Box extensions and adjacent boxes within 48" of each other are not allowed for the purpose of creating more wire capacity.

I. Junction boxes 6" x 6" or larger size shall be without stamped knock-outs.

J. Wireways shall not be used in lieu of junction boxes.

2.18 GENERAL

A. All steel fittings and conduit bodies shall be galvanized.

B. No cast metal or split-gland type fittings permitted.

C. Mogul-type condulets larger than two inches (2") not permitted except as approved or detailed.

D. All condulet covers must be fastened to the condulet body with screws and be of the same manufacture.

E. Wireways, gutters and c-condulets 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

3.1 CONDUIT SIZING, ARRANGEMENT, AND SUPPORT

A. EMT is permitted to be used in sizes 4" 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 1/2 inch minimum except all homerun conduits shall be 3/4", or as specified elsewhere. Caution: Per the NEC, the allowable conductor ampacity is reduced when more than three (3) 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. 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 six (6) inch clearance between conduit and piping. Maintain twelve (12) inch 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 eight (8) feet on center.

K. Supports shall be independent of the installations of other trades, e.g. ceiling support wires, HVAC pipes, other conduits, etc., unless so approved or detailed.

L. In general, all conduits 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, electrical or utility rooms that are not occupied spaces.

M. Changes in direction shall be made with symmetrical bends, cast steel boxes, stamped metal boxes or cast steel conduit bodies.

N. For indoor conduits, no continuous conduit run shall exceed 100 feet without a junction box.

O. All conduits installed in exposed areas shall be installed with a box offset before entering box.

3.2 CONDUIT INSTALLATION

A. Ground and bond conduit under provisions of Section 260526.

B. Cut conduit square; de-burr cut ends.

C. Conduit shall not be fastened to the corrugated metal roof deck. Maintain a minimum six (6) inch separation from the roof deck to conduits.

D. Bring conduit to the shoulder of fittings and couplings and fasten securely.

E. 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.

F. All conduit terminations (except for terminations into conduit bodies) shall use conduit hubs, or connectors with one (1) locknut, or shall use double locknuts (one (1) each side of box wall) and insulated bushing. Provide bushings for the ends of all conduit not terminated in box walls. Refer to Section 260526 – Grounding and Bonding for Electrical Systems for grounding bushing requirements.

G. Install no more than the equivalent of four (4) 90 degree bends between boxes.

H. Use hydraulic one (1)-shot conduit bender or factory elbows for bends in conduit larger than two (2) inch size unless sweep elbows are required.

I. Conduit shall be bent according to manufacturers' recommendations. Torches or open flame shall not be used to aid in bend of PVC conduit.

J. Use suitable conduit caps or other approved seals to protect installed conduit against entrance of dirt and moisture.

K. Provide 1/8 inch nylon pull string in empty conduit, except sleeves and nipples.

L. 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.

M. Avoid moisture traps where possible. Where moisture traps are unavoidable, provide junction boxes with drain fittings at conduit low points.

N. 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.

O. Route conduit through roof openings for piping and ductwork where possible.

P. Conduit is not permitted in any slab topping of two inches or less. Consult Structural Engineer for approval of conduit installed in topping slabs greater than two inches.

Q. Maximum Size Conduit in Slabs Above Grade: 3/4 inch. Do not route conduits to cross each other in slabs above grade.

R. PVC conduit shall transition to galvanized rigid metal conduit before it enters a concrete pole base, foundation, wall (where exposed) or up through a concrete floor.

S. Identify conduit under provisions of Section 260553.

T. All conduit installed underground (exterior to building) shall be buried a minimum of 24” below finished grade, whether or not the conduit is concrete encased.

1. All underground conduits shall be installed with “DANGER – BURIED ELECTRICAL CONDUIT” red flagging tape 6-inches above conduit. Tape shall be continuous along the conduit run.

2. Tracer wire shall be installed on all exterior electrical utilities. Trace wire to be fourteen (14) gauge minimum solid copper with thermoplastic insulation recommended for direct burial. Wire connectors to be 3M DBR, or approved equal, and shall be watertight to provide electrical continuity. Install trace wire in the same trench with the conduit during installation and secure to conduit as required to ensure that the wire remains adjacent to the conduit. Trace wire access points shall in general be no more than 500’ apart.

U. 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 manufacturers’ recommendations.

3.3 CONDUIT INSTALLATION SCHEDULE

A. Conduit other than that specified below for specific applications shall not be used.

B. Conduit in patient care areas shall be metallic to maintain dual ground paths as required by the NEC.

C. Underground Installations Within Five Feet of Foundation Wall: Rigid steel conduit.

D. Underground Installations More than Five Feet From Foundation Wall: Schedule 40 PVC conduit.

E. Directional Boring: HDPE conduit.

F. Under Slab on Grade Installations: Schedule 40 PVC conduit.

G. Exposed Outdoor Locations: Electrical metallic tubing with raintight fittings

H. Concealed in Concrete and Block Walls: Electrical metallic tubing.

I. Within Concrete Slab: Schedule 40 PVC conduit.

J. Wet Interior Locations: Rigid steel conduit.

K. Concealed Dry Interior Locations: Electrical metallic tubing.

L. Exposed Dry Interior Locations: Electrical metallic tubing.

M. Motor and equipment connections: Flexible PVC coated metal conduit (all locations). Minimum length shall be one foot, maximum length shall be three feet. Conduit must be installed perpendicular to direction of equipment vibration to allow conduit to freely flex.

N. 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" minimum diameter and six (6) foot maximum length. Conduit length shall allow movement of fixture for maintenance purposes.

3.4 SURFACE METAL RACEWAY AND MULTI-OUTLET ASSEMBLY INSTALLATION

A. Use flat-head screws to fasten channel to surfaces every twenty-four (24) inches. 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 260526.

D. Fastener Option: Use clips and straps suitable for the purpose.

3.5 NONMETALLIC SURFACE RACEWAY INSTALLATION

A. Use flat headed screws with appropriate anchors to fasten channel to surfaces secured every twenty-four (24) inches. Mount plumb and level. All surface mounted devices shall be fastened to the wall utilizing flat head screws along with appropriate anchors. No device shall be adhered to the wall surface using two-faced tape or any means other than as described above.

B. Use suitable insulating bushings and inserts at connections to outlets and corner fittings.

C. In areas where the walls cannot be fished, the station cable serving these outlets shall be covered with raceways. No exposed wire shall be permitted within offices, laboratories, and conference rooms or like facilities.

D. The non-metallic raceway shall have a screw applied base. Both the base and cover shall be manufactured of rigid PVC materials.

E. The raceway shall originate from a surface mounted box mounted adjacent to and at the same height as existing electrical boxes in the room, be attached to the wall and terminate above the ceiling.

F. All fittings including, but not limited to, extension boxes, elbows, tees, fixture bodies shall match the color of the raceway.

G. The raceway and all systems devices shall be UL listed and exhibit nonflammable self extinguishing characteristics, tested to specifications of UL94V-0.

H. The raceway and all systems devices shall adhere to the EIA/TIA Category 5E bend radius standard.

3.6 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. Maintain a minimum six (6) inch separation from the roof deck to boxes.

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 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 inch by 24 inch 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.

K. Install boxes to preserve room acoustic ratings using approved material and methods.

L. Boxes mounted in common walls of adjacent rooms shall be offset by at least one stud space to minimize sound transference between rooms. If space does not allow for offsetting of boxes for adjacent rooms by one stud cavity, sound dampening material such as sound batting shall be installed around and between boxes.

3.7 OUTLET BOX INSTALLATION

A. Provide recessed outlet boxes in finished areas; secure boxes to interior wall and partition studs, accurately positioning to allow for surface finish thickness. The front edge of the box, plaster ring, extension ring, or listed extender shall not be set back of the finished wall surface more than ¼" in accordance with NEC 314.20. Use stamped steel stud bridges for flush outlets in hollow stud wall, and adjustable steel channel fasteners for flush ceiling outlet boxes.

B. Do not install boxes back-to-back in walls. Provide minimum 6 inch separation, except provide minimum 24 inch separation in acoustic-rated walls.

C. Power

1. Recessed (1/4" maximum) outlet boxes in masonry, concrete or tile construction shall be minimum 4-inch 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.

D. Low Voltage

1. 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.

E. Provide knockout closures for unused openings.

F. Support boxes independently of conduit except for cast boxes that are connected to two (2) rigid metal conduits, both supported within twelve (12) inches of box.

G. 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.

H. Install boxes in walls without damaging wall insulation.

I. Coordinate mounting heights and locations of outlets mounted above counters, benches, and backsplashes.

J. Ceiling outlets shall be four (4) inch square, minimum 2-1/8 inch deep except that concrete boxes and plates will be approved where applicable. Position outlets to locate luminaires as shown on reflected ceiling plans.

K. In inaccessible ceiling areas, position outlets and junction boxes within 6 inches of recessed luminaire, to be accessible through luminaire ceiling opening.

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 four (4) inch square with raised covers for one (1) and two (2) gang requirements. For three (3) gang or larger requirements, use gang boxes with non-overlapping covers.

3.8 FLOOR BOX INSTALLATION

A. Set boxes level and flush with finish flooring material and parallel to the walls of the room.

3.9 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 are to be readily-accessible.

B. Support pull and junction boxes independent of conduit.

END OF SECTION

SECTION 26 05 53

IDENTIFICATION

PART 1 - GENERAL

1.1 SCOPE

A. Perform all Work required to provide and install the labeling of power, lighting, general wiring, signal, fire alarm, and cabling.

1.2 REFERENCES

A. Applicable provisions of Division 1 shall govern work under this section.

B. Section 260519 – Low Voltage Electrical Power Conductors and Cables

C. Section 260523 – Control Cables

D. Section 271010 – Telecommunication Cabling Systems

PART 2 - PRODUCTS

2.1 MATERIALS

A. Labels: All labels shall be permanent, and machine generated. NO HANDWRITTEN OR NON-PERMANENT LABELS ARE 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 shall be self-laminating, white/transparent vinyl and be wrapped around the cable or sheath. Labels for power conductors (600V and lower) shall be cloth-type. 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, white letters on a black background. Emergency system (Level 1 and Level 2) shall use white letters on red background.

D. Tape (phase identification only): Scotch #35 tape in appropriate colors for system voltage and phase.

E. Adhesive type labels not permitted except for phase and wire identification. Machine generated adhesive labels shall be permitted for device plates, 4-11/16” and smaller junction boxes, fire alarm and control devices.

PART 3 - EXECUTION

3.1 GENERAL

A. Where mixed voltages are used in one building (e.g. 480 volt, 208 volt) each switch, switchboard, junction box, equipment, etc., on each system must be labeled for voltage in 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. Install nameplates parallel to equipment lines.

G. Secure nameplates to equipment fronts using screws, rivets or manufacturer approved adhesive or cement.

H. Embossed tape will not be permitted for any application.

3.2 JUNCTION AND PULLBOX IDENTIFICATION

A. The following junction and pullboxes shall be identified utilizing spray painted covers:

System	Color(s)
Secondary Power – 480Y/277V	Brown
Secondary Power – 208Y/120V, 240/120V	White
Emergency Power – 480Y/277V	Brown/Red
Emergency Power – 208Y/120V	White/Red
Fire Alarm	Red
Temperature Control	Green
Door Control and Door Monitoring System	Orange
Sound and Intercom Systems	Blue
Video Surveillance System/MATV	Yellow

B. Provide circuit numbers, and source panel designations for power wiring. Other system shall be identified as shown on details or approved shop drawings. Temperature control shall identify the source.

3.3 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 schematic and interconnection diagrams or equipment manufacturer's shop drawings for control wiring.

B. All wiring shall be labeled within 2 to 4 inches of terminations. Each end of a wire or cable shall be labeled as soon as it is terminated including wiring used for temporary purposes.

3.4 WIRING DEVICE IDENTIFICATION

A. Wall switches, line voltage wall dimmers, motor switches, receptacles (interior, exterior, floor boxes, etc.), photocells and time clocks shall be identified with circuit numbers and source. Labeling shall be permanent and machine generated. Label shall have 1/4” black text on a clear label. Label shall be installed at consistent location on the face of the device cover plate.

B. Wall switches, line voltage wall dimmers, motor switches, receptacles (interior, exterior, floor boxes, etc.), photocells and time clocks shall be identified with circuit numbers and source. Labeling shall be permanent and machine generated (1/4” black text on a clear label) or neatly hand-written permanent marker. Label shall be installed on the inside of the device cover plate.

3.5 NAMEPLATE ENGRAVING

A. Provide nameplates of minimum letter height as scheduled below.

B. Panelboards, Switchboards and Motor Control Centers: 1 inch; identify equipment designation. 1/2 inch; identify voltage rating, source and room location of the source.

C. Equipment Enclosures: 1 inch; identify equipment designation. 1/2 inch; identify voltage rating, source and room location of the source where applicable.

D. Circuit Breakers, Switches, and Motor Starters/VFD's in Panelboards or Switchboards or Motor Control Centers: 1/2 inch; identify circuit and load served, including location.

E. Individual Circuit Breakers, Disconnect Switches, Enclosed Switches, Motor Starters, and VFD's: 1/2 inch; identify source and load served.

F. Transformers: 1 inch; identify equipment designation. 1/2 inch; identify primary and secondary voltages, primary source, and secondary load and location.

G. Junction boxes: 1 inch; identify system source(s) and load(s) served. Junction boxes may be neatly identified using a permanent marker.

3.6 PANELBOARD DIRECTORIES

A. Typed directories for panels must be covered with clear plastic, have a metal frame. Room number on directories shall be Owner's numbers, not Plan numbers unless Owner so specifies.

3.7 ARC FLASH LABELS

A. Install ARC FLASH WARNING signs on all switchboards, panelboards, and motor control centers.

3.8 FIRE ALARM DEVICES

A. Install computer printed labels on all addressable fire alarm devices indicating the device loop and address. Label shall have 1/4" black text on a clear label.

1. Coordinate label location on devices with the Owner prior to installation.

END OF SECTION

SECTION 26 09 43

DIGITAL LIGHTING CONTROLS

PART 1 - GENERAL

1.1 SCOPE

A. Perform all work required to provide and install the lighting control components, conductors, cabling and raceways to form a distributed-type digital lighting control system. The lighting control system shall provide time-based, sensor-based (occupancy and/or daylight) and manual lighting controls, as indicated on plans and schedules.

B. Section includes:

1. Zone controllers
2. Manual controls
3. Digital occupancy sensors
4. Digital photo sensors
5. Programming tools
6. Accessories
7. Wiring

1.2 REFERENCES

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification sections, apply to this Section.

B. Specification 260519 Low-Voltage Electrical Power Conductors and Cables

C. Specification 260523 Control Cables

D. Specification 262728 Wiring Devices

E. Refer to Digital Lighting Controls Schedule, Digital Lighting Controls - Zone Control Schedule and Digital Lighting Controls - Switch Schedule on plans.

1.3 SUBMITTALS

A. Product data: Provide a detailed cut sheet with model number(s) and included options clearly noted for each system component type, except cabling. Indicate dimensions.

B. Shop drawings:

1. CAD drawings:

a. Selected manufacturer shall request CAD floor plans from the Engineer and layout all system devices on the CAD plan, except for cabling. A legend shall be provided on the CAD plan to aid in quick identification of each device and function of that device.

b. For occupancy and photo sensors: Selected manufacturer shall review ceiling heights, room obstructions (e.g. ceiling fans) and room finishes shown on the architectural plans. Where a conflict arises between the design on plan and selected manufacturer's recommendations, the manufacturer's recommendation shall dictate the type and quantity of devices used in that space.

c. The locations and quantities of occupancy and photo sensors shown on the drawings are diagrammatic and indicate only the rooms which are to be provided with those sensors. <u>The Contractor shall include in their bid the additional occupancy sensors needed to properly and completely cover the respective room.</u>

2. One-line block diagram: Project specific with nomenclature matching plans. Show interconnections between components specified in this section and necessary system interfaces. Indicate required communication cabling types.
3. Wiring diagrams: Power, signal, and control wiring. Coordinate nomenclature with block diagram.
4. Custom button labels: Submit a custom button label form for each manual switch requiring custom labels.

C. Warranties: Submit sample warranty letter meeting requirements specified in this section.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: Submit under requirement and format listed in Specification 260500 Common Work Results

B. Include the following additional documentation:
1. Copy of on-site system startup reports.
2. All required submittals for this section, updated to reflect required changes from review comments.
3. System device addresses and programmed settings (e.g. an occupancy sensor time delay).
4. Mark locations of zone controllers and interfaces on the as-built drawings.
5. Warranty letter(s) indicating dates of coverage and warranty claim contact information.

1.5 QUALITY ASSURANCE

A. Source Limitations: Digital lighting control system components shall be sourced from a single manufacturer.
1. Exception: Occupancy sensors and emergency relay devices, tested with and approved by the manufacturer of the selected digital lighting control system, may be from different manufacturer. However, all occupancy sensors (digital and analog) must be from the same manufacturer.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.6 DEFINITIONS

A. BAS: Building automation system.

B. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control, signaling and power-limited circuits.

C. RS-232: A serial network protocol complying with TIA/EIA-232.

1.7 PLAN NOTATION

A. Luminaire zoning notation on plans:
1. Basic room zoning
a. Rooms with Digital Lighting Control Devices (‘L’ subscript), but <u>without</u> luminaire subscripts indicates that room contains either <u>one zone of dimmed</u> control or <u>two or fewer zones of switched</u> control. The luminaire subscripts have been omitted to maintain drawing clarity.

2. Complex room zoning

   a. To better define zoning intent in areas containing two or more dimmed lighting zones or three or more switched lighting zones, luminaire subscripts (e.g. ‘a1’, ‘a2’, etc) have been shown next to each luminaire on plan.

   b. Luminaires with matching subscripts shall be controlled together as one lighting control zone. A luminaire with two subscripts (e.g. ‘a1,a2’) indicates that luminaire belongs to two independent lighting control zones to allow for multi-level or step-dimming control.

B. Manual controls

1. Basic rooms: Switch breaks and line work shown on plans will identify control within the room.

2. Complex rooms: Each low voltage manual switch ($\$_{LV}$) is assigned a unique three digit number (e.g. ‘001’) on plan. Refer to the Digital Lighting Control - Switch Schedule on plans for quantity of buttons, control type and zones controlled. Switch breaks have been omitted from the plans for these types of rooms.

C. Digital occupancy sensors

1. Digital occupancy sensors intended to be part of the digital lighting control system will have an ‘L’ subscript on plan.

2. Basic rooms: All the luminaires in the room shall be controlled by the occupancy sensor(s) shown in that room. Subscripts indicating zones controlled have been omitted from the occupancy sensor.

3. Complex rooms: Subscripts of lighting zones controlled by each occupancy sensor will be indicated on plan below the occupancy sensor symbol (e.g. ‘a1,a2’). Refer to Digital Lighting Controls – Zone Control Schedule on plan for additional information.

D. Digital photo sensors

1. Digital photo sensors intended to be part of the digital lighting control system will have an ‘L__’ subscript on plan. A ‘;’ is used between groups of zones on plan to indicate multiple, separate zones are controlled using the input from this one device (e.g. ‘a1-a4; a5).

2. Basic rooms: When a photo sensor is shown in a room containing luminaires without subscripts, all the luminaires in the room shall be controlled (i.e. switched or dimmed) by the photo sensor shown in that room as a common group. Subscripts indicating zones controlled have been omitted from the occupancy sensor.

3. Complex rooms: Subscripts of lighting zones controlled by each occupancy sensor will be indicated on plan below the photo sensor symbol (e.g. ‘a1, a2’). Refer to Digital Lighting Controls – Zone Control Schedule on plan.

1.8 COORDINATION

A. Verify required BAS interface type with mechanical controls contractor. Coordinate audio/video interfaces with audio/video systems contractor.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site. Store and protect under provisions of Specification 260500 General Work Results.

1.10 WARRANTY

A. All equipment shall be warranted to be free of defects in materials and workmanship by the manufacturer for the period of five (5) years from the date of successful system startup.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Refer to Digital Lighting Control Schedule on plan.

2.2 ZONE CONTROLLERS

A. Controls one or more luminaires in one or more independent lighting control zones. Contains one or more 20-amp, 120/277 volt relays in a plenum rated enclosure suitable for mounting to a junction box or luminaire. Also serves as a connection point for system peripheral devices (e.g. digital occupancy sensors, digital photo sensor, manual controls) serving room.

B. Provide a zone controller with 0-10 VDC dimming when load(s) controlled are dimmable. Zone controllers ARE NOT shown on plans. Selected manufacturer shall provide in quantities as needed to meet zoning requirements shown on plans and schedules.

2.3 MANUAL CONTROLS

A. Low voltage manual switches

1. Field-programmable, momentary-contact, plastic push buttons or rocker switches with LED light for each button indicating status. Provide remote interface and remote power supply, if necessary, for proper switch operation.
2. Multiple switches shall be ganged together, if needed, to provide control indicated on plans at each manual control location.
3. Non-$_{LV}$ switches: Standard “ON”, “OFF”, “RAISE” or “▲”, and “LOWER” or “▼” labels are acceptable. Custom button labels are not required.
4. $_{LV}$ switches: Provide custom button labels as indicated on Digital Lighting Control System – Switch Schedule on plan.
5. Device color shall be white with cover plate to match Specification 262726 Wiring Devices

B. Refer to Digital Lighting Controls – Switch Schedule for button quantity, purpose and lighting zones controlled by each manual control.

2.5 DIGITAL OCCUPANCY SENSORS

A. Device shall be designed for use with the digital lighting control system.

B. Sensors to be low voltage devices and shall be powered from a zone controller.

C. Provide with field-programmable time delay.

D. Provide with an LED as a visual means that motion is being detected during both testing and normal operation.

E. Provide mounting hardware suitable for specified mounting location.

F. Refer to Digital Lighting Controls – Switch Schedule and floor plans for additional information.

2.6 DIGITAL PHOTO SENSORS

A. Interior photo sensor: Ceiling mounted digital sensor that provides light level readings directly to the zone controller for automatic daylight harvesting. Powered by and connected to the zone controller.

B. Skylight photo sensor: Photo sensing device specifically design for use in skylight sidewall connected to the network via suitable input module. Powered by and connected to the zone controller.

C. Exterior photocell: Analog photo sensing device specifically designed for exterior use and connected to the system via a suitable interface module. Photocell to have weatherproof housing with visor for shading and lens protection. Adjustable light level sensitivity.

D. Refer to Digital Lighting Controls – Switch Schedule and floor plans for additional information.

2.7 PROGRAMMING TOOLS

A. Wireless configuration tool: Handheld device with LCD that allows for configuration of all system devices, one at a time, via device infrared transceivers.

B. USB interface: Plugs into a laptop computer. Contains RJ45 connector that connects to a system device in each room using network cable. Preloaded software contained in the USB flash drive allows for real-time status of system components along with calibration and control.

C. Web-based programming: Provides connection via any internet-connected computer with username/password protection. Allows for multiple users at one time. No local software or user licenses required on the user's computer. Connects to user's local area network (LAN) or via the BAS (BACnet MS/TP protocol). GUI on website allows for programming and monitoring of all networked digital lighting control system components. Requires data connection to LAN with Ethernet static IP address, plus 120 volt receptacle.

D. Programming tool IS NOT shown on plans. Furnish programming tool above for system programming.

2.8 ACCESSORIES

A. RS-232 interface: Serial device that allows for control of the digital lighting system by a third-party control system (e.g. A/V system) and integration of motorized shades. Built-in protocol allows for automatic response to message requests from third party devices. RS-232 interfaces ARE shown on plans.

B. Digital I/O interface: Two (2) input and one (1) 24 VDC, 1 amp isolated SPDT relay with N.O. and N.C. output for integration with third-party devices, such as input from a BAS time clock or output to a piece of HVAC equipment via BAS (e.g. turn up HVAC equipment when occupancy sensor senses occupancy). Digital I/O interfaces ARE shown on plans. Isolated output relay: 24 VDC, 1 amp isolated SPDT relay with N.O. and N.C. output only for control of third-party HVAC equipment. Output relays ARE shown on plans.

D. Infrared partition sensor: Utilizes infrared technology to detect the presence of a moveable partition. Provide necessary interface device that inputs the partition position signal into the digital lighting control system. Partition sensors ARE shown on plans.

E. Analog occupancy sensor interface: Allows for third-party and analog occupancy sensors to be connected into the digital lighting control system. Analog interfaces ARE NOT shown on plans.

F. Emergency lighting control devices: Refer to Specification 265200 Emergency Lighting for requirements.

2.9 WIRING

A. Line-voltage conductors: Comply with Specification 260519 Low-Voltage Electrical Power Conductors and Cables.

B. Digital lighting control system cables: Comply with selected digital lighting control manufacturer's recommendations. All low voltage communication cabling shall be plenum rated.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Zone controllers

1. Rooms with accessible ceiling (e.g. lay-in grid): Install zone controller for each room above accessible ceiling directly above a manual control location. Mark location of zone controller on as-built drawing.

2. Rooms with open ceilings: Install zone controller in adjacent room with accessible ceiling. Mark location of zone controller on as-built drawing.

a. Exception: Zone controllers for back-of-house rooms (e.g. storage room) with open ceilings may be installed exposed on wall near bottom of structure and above manual control location.

3. Rooms with inaccessible (e.g. gypsum) ceilings: Install zone controller in adjacent room with accessible ceiling or adjacent back-of-house room with open ceiling. Mark location of zone controller on as-built drawing.

B. Manual Controls

1. Install low voltage wall stations at locations shown on plans. All cabling shall be per manufacturer's recommendation. Connect to zone controller.
2. Program each button function/touchscreen per Digital Lighting Control System – Switch Schedule on plans.
3. Install custom button labels for $\$_{LV}$ wall stations and suitable cover plates for all manual controls.

C. Digital Occupancy Sensors

1. Connect to zone controller per manufacturer's recommendation.
2. It shall be the contractor's responsibility to locate and aim sensors in the correct location required for complete and proper volumetric coverage within the range of coverage(s) of controlled areas per the manufacturer's recommendations. Rooms shall have 90% - 100% coverage (minor motion in office environments).
3. Ceiling sensors shall not be installed within four (4) feet of HVAC air diffusers or heating blowers.
4. Provide a minimum 6' service loop in the cable at the ceiling sensor location to allow for sensor relocation if necessary.

D. Digital Photo Sensors

1. Install the photo sensor at the location recommended by the manufacturer and connect to the system per manufacturer's recommendations utilizing any necessary interface.
2. Daylight harvesting shall begin only after the target foot-candle level(s) in the room has been reached. Light levels for initiating daylight harvesting of each zone shall be field programmed by the factory authorized representative during the start-up process.
3. Aim exterior photo cell north.
4. device in main building and out-building per manufacturers requirements.

E. Accessories

1. Isolated output relay: Install device above accessible ceiling in rooms shown on plan. Wiring to device output and programming of third-party system (e.g. BAS system) by others.
2. Infrared partition sensor: Install device at location shown on plans. Partition sensor interface shall be located above nearest accessible ceiling. Digital lighting control system shall automatically reconfigure manual and automatic lighting controls based on partition(s) position.
3. Analog occupancy sensor interface: Install device above accessible ceiling in rooms with analog occupancy sensors. Quantity of interfaces needed determined by selected manufacturer based on lighting control requirements for the room.

4. Emergency lighting control devices: Override all dimming of life safety luminaires shown on plan that are part of the digital lighting control system upon normal power loss using UL924 listed device. Provide devices in quantities as needed.

3.2 WIRING INSTALLATION

A. Install all low voltage cabling in raceways except where installed above accessible ceilings.

B. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points. Separate power-limited and non-power-limited conductors according to conductor manufacturer's written instructions. Provide a physical barrier between

3.3 PRE-INSTALLATION MEETING

A. A factory-authorized technician from the selected system manufacturer shall meet with the electrical contractor on-site prior to installation of the system to step through the installation process, important installation requirements and answer contractor questions.

3.4 SYSTEM START-UP

A. Upon completion of the installation by the contractor, the installation of the devices shall be reviewed on-site by the manufacturer's factory authorized technician. This visit may be combined with the occupancy sensor startup and training visit. The owner shall be included in determining the initial programming of time sweeps and similar functions.

B. The Electrical Contractor shall provide both the manufacturer and the Electrical Engineer with 10 working days written notice of the scheduled start-up date.

C. Factory-authorized technician shall utilize the configuration tool to program each digital lighting control system device per plans and owner input.

D. Factory-authorized technician shall setup the web-based software provided with the digital lighting control system to fit the project and then program each system device per plans and owner input.

3.5 OWNER TRAINING

A. After system start-up, the factory-authorized technician shall train the owner’s representatives in the system architecture, components, programming and any necessary maintenance for the system. This training may take place during the system start-up trip. Operations and maintenance manuals shall be delivered to the owner prior to the owner training being scheduled.

3.6 ADJUSTING

A. When requested within twelve (12) months of date of Substantial Completion, provide on-site assistance in adjusting sensors and to assist Owner's personnel in making program changes to suit actual occupied conditions. Provide one (1) visit to Project during other than normal occupancy hours for this purpose.

END OF SECTION

SECTION 26 27 02
EQUIPMENT WIRING

PART 1 - GENERAL

1.1 SCOPE

A. Perform all Work required to provide and install the electrical connections indicated by the Contract Documents with supplementary items necessary for proper installation.

B. Equipment included in this Section may be specified under other Divisions and/or Sections, or furnished by Owner, including, but not limited to:

1. HVAC motors, VFDs, and panels
2. Plumbing motors, VFDs, and panels
3. Modular Furniture

1.2 REFERENCES

A. Applicable provisions of Division 1 govern work under this Section.

B. Section 260533 Raceway and Boxes for Electrical Systems.

C. Section 260519 Low-Voltage Electrical Power Conductors and Cables.

1.3 SUBMITTALS

A. Product Data: Provide data for cord and wiring devices.

1.4 COORDINATION

A. Coordinate all equipment requirements with the various contractors and the Owner. Review the complete set of drawings and specifications to determine the extent of wiring, starters, devices, etc., required.

PART 2 - PRODUCTS

2.1 CORDS AND CAPS

A. Straight-blade Attachment Plug: NEMA WD 1.

B. Locking-blade Attachment Plug: NEMA WD 5.

C. Attachment Plug Configuration: Match receptacle configuration at outlet provided for equipment.

D. Cord Construction: Oil-resistant thermoset insulated multiconductor flexible cord with identified equipment grounding conductor, suitable for hard usage in damp locations.

E. Cord Size: Suitable for connected load of equipment and rating of branch circuit overcurrent protection.

2.2 OTHER PRODUCTS

A. Refer to related sections for other product requirements.

PART 3 - EXECUTION

3.1 INSPECTION

A. Verify that equipment is ready for electrical connection, wiring, and energization.

3.2 PREPARATION

A. Review equipment submittals prior to installation and electrical rough-in. Verify location, size, and type of connections. Coordinate details of equipment connections with supplier and installer.

3.3 INSTALLATION

A. Use wire and cable with insulation suitable for temperatures encountered in heat-producing equipment.

B. Make conduit connections to equipment using flexible PVC-coated metal conduit.

C. Install pre-finished cord set where connection with attachment plug is indicated or specified, or use attachment plug with suitable strain-relief clamps.

D. Provide suitable strain-relief clamps for cord connections to outlet boxes and equipment connection boxes.

E. Make wiring connections in control panel or in wiring compartment of pre-wired equipment in accordance with manufacturer's instructions. Provide interconnecting wiring where indicated.

F. Install disconnect switches, controllers, control stations, and control devices such as limit switches and temperature switches as indicated. Connect with conduit and wiring as indicated.

G. Coolers and Freezers: Cut and seal conduit openings in freezer and cooler walls, floor, and ceilings.

3.4 HVAC AND PLUMBING CONNECTIONS

A. Provide all power wiring including all circuitry carrying electrical energy from panelboard or other source through starters, variable frequency drives (VFDs), and disconnects to motors or to packaged control panels. Packaged control panels may include disconnects and starters and overcurrent protection. Provide all wiring between packaged control panels and motors.

B. VFD Installations: Install VFD input wiring and output wiring in separate conduit systems. Do not mix VFD input power and output power, or control wiring in a common raceway.

C. Provide 120 volts to each temperature control panel. Coordinate requirements with HVAC/DDC contractors.

D. Unless otherwise specified, all electrical motors and control devices such as aquastats, float and pressure switches, fan powered VAV boxes, switches, electro-pneumatic switches, solenoid valves and damper motors requiring mechanical connections shall be furnished and installed and wired by the Contractor supplying the devices.

E. Each motor terminal box shall be connected with a minimum 12", maximum 36" piece of flexible PVC-coated metal conduit to a fixed junction box. Conduit must be installed perpendicular to direction of equipment vibration to allow conduit to freely flex.

F. Check for proper rotation of each motor.

3.5 MODULAR FURNITURE CONNECTIONS

A. Coordinate delivery of furniture electrical whips with the furniture vendor. Schedule early delivery of whips to allow timely installation prior to furniture delivery.

B. Coordinate furniture power and voice/data feed points with the furniture vendor prior to rough-in. Furniture vendor to provide dimensioned plans showing wall and floor box locations for furniture feeds. DO NOT dimension floor box locations from electrical plans.

C. Provide dedicated neutrals for each circuit serving furniture. DO NOT share neutrals. Furniture systems are considered non-linear loads; provide one (1) wire size larger neutrals than phase conductors (i.e. provide #10 AWG neutrals if #12 AWG phase conductors are used).

3.6 EQUIPMENT CONNECTION SCHEDULE

A. As indicated on the drawings.

END OF SECTION

SECTION 26 27 26

WIRING DEVICES

PART 1 - GENERAL

1.1 SCOPE

A. Perform all Work required to provide and install the following wiring devices indicated by the Contract Documents with supplementary items necessary for proper installation.

B. Equipment included in this Section

1. Wall switches
2. Receptacles
3. Wall dimmers
4. Device plates and box covers

1.2 REFERENCES

A. Applicable provisions of Division 1 govern work under this Section.

1.3 SUBMITTALS

A. Provide product data showing model numbers, configurations, finishes, dimensions, and manufacturer's instructions.

1.4 OPERATION AND MAINTENANCE DATA

A. All operations and maintenance data shall comply with the submission and content requirements specified under section GENERAL REQUIREMENTS.

PART 2 - PRODUCTS

2.1 GENERAL

A. All materials shall meet or exceed all applicable referenced standards, federal, state, and local requirements, and shall conform to codes and ordinances of authorities having jurisdiction.

B. Provide factory fabricated wiring devices in the type and electrical rating for the service indicated. Where type and grade are not indicated provide proper selection to correspond with branch circuit wiring and overcurrent protection.

C. Attachment of wires to devices shall be by screw pressure under the head of binding screws. Arrangements depending on spring pressure or tension are not acceptable. All binding screws shall be brass or bronze.

D. See Drawings for Device Schedule.

2.2 DEVICE COLOR

A. White, unless noted otherwise.

2.3 WALL SWITCHES

A. Wall Switches for Lighting Circuits and Motor Loads Under 1/2 HP: Quiet-type single pole through four (4)-way.

B. Heavy duty use toggle switch, nylon or high impact resistant face and body, rated 20 amperes and 120/277 volts AC.

C. Switches shall be UL20 Listed and meet Federal Specification WS-896. All switches shall be heavy duty Specification Grade with separate green ground screw.

D. All switches shall be back and side wired, screw clamp type, suitable for solid or stranded wire up to #10 AWG.

2.4 KEYED SWITCHES

A. Keyed switches shall have the same requirements as wall switches except for a barrel key operator in lieu of a toggle switch.

B. Provide one (1) key per switch to the Owner.

2.5 PILOT SWITCHES

A. Pilot switches shall have the same requirements as wall switches except the red toggle handle shall be illuminated when the load is ON.

2.6 ILLUMINATED SWITCHES

A. Illuminated switches shall have the same requirements as wall switches except the clear toggle handle shall be illuminated when the load is OFF.

2.7 STYLE-LINE (DECORA) WALL SWITCHES

A. Wall Switches for Lighting Circuits and Motor Loads Under 1/2 HP: Single pole through four (4)-way.

B. Rocker switch, nylon or high impact resistant face and body, rated 20 amperes and 120/277 volts AC.

C. Switches shall be UL20 Listed and meet Federal Specification WS-896. All switches shall be Specification Grade with separate green ground screw.

D. All switches shall be back and side wired, screw clamp type, suitable for solid or stranded wire up to #10 AWG.

2.8 STRAIGHT-BLADE RECEPTACLES

A. Nylon or high impact resistant face, NEMA configuration as scheduled on the Drawings.

B. Receptacles shall be UL498 Listed and meet Federal Specification WC-596.

C. 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. Connector-type receptacles are also acceptable.

D. Hospital grade receptacles shall be tested and listed according to applicable standards and shall be readily identified on the face of the device by a green dot.

2.9 TWIST LOCK RECEPTACLES

A. Nylon or high impact resistant face, NEMA configuration as scheduled on the Drawings.

B. Receptacles shall be UL498 Listed and meet Federal Specification WC-596.

C. 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.

2.10 GROUND FAULT CIRCUIT INTERRUPTER (GFCI) RECEPTACLES

A. Duplex convenience receptacle, Specification Grade, with integral ground fault current interrupter, auto monitoring (self-test), and line-load reversal function meeting the requirements of UL standard 943 Class A and UL standard 498.

B. Hospital grade GFCI receptacles shall be tested and listed according to applicable standards and shall be readily identified on the face of the device by a green dot.

C. All receptacles installed in outdoor locations, in garages, within six (6) feet of the outside edge of sinks, and in other damp or wet locations shall be GFCI type.

2.11 TAMPER RESISTANT RECEPTACLES

A. Tamper resistant receptacles shall be similar to standard receptacles except for the addition of a shutter system that blocks access to the phase and neutral plug slots while the device is not in use.

B. Hospital Grade tamper resistance receptacles shall be installed in Pediatric patient care areas, waiting rooms, and other areas indicated on the Drawings.

2.12 COMBINATION USB CHARGER RECEPTACLES

A. Standard AC duplex tamper resistant receptacle with two (2) USB charging ports (Type-A and/or Type-C as noted in the schedule) rated at a minimum of 3.0 A at 5 VDC, UL Listed to UL 498 and UL 1310.

B. Receptacle shall be UL 498 and UL 1310 Listed and meet Federal Specification WC596.

C. USB ports shall work with USB 2.0, 3.0, and 3.1 compatible devices.

D. Device shall have auto grounding feature.

E. Receptacle 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.

F. Hospital grade receptacles shall be tested and listed according to applicable standards and shall be readily identified on the face of the device by a green dot.

2.13 SURGE PROTECTION RECEPTACLES

A. Duplex receptacle with integral surge suppression with a minimum rating of 210 joules/13,000A per mode. Surge symbol indicated on the device faceplate.

B. Receptacle shall meet UL 1449 Standard, 3rd Edition and Federal Specification WC596.

C. Color shall be blue unless noted otherwise.

D. Damage alert alarm and LED indicator light.

E. Device shall have auto grounding feature.

F. Device shall have isolated ground where scheduled.

G. Receptacle 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

H. Hospital grade receptacles shall be tested and listed according to applicable standards and shall be readily identified on the face of the device by a green dot

2.14 ISOLATED GROUND RECEPTACLES

A. Isolated ground receptacles shall have the grounding pins isolated from the mounting strap. A separate isolated grounding screw shall be provided.

B. All receptacles designated as isolated ground shall have an isolated ground triangle imprint on the face of the receptacle.

2.15 SPECIFIC USE RECEPTACLE

A. Configuration: As indicated on drawings.

2.16 WALL DIMMERS

A. Wall Dimmers: Linear slide type or electronic to match the load served. Loads may include the following:

1. Incandescent lighting.
2. Fluorescent lighting.
3. Electronic low-voltage lighting.

4. Magnetic low-voltage lighting.
5. LED lighting

B. Rating: 600 Watts minimum, larger size to accommodate load shown on Contract Drawings.

2.17 DEVICE PLATES AND BOX COVERS

A. Cover Plate
1. Finished Spaces: 302/304 smooth stainless steel.
2. Unfinished Spaces: 302/304 smooth stainless steel.
3. Mechanical and Electrical Rooms: 302/304 smooth stainless steel.

B. Weatherproof Cover Plate: Gasketed plastic with hinged cover, wet location listed while in use.

2.18 TIME SWITCH

A. The switch shall be programmed to automatically turn lights off after a preset time.

B. The delay timer shall be adjustable with a range of five (5) minutes to twelve (12) hours.

C. Switch shall be rated for 120/277V, 1200W load.

D. The switch shall beep warning every five (5) seconds during the last minute of countdown. Also, the switch shall flash lights (for warning) at one (1) minute before timer expires.

E. Time scrolling shall be provided to override preset time by pressing the ON/OFF switch for four (4) seconds.

F. LCD provided to show count down time.

G. The switch shall have zero (0) crossing circuitry.

PART 3 - EXECUTION

3.1 INSTALLATION

A. All dimensions noted are centerline dimensions.

B. Install wall switches 42 inches above floor, OFF position down.

C. Install wall dimmers 42 inches above floor; de-rate ganged dimmers as instructed by manufacturer; do not use common neutral.

D. Install convenience receptacles 18inches above floor, 6 inches above counters or backsplash, grounding pole on bottom. Mount horizontally where indicated.

E. Install boxes for information outlets 18 inches above finished floor. Install boxes for telephone jack for wall telephones 54 above finished floor.

F. Install specific-use receptacles at heights shown on Contract Drawings.

G. Poke-through device installation: Unit shall permit all wiring to be completed at floor level. Use is defined by the UL Fire Resistance Directory as a minimum spacing of "two (2) ft. (610 mm) on center and not more than one (1) device per each 65 sq. ft. (6 m²) of floor area in each span." Installation shall be completed by pushing unit down into the cored hole. Prior to and during installation, refer to system layout and/or approval drawings. Installer shall comply with detailed manufacturer's instruction sheet included with each device. The unit shall contain a retainer for securing the device in the slab, as well as the necessary intumescent material to seal the cored hole under fire conditions.

H. Install decorative plates on switch, receptacle, and blank outlets in finished areas.

I. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface-mounted outlets.

J. Install devices and wall plates flush and level.

K. Receptacles shall have a bonding conductor from grounding terminal to the metal conduit system. Self-grounding receptacles using mounting screws as bonding means are not approved.

3.2 FIELD QUALITY CONTROL

A. Inspect each wiring device for defects.

B. Operate each wall switch with circuit energized and verify proper operation.

C. Verify that each receptacle device is energized.

D. Test each receptacle device for proper polarity.

E. Test each GFCI receptacle device for proper operation.

3.3 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.

END OF SECTION

SECTION 26 27 28
DISCONNECT SWITCHES

PART 1 - GENERAL

1.1 SCOPE

A. Perform all Work required to provide and install disconnect switches, fuses and enclosures indicated by the Contract Documents with supplementary items necessary for proper installation.

1.2 REFERENCES

A. Applicable provisions of Division 1 govern work under this Section.

1.3 SUBMITTALS

A. Include outline drawings with dimensions, and equipment ratings for voltage, ampacity, horsepower, and short circuit.

1.4 OPERATION AND MAINTENANCE DATA

A. All operations and maintenance data shall comply with the submission and content requirements specified under section GENERAL REQUIREMENTS.

PART 2 - PRODUCTS

2.1 DISCONNECT SWITCHES

A. Fusible Switch Assemblies (use only when overcurrent protection is required): NEMA Type Heavy Duty; quick-make, quick-break, load interrupter, enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position. Fuse Clips: designed to accommodate Class R cartridge type fuses.

B. Nonfusible Switch Assemblies: NEMA Type Heavy Duty; quick-make, quick-break, load interrupter, enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position.

C. Provide auxiliary contacts on fusible switches serving elevator controllers.

D. Solid neutral bus when neutral conductor is included with circuit.

E. Provide manufacturer’s equipment ground kit in all disconnect switches.

F. Enclosure: NEMA Type as indicated on Drawings.

G. Current rating and number of poles as indicated on drawings.

2.2 FUSES

A. Fuses 600 Amperes and Less: Dual element, time delay, 600 volt, UL Class RK 1. Interrupting Rating: 200,000 rms amperes.

B. Fuses 601 Amperes and Larger: Time delay, 600 volt, UL Class L. Interrupting Rating: 200,000 rms amperes.

C. Provide three (3) spares of each size and type fuse. Provide enclosure for spare fuse.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install disconnect switches where indicated on Drawings.

B. Install switches so that the maximum height above the floor to the center of the operating handle does not exceed 6'-6".

C. Provide conduit and wiring from the auxiliary contacts on the elevator disconnect switch to the elevator controller. Coordinate installation with the elevator vendor.

D. Provide identification as specified in Section 260553.

END OF SECTION

SECTION 26 51 13

INTERIOR LIGHTING

PART 1 - GENERAL

1.1 SCOPE

A. Perform all Work required to provide and install the equipment indicated in the Contract Documents with supplementary items necessary for a proper and functioning installation.

B. Section Includes:

1. Interior luminaires
2. Exit signs

1.2 REFERENCES

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification sections, apply to this Section.

B. Refer to Division 26 Section “Low Voltage Electrical Power Conductors and Cables” for wiring requirements

C. Refer to Division 26 Section “Emergency Lighting” for emergency battery ballasts, emergency lighting units, exit signs with battery backup and lighting inverter systems.

1.3 SUBMITTALS

A. Product data:

1. For each luminaire type, submit a technical cut sheet with complete model number(s) and included options clearly noted, plus luminaire support points, weight, accessory information and photometric performance data indicating total luminaire efficiency. Place luminaire type (e.g. ‘F1’) at the top of each cut sheet page for that luminaire.
2. Submit a technical cut sheet for the associated driver proposed for that luminaire. When multiple luminaires use the same driver, a single cut sheet for the driver may be submitted with all luminaires utilizing that driver clearly labeled on the cut sheet.

B. Finish samples: For decorative luminaires, submit paint/finish samples to Architect via mail for review and selection.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: Submit under requirements and format listed in Division 26 Section “Common Work Results”.

B. Include the following documentation

1. All required submittals for this section, updated to reflect required changes from review comments.
2. Warranty letter(s) indicating dates of coverage and warranty claim contact information.

1.5 QUALITY ASSURANCE

A. Electrical components and accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction and marked for intended use.

B. All materials shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.

1.6 DEFINITIONS

A. CRI: Color rendering index

B. CCT: Correlated color temperature

C. BUG: Backlight, Uplight and Glare ratings for luminaires based on IESNA TM-15-07.

1.7 COORDINATION

A. Coordinate layout and installation of lighting fixtures and suspension system with other construction that penetrates ceilings or is supported from structure, including HVAC equipment, fire-suppression system, and partition assemblies.

1.8 DELIVERY, STORAGE AND HANDLING

A. Deliver luminaires in factory-fabricated packaging.

B. Handle lighting fixtures carefully to prevent breakage, denting and scoring the fixture finish. Do not install damaged lighting fixtures.

C. Store product in a clean, dry space protected from weather.

1.9 WARRANTY

A. All equipment shall be warranted to be free of defects in materials and workmanship by the manufacturer for the time period listed below from the date of project substantial completion:

1. LED luminaires (including LED power supply): Five (5) years

1.10 EXTRA MATERIAL

A. Special Tools - Two (2) tools to remove and install each type and size of fasteners on fixtures equipped with vandal resistant fasteners.

B. Deliver replacement stock as directed to Owner's storage space.

PART 2 - PRODUCTS

2.1 INTERIOR LUMINAIRES

A. Refer to the Luminaire Schedule on the drawings for types of luminaires (e.g. F1, F2, EM1, etc.). The luminaire type listed in the schedule will appear on the lighting plans adjacent to the symbol for each luminaire.

B. For each luminaire type the manufacturer and model listed first in the schedule, in conjunction with all other luminaire attributes listed on the schedule, shall be considered the basis of design. The remaining acceptable manufacturers shall meet or exceed the performance of the basis of design. When a discrepancy exists between the model number and the other attributes listed for that luminaire, the Contractor shall ask for clarification during the bidding process or include the more expensive option as part of their bid.

C. Provided luminaire doors with rubber, fiberglass gaskets or equivalent material to prevent light leak. Luminaires shall be provided with proper thermal protection as required for surrounding environment.

D. Acrylic lenses shall be prismatic and not less than 0.125-inches thick nominal, unless noted otherwise on plans.

E. All luminaire finishes shall be factory applied unless specifically noted otherwise. Refer to schedule on drawings for finish color.

2.2 SOLID STATE LUMINAIRES

A. Photometric Measurement: Comply with IESNA LM-80-21.

B. Lumen Maintenance: Tested in accordance to IESNA LM-79-19.

C. Long Term Lumen Maintenance: Comply with IESNA TM-21-11.

D. The basis of design for each LED luminaire is listed on the Luminaire Schedule. All other listed acceptable manufacturers shall meet or exceed the delivered lumens of the basis of design using +/- 10% input watts.

E. CRI and CCT per Luminaire Schedule on plans

2.3 EXIT SIGNS

A. Mounting type and chevrons shall be as indicated on the Drawings. Lettering and chevron-type directional indicators shall comply with NFPA 101, Life Safety Code, and shall be Listed in accordance with UL 924, Standard for Safety Emergency Lighting and Power Equipment.

B. Sign housing type shall be as indicated on the Luminaire Schedule.

C. Mounting canopies will be of identical construction and color to match the exit frame.

2.4 LAMPS – LED RETROFIT

A. Acceptable manufacturers: Subject to compliance with requirements, provide products from the following manufacturers (* = basis of design). Remaining manufacturers listed below shall meet or exceed the quality and features for each basis of design model.

1. Cree*
2. Philips

B. A-lamp retrofit type: Edison base, integral LED power supply, suitable for direct replacement of traditional incandescent A-lamps, 25,000 hours rated life, dimmable, 10 year limited warranty, 120 VAC rated, UL damp listed. Correlated color temperature of 2700K 5000K and color rendering index of 80. Available in 6 watts (40 watt), 9.5 watt (60 watt) and 13.5 watt (75 watt) versions. Basis of design: Cree A19 series

C. BR30 LED: Edison base, integral LED power supply, suitable for direct replacement of traditional incandescent BR-lamps, 25,000 hours rated life, minimum 600 delivered lumens, dimmable, 10 year limited warranty, 120 VAC rated, UL damp listed. Correlated color temperature of 2700K 5000K and color rendering index of 80. Available in 9.5 watt (65 watt) version. Basis of design: Cree BR30 series ,

D. BR30 LED: Edison GU24 base, integral LED power supply, suitable for direct replacement of traditional incandescent BR-lamps, minimum 600 delivered lumens, 35,000 hours rated life, dimmable, 10 year limited warranty, 120 VAC rated, 25 50 degree flood, UL damp listed. Correlated color temperature of 2700K and color rendering index of 90+. Available in 12 watt (65 watt) version. Basis of design: Cree LBR30 series.

E. MR16 LED: GU5.3 base, integral LED power supply, suitable for direct replacement of traditional MR16 halogen lamps, minimum 460 or 620 delivered lumens, 25,000 hours rated life, dimmable, 3 year limited warranty, 12 VAC rated, 17 25 40 degree distribution, UL listed. Correlated color temperature of 3000K and color rendering index of 80+. Available in 7 watt (35 watt) and 9 watt (50 watt) versions. Basis of design: Cree LM16 series

F. PAR38 LED: Edison GU24 base and integral LED power supply suitable for direct replacement of traditional PAR38 halogen lamps, minimum 600 or 950

G. delivered lumens, 25,000 hours rated life, dimmable, 3 year limited warranty, 120 VAC rated, 20 degree distribution 12 25 degree distribution , UL listed. Correlated color temperature of 2700K and color rendering index of 90+. Available in 12 watt (50 watt) and 13.5 watt (90 watt) versions. Basis of design: Cree LRP eries

2.5 LED POWER SUPPLIES

A. Acceptable manufacturers: Selected and tested by luminaire manufacturer with specified luminaire for compatibility and performance.

B. Provide with 0-10 VDC dimming when specified on Luminaire Schedule on plans.

C. LED power supplies shall have temperature and a moisture rating suitable for the environments for which it is to be installed. Luminaires installed in low ambient temperature areas shall have power supplies specifically designed for low temperature operation.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install luminaires at locations and heights as indicated, in accordance with luminaire manufacturer's written instructions, applicable requirements of NEC, NECA's "Standard of Installation", NEMA Standards and with recognized industry practices to ensure that luminaires fulfill requirements.

B. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.

C. Check the building electrical system requirements and architectural finishes. Regardless of the catalog number prefixes and suffixes shown, furnish fixtures with the proper trim, frames, supports, hangers, driver, voltage rating, and other miscellaneous appurtenances to properly coordinate with Project conditions. Verify with Engineer prior to ordering.

D. Check the type of ceilings to be installed in each room and verify that the recessed light fixtures are proper for the type of ceiling to be installed before ordering fixtures. Provide a frame compatible with the type of ceiling in which the recessed lighting fixture is installed. Refer to the Architectural Room Finish Schedule for the specified ceiling type.

E. Install suspended luminaires and 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.

F. Support luminaires larger than 2 x 4 foot size independent of ceiling framing using #12 steel wires anchored to structure.

G. Locate ceiling luminaires as indicated on the architectural reflected ceiling plan.

H. Install surface mounted luminaires and exit signs plumb and adjust to align with building lines and with each other. Secure to prohibit movement.

I. Finishing Collar or Combination Finishing Collar/Outlet Box (Surface Mounted Fixture Used With Exposed Raceway):

1. Provide finishing collar where surface mounted fixture is installed on an exposed raceway outlet box and the fixture base is larger than the outlet box.

2. Provide combination finishing collar/outlet box where surface mounted fixture is not indicated to be installed on an exposed raceway outlet box, but raceway cannot be run directly into fixture body due to fixture design.

J. 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.

K. Install recessed luminaires to permit removal from below.

L. Install recessed luminaires using accessories and firestopping materials to meet regulatory requirements for fire rating.

M. Install wall mounted luminaires at height as scheduled.

N. Install accessories furnished with each luminaire.

O. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within luminaire.

P. Bond fixtures and metal accessories to branch circuit equipment grounding conductor.

Q. Protect installed fixtures from damage during the remainder of the construction period.

3.2 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 Drawings or as directed by the Architect/Engineer.

C. Touch up luminaire finish at completion of work.

3.3 FIXTURE CONNECTIONS

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" diameter and six foot maximum length. Conduit length shall allow movement of the fixture for maintenance purposes.

B. The flexible connectors shall be all steel, galvanized, clamp type with locknut or snap-in connector including those used on the master-slave unit.

C. Fixture whips shall be supported to prevent them from lying on or being supported by the ceiling grid. Supports shall be listed for raceway support. Tape and other temporary means are not acceptable.

3.4 FIELD QUALITY CONTROL

A. Upon completion of installation of interior lighting fixtures, and after circuitry has been energized, apply electrical energy to demonstrate capability and compliance with requirements. When possible, correct malfunctioning units at the Project Site, then retest to demonstrate compliance; otherwise, remove and replace with new units, and proceed with retesting.

B. All existing fixtures in work area that are re-used or relocated shall be cleaned inside and out, broken or damaged parts replaced and new lamps installed.

END OF SECTION

SECTION 26 52 00

EMERGENCY LIGHTING-UNIT EQUIPMENT

PART 1 - GENERAL

1.1 SCOPE

A. Perform all Work required to provide and install the following emergency lighting-unit equipment indicated by the Contract Documents with supplementary items necessary for proper installation.

B. Equipment included in this Section

1. Emergency lighting units
2. Exit signs
3. Battery back-up ballasts.

1.2 REFERENCES

A. Applicable provisions of Division 1 govern work under this Section.

1.3 SUBMITTALS

A. Include outline drawings, lamp and ballast data, battery/charger information, support points, weights, accessory information and performance data for each luminaire type.

B. For each luminaire type, submit luminaire information in the following example table format, and submit catalog cuts with highlighted catalog numbers and required accessories.

LUMINAIRE		BALLAST	LAMP	ANSI INPUT WATTS
Type	Manufacturer and Catalog No.	Manufacturer, Quantity per Fixture, and Catalog No.	Manufacturer, Quantity per Fixture, and Catalog No.	

1.4 OPERATION AND MAINTENANCE DATA

A. All operations and maintenance data shall comply with the submission and content requirements specified under section GENERAL REQUIREMENTS.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver lighting fixtures individually wrapped in factory-fabricated fiberboard type containers.

B. Handle lighting fixtures carefully to prevent breakage, denting and scoring the fixture finish. Do not install damaged lighting fixtures.

C. Store product in a clean, dry space protected from weather.

1.6 EXTRA MATERIAL

A. Provide one extra of each type of exit sign.

B. Deliver replacement stock as directed to Owner's storage space.

PART 2 - PRODUCTS

2.1 EXIT/EMERGENCY LIGHTING AND ACCESSORIES

A. See the Luminaire Schedule on the drawings, for type of fixtures and catalog numbers. Catalog numbers are shown on the drawings for quality and performance requirements only. Fixtures manufactured by others are equally acceptable provided they meet or exceed the performance of the indicated fixtures, and meet the intent of the design.

B. All materials shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.

2.2 SELF-POWERED EXIT SIGNS

A. Acceptable Manufacturers: As indicated on the Drawings.

B. Exit light mounting type shall be as indicated on the Drawings.

C. Housing material shall be as indicated on the Drawings.

D. Lettering and chevron-type directional indicators shall comply with NFPA 101, Life Safety Code, and shall be Listed in accordance with UL 924, Standard for Safety Emergency Lighting and Power Equipment.

E. Exit sign design will allow universal 120/277VAC, 60 Hz operation.

F. Normal illumination will be provided by LED's. Normal LED lamp life shall be in excess of 20 years.

G. Mounting canopies will be of identical construction and color to match the exit frame.

H. Provide with a fully automatic emergency operation module. All emergency module components shall mount inside the exit sign housing and will include a solid-state, constant current type battery charger; a maintenance-free, nickel-cadmium battery; an AC-On indicator light; and a test switch.

I. Standard operating temperature: 68°F to 86°F. Provide exit sign suitable for environmental conditions above or below the standard operation temperature or as noted in the Luminaire Schedule.

J. Provide unit with self-testing/self-diagnostic electronics where noted on the Drawings.

K. Provide wire guard where noted on the Drawings.

2.3 EMERGENCY LIGHTING UNITS

A. Acceptable Manufacturers: As indicated on the Drawings.

B. Emergency light mounting shall be as indicated on the Drawings.

C. Housing material shall be as indicated on the Drawings.

D. Units shall comply with NFPA 101, Life Safety Code, and shall be Listed in accordance with UL 924, Standard for Safety Emergency Lighting and Power Equipment.

E. Emergency operation shall be provided for a minimum of ninety (90) minutes.

F. Design will allow universal 120/277VAC, 60 Hz operation.

G. Lamp type, quantity, and wattage shall be as indicted on the Drawings.

H. Emergency components shall include a solid-state, constant current type (for nickel-cadmium batteries) battery charger; a maintenance-free, nickel-cadmium battery; an AC-On indicator light; voltmeter; and a test switch.

I. Standard operating temperature: 68°F to 86°F. Provide emergency light suitable for environmental conditions above or below the standard operation temperature or as noted in the Luminaire Schedule.

J. Provide unit with self-testing/self-diagnostic electronics where noted on the Drawings. Self-testing feature shall comply with the requirements of NFPA 101 and the NEC.

2.4 REMOTE LIGHTING HEADS

A. Acceptable Manufacturers: As indicated on the Drawings.

B. Remote head mounting shall be as indicated on the Drawings.

C. Housing material shall be as indicated on the Drawings.

D. Lamp type, quantity, voltage, and wattage shall be as indicted on the Drawings.

E. Units shall comply with NFPA 101, Life Safety Code, and shall be Listed in accordance with UL 924, Standard for Safety Emergency Lighting and Power Equipment.

2.5 EMERGENCY BALLASTS

A. Acceptable Manufacturers

1. Philips Bodine
2. Iota Engineering

B. Linear Fluorescent Lamps

1. Emergency lighting shall be provided by using a standard fluorescent fixture equipped with an emergency ballast. The emergency ballast shall consist of a field-replaceable, high-temperature, maintenance-free nickel-cadmium battery, charger and electronic circuitry contained in a metal case. An illuminated test switch to monitor the charger and battery and installation hardware shall be provided. The emergency ballast shall delay AC ballast operation for approximately three (3) seconds to prevent false tripping of the AC ballast end-of-lamp-life shutdown circuits. The emergency ballast shall be capable of operating one (1) or two (2) fluorescent lamp(s) in the emergency mode for a minimum of 90 minutes.

   a. Refer to Luminaire Schedule for required lumen output. It shall be suitable for indoor and damp locations. The emergency ballast shall exceed emergency standards set forth by the current NEC. The emergency ballast shall be UL Listed for installation inside, on top of, or remote from the fixture and shall be warranted for a full five (5) years from date of purchase.

2. Provide unit with self-testing/self-diagnostic electronics where noted on the Drawings. Self-testing feature shall comply with the requirements of NFPA 101 and the NEC.

3. Provide unit with remote control testing electronics where noted on the Drawings. 30-second and 90-minute test options. Include one (1) compatible remote control for the project. Self-testing feature shall comply with the requirements of NFPA 101 and the NEC.

4. Where noted in the Luminaire Schedule, emergency ballast shall be rated for cold temperatures. It shall be suitable for indoor and damp locations and for sealed & gasketed fixtures, including fixtures rated for wet locations. The storage and operating temperature range for the cold weather emergency ballast shall be -4°F to +131°F.

C. LED Lamps

1. Emergency lighting shall be provided by using a standard LED fixture equipped with an emergency driver. The emergency driver shall consist of two (2) field-replaceable, high-temperature, maintenance-free nickel-cadmium batteries with a separate battery charger and electronic circuitry contained in a metal case. Battery and installation hardware shall be provided along with a test switch. The emergency driver shall be capable of operating an LED load of up to 23.1 Watts at rated current (700 mA) for a minimum of 90 minutes. It is suitable for damp locations as well as sealed and gasketed fixtures. The emergency driver shall comply with emergency standards set forth by the current NEC. The emergency driver shall be UL Component Recognized for factory installation only and shall be warranted for a full three (3) years from date of purchase.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.

C. Check the building electrical system requirements and architectural finishes. Regardless of the catalog number prefixes and suffixes shown, furnish fixtures with the proper trim, frames, supports, hangers, ballasts, voltage rating, and other miscellaneous appurtenances to properly coordinate with Project conditions. Verify with Engineer prior to ordering.

D. Check the type of ceilings to be installed in each room and verify that the recessed light fixtures are proper for the type of ceiling to be installed before ordering fixtures. Provide a frame compatible with the type of ceiling in which the recessed lighting fixture is installed. Refer to the Architectural Room Finish Schedule for the specified ceiling type.

E. Install suspended luminaires using pendants supported from swivel hangers. Chain or cable supports may be used in unfinished spaces or where indicated on the fixture schedule. Provide pendant, chain, or cable length required to suspend luminaire at indicated height.

F. Fixture whips shall be supported to prevent them from lying on or being supported by the ceiling grid. Supports shall be listed for raceway support. Tape and other temporary means are not acceptable.

G. Locate exit and emergency luminaires as indicated on the Drawings. Install accessories furnished with each luminaire.

H. Install surface mounted luminaires plumb and adjust to align with building lines and with each other. Secure to prohibit movement.

I. Finishing Collar or Combination Finishing Collar/Outlet Box (Surface Mounted Fixture Used With Exposed Raceway):

   1. Provide finishing collar where surface mounted fixture is installed on an exposed raceway outlet box and the fixture base is larger than the outlet box.

   2. Provide combination finishing collar/outlet box where surface mounted fixture is not indicated to be installed on an exposed raceway outlet box, but raceway cannot be run directly into fixture body due to fixture design.

J. 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.

K. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within luminaire.

L. Bond fixtures and metal accessories to branch circuit equipment grounding conductor.

M. Protect installed fixtures from damage during the remainder of the construction period.

N. Insert a copy of the battery warranty in each unit and mark on batteries the date placed in service.

O. Emergency Lighting Units

   1. Units shall be mounted so that they may easily be removed for service.

   2. Units shall be permanently connected to a 120/277 volt power source in compliance with the NEC.

   3. Remote lamps shall be connected to battery unit using raceway and wire size noted on the Drawings.

P. Emergency Ballasts and Generator Transfer Device

   1. Install in accordance with manufacturer’s instructions.

2. Where provided, install remote test/monitoring plate and location indicated on the Drawings.

3.2 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 Drawings or as directed by the Architect/Engineer.

C. Touch up luminaire finish at completion of work.

3.3 FIELD QUALITY CONTROL

A. Upon completion of installation of interior lighting fixtures, and after circuitry has been energized, apply electrical energy to demonstrate capability and compliance with requirements. When possible, correct malfunctioning units at the Project Site, then retest to demonstrate compliance; otherwise, remove and replace with new units, and proceed with retesting.

END OF SECTION

SECTION 27 05 13

COMMUNICATIONS COMMON WORK RESULTS

PART 1 - GENERAL

1.1 SCOPE

A. Perform all Work required to provide and install the required remote control and signal cabling indicated by the Contract Documents with supplementary items necessary for proper installation.

1.2 SUMMARY

A. Section includes

1. Contractor Responsibility and Qualifications
2. Reference Standards and Codes
3. Required Contractor Training
4. Quality Assurance
5. Submittals
6. Product Assurance
7. Coordination
8. Alternates, Substitution and Change Orders
9. Project Management
10. Delivery and Storage
11. Cleaning
12. Painting

1.3 CONTRACTOR RESPONSIBILITY AND QUALIFICATION

A. The chosen Communications Contractor (here after referred to as Contractor) shall provide a minimum one (1) year warranty on material, installation and workmanship.

B. Contractor shall provide all components, materials, services and labor essential for a complete and functional structured cabling system.

C. The Contractor shall be responsible for complying with all local, state and federal laws and regulations applicable to the work performed, although said law, rule or regulation is not identified herein.

D. Examination of building and site shall be the responsibility of the Contractor: Contractors shall examine site and building as required prior to installation to determine any conditions affecting the scope of work. Contact Owner representative for arrangements. All systems and cabling are assumed working and in good condition unless contractor documents exceptions.

E. Contractor shall call for all inspections required. Final payment of this contract will not be made until final inspections have been completed and all deficient items noted have been corrected.

F. Contractor will respect and protect the privacy and confidentiality of Owner, its employees, processes, products, and intellectual property to extent necessary, consistent with the legal responsibilities of the State of Iowa and Owner policies.

G. Use of sub-contractors: The Contractor shall inform in writing to Owner's representative and General Contractor about the intention to use sub-contractors and the scope of work for which they are being hired. Owner's representative prior to the sub-contractor's hiring and start of any work must approve the use of sub-contractors in writing.

H. Contractor will be required to provide a sufficient number of technicians for this project to stay on schedule.

I. Contractor must have a Registered Communications Distribution Designer (here after referred to as RCDD) on staff and must be available as needed for design discussions and inspections. Identify the design experience of the proposed RCDD.

J. Contractor shall identify the qualifications of their technician. Vendor shall also identify the type(s) of certifications / testing that its technicians go through before and after being hired on by your company.

K. Installers: Only technicians certified by equipment manufacturer are approved.

1.4 REFERENCE STANDARDS AND CODES

A. Supervisors and lead installers shall have a working knowledge and understanding of the following documents and codes are their most recent updates, and shall be familiar with the requirements that pertain to this installation. Installers shall be familiar with and have practical working knowledge of the requirements that pertain to this installation.

B. Codes: Comply with applicable sections of the most recent editions and addenda of following for interior and exterior installations. Ensure you are using the latest and most up to date standards regulations applicable. [NOTE: All installations within non-State owned properties shall comply with all applicable codes and regulations adopted by the authorities having jurisdiction.]

1. International Building Code (IBC)
2. National Electrical Code (NEC/NFPA 70)
3. National Electrical Safety Code (NESC IEEE)

C. Standards: Comply with applicable sections of the most recent editions and addenda of the following for installations and testing of communications cabling, connectors, and related hardware. Comply with applicable sections of the following for interior and exterior installations.

1. TIA/EIA-568-B1.1, Commercial Building Telecommunications Cabling Standard Part 1: General Requirements.
2. TIA/EIA-568-B.2-4, Commercial Building Telecommunications Cabling Standard Part 2: Balanced Twisted-Pair Cabling Components
3. TIA/EIA-569-A-7, Commercial Building Standard for Telecommunications Pathways and Spaces.
4. ANSI/TIA/EIA-569-A, Commercial Building Standards for Telecommunications Pathways and Spaces.
5. TIA/EIA-606-A, Administration Standard for Commercial Telecommunications Infrastructure.
6. J-STD-607, Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications
7. TIA/EIA 758, Customer-Outside Plant Telecommunications Cabling Standard

D. BICSI: Comply with the most current editions of the following BICSI manuals:

1. BICSI – Telecommunications Distribution Methods Manual
2. BICSI – Installation Transport Systems Information Manual
3. BICSI – Network Design Reference Design Manual
4. BICSI – Wireless Design Reference Manual
5. BICSI – Electronic Safety and Security Design Reference Manual

6. Infocomm/BICSI – AV Design Reference Manual

1.5 ELECTRONIC DOCUMENT RELEASE

A. Electronic versions of the bid documents will be made available to the contractors for use during the bidding process and to help generate fabrication drawings for various systems. A summary of the requirements for the various document types is listed below:

1. PDF

   a. Contact the Construction Manager or Architect to obtain a PDF version of the Bid Documents. No Document Release Form is required.

2. AutoCAD

   a. Bluestone Engineering can provide an AutoCAD version of the bid documents for the contractor to use for generating shop drawings and fabrication drawings. This will include plan drawings with the architectural background. The contractor is responsible for incorporating any modifications that occur during bidding by all disciplines. Details and schedules will not be included.

   b. A document release form (see attached) will be required to be completed by the contractor to determine the version of AutoCAD and drawings required. No fee is associated with these drawings.

3. REVIT

   a. The REVIT drawings will be converted to AutoCAD and then transferred to the contractor.

   b. Bluestone Engineering can provide an AutoCAD version of the bid documents for the contractor to use for generating shop drawings and fabrication drawings. This will include plan drawings with the architectural background. The contractor is responsible for incorporating any modifications that occur during bidding by all disciplines. Details and schedules will not be included.

   c. A document release form (see attached) will be required to be completed by the contractor to determine the version of AutoCad and drawings required.

   d. Submittal of the document release form will be required prior to the AutoCAD files being transmitted.

1.6 SUBSTITUTION

A. All manufacturers listed as Acceptable Manufacturers in each specification section are considered equal to the basis of design. The basis of design is preferred and will take precedence. Any products from an alternate approved manufacturer need to meet the requirements and performance specified and shall be equal to the basis of design.

B. The Contractor may request permission for a substitution of any item (equipment or material), subject to the following conditions:

1. Submit substitution requests in writing to the Engineer, on a form supplied by the Engineer. A sample copy of this form is included at the end of this section. An electronic copy can also be provided to the Contractor by the Engineer.

2. Where equipment or accessories are used which differ in arrangement, configuration, dimensions, ratings, or engineering parameters from those indicated on the contractor 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 as well as any re-design costs incurred by the Architect or Engineer. The Contractor is also responsible for coordinating changes required by other trades.

3. Any requests for alternate manufacturers must be submitted to the Architect/Engineer at least ten (10) days prior to bid day. Incomplete substitution requests will not be considered.

C. Approval

1. No work involving requests for substitution shall commence without written approval on the provided form by the Engineer.

2. Any work started or material ordered/installed by the Contractor without written approval shall be removed/repaired at the sole expense of the Contractor. The Contractor will also be responsible for any costs incurred by the Owner for such rework.

1.7 REQUIRED CONTRACTOR TRAINING

A. The Contractor shall be fully conversant and capable in the cabling of low voltage applications such as, but not limited to data, voice and imaging network systems. The Contractor shall at a minimum possess the following qualifications:

1. Personnel trained and certified in the design of the Structured Cabling System.

2. Personnel trained and certified to install the Structured Cabling System.

3. The Designer and Installer shall show proof of current “Certified Installer” of the Structured Cabling System via an updated certificate given after attending the appropriate training course or an on-line re-certification class.

4. Provide references for the type of installation provided in this specification.

5. Personnel trained and certified in fiber optic cabling, splicing, termination and testing techniques. Personnel must have experience using an optical light source and OTDR.

6. Personnel trained in the installation of pathways and support for housing horizontal and backbone cabling.

1.8 QUALITY ASSURANCE

A. Perform work in accordance with contract documents and governing codes and standards.

B. All personnel performing the work of this Section shall be thoroughly familiar with the cabling methods set forth in the latest release of the BICSI TDMM (Building Industry Consulting Services International Telecommunications Distribution Methods Manuals).

C. Contractor’s RCDD shall review all required work prior to commencing. The Contractor’s RCDD shall oversee the installation and will have the end responsibility for the quality of the installation work performed. All submitted designs and or changes to the design shall be approved and signed off by the Contractor’s RCDD.

D. The installed cabling systems shall not generate nor be susceptible to any harmful electromagnetic emission, radiation, or induction that degrades cabling systems.

E. Expansion Capability: Unless otherwise indicated, provide spare positions in wall fields, cross connects, and terminal strips, and space in cable pathways to accommodate twenty (20) percent future growth in campus distribution and riser.

F. Backward Compatibility: The provided solution shall be backward compatible with lower category ratings such that if higher category components are used with lower category components, the permanent link and channel measures shall meet or exceed the lower channel’s specified parameters.

G. Component Compliance: The provided solution’s components shall each meet the minimum transmission specifications listed herein such that no individual component will be less than specifications for permanent and channel, regardless of the fact that tests for permanent and channel ultimately meet required specifications.

H. Pre-installation Inspection: Visually inspect all cables, cable reels, and shipping cartons to detect possible cable damage incurred during shipping and transport.

1. Test each pair of UTP cable for open and short circuits. Test results to be submitted to Owner.

I. Visibly damaged goods are to be returned to the supplier and replaced at no additional cost to the Owner.

1.9 PERMITS, FEES AND CERTIFICATES OF APPROVAL (IF APPLICABLE)

A. The Owner will make application and pay for building permits.

B. As pre-requisite to final acceptance, supply to the Owner certificates of inspection from an inspection agency acceptable to the Owner and approved by the local municipality and utility company serving the project.

PART 2 - PRODUCTS

2.1 GENERAL

A. All materials shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.

2.2 SUBMITTALS

A. General

1. Bill of materials, noting any long lead time items in business days. 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.
2. RCDD Certifications
3. Proposed test forms for fiber backbone, copper backbone and horizontal UTP cable.
4. Project schedule including all major work components that materially affect any other work on the project.
5. Basis of Design Certification of Structure Cabling System
6. Submit door rough-in wiring details.
7. System Drawings: Project specific system drawing noting systems components and interconnection between components. The interconnection of components shall clearly indicate all wiring required in the system.

B. Two (2) indexed sets of manufacturer's technical data for each product including product description, specifications including labeling or listing by an agency acceptable to the Owner, and storage requirements.

C. Firestop design basis documentation that shall include each type of communication penetration, type of building construction being penetrated including the hourly resistance rating of floor, wall, or other partition of building construction into which firestop design will be installed, and firestop device or system proposed for use.

D. Installation Procedures and Material Safety Data Sheets shall be included with products delivered to the job site.

E. Informational Submittals

1. Manufacturer's Installation, Start-Up and Adjustment Instructions.
2. Certificates:
   a. Certify that field tests have been performed and that work meets or exceeds specified requirements.

b. Certify that factory tests have been performed and that work meets or exceeds specified requirements. Certificates may be based on recent or previous test results, provided material or products tested are identical to those proposed for this Project.

c. Calibration report of test equipment for fiber and copper. Last calibration date should not be older than one (1) year from the 1st day of testing.

d. Name(s) and copy of certificate of RCDD's.

3. Field Test Results: Submit sample cable test results showing report format and parameter test.

4. Operation and Maintenance Data

5. Special Warranty: With respect to the installation of the Structure cabling system, furnish the Structured Cabling System applications extended warranty.

2.3 PRODUCT ASSURANCE

A. All materials shall be UL and/or ETL approved and labeled in accordance with NEC for all products where labeling service normally applies.

B. Materials and equipment requiring UL 94, 149, or 1863 listing shall be so labeled. A modification of products that nullifies UL labels is not permitted.

C. All materials and equipment provided shall be the standard Commercial-Off-The-Shelf (COTS) products of a manufacturer engaged in the manufacture of such products. All materials shall be typical commercial designs that comply with the requirements specified. All materials and equipment shall be readily available through manufacturers and/or distributors. All equipment shall be supplied complete with any optional items required for proper installation.

D. Materials or Manufacturers not listed in this Division 27 but are required materials to provide a complete and functioning cable infrastructure system shall have cut sheets and product data included in the material and procedures submittal package.

E. Coordinate the features of materials and equipment so they form an integrated system. Match components and interconnections for optimum future performance and backward compatibility.

F. Contractor shall test all fiber cable while on the reel prior to installation of the cable. The Contractor shall assume liability for replacement of cable should it be found defective at this time or a later date prior to customer acceptance.

PART 3 - EXECUTION

3.1 COORDINATION

A. Coordinate arrangement, mounting, and support of communications equipment with Architect or Owner.

1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.

2. To provide for ease of disconnecting the equipment with minimum interference to other installations.

3. To allow connecting pathways, cables, wireways, cable trays, and busways will be clear of obstructions and of the working and access space of other equipment.

B. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

C. Coordinate location of access panels and doors for communications items that are behind finished surfaces or otherwise concealed. Access doors and panels are specified in Division 08 Section "Access Doors and Frames."

D. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section “Penetration Firestopping.”

E. Contractor shall be responsible for coordination with all trades, to include required scheduling of materials and/or equipment with Owner and/or General Contractor for delivery, storage and protection of equipment as required.

3.2 FIELD QUALITY CONTROL

A. The Contractor shall perform the following field inspections during installation and commissioning:

1. Visually inspect UTP and optical fiber jacket materials for NRTL certification markings.
2. Visually inspect cabling placements, pathways and terminations in communications equipment rooms, telecommunications rooms and work area’s for compliance with standards and codes.
3. Visually inspect grounding and bonding for compliance with standards and codes.
4. Visually inspect all installed cable trays, cable pathways and wall penetrations for compliance with standards and codes.

B. The Contractors RCDD will be responsible for all field inspections and will submit a signed weekly inspection report to Owner.

3.3 ALTERNATES, SUBSTITUTIONS AND CHANGE ORDERS

A. If a proposed alternate material is equal to or exceeds specified requirements, Contractor shall provide manufacturer’s specifications in writing for written approval prior to purchase and installation of proposed materials. The proposed material substitution shall not void or change manufacturer’s warranty.

B. Contractor shall provide a complete cabling infrastructure according to these written specifications and drawings. If the Owner changes the scope of work to be performed by the Contractor, it shall be in writing. Contractor shall response to these changes with a complete material list, labor, and taxes in writing presented to the Owner for approval. Contractor shall not proceed with additional scope of work without a signed approval by the Owner.

C. Additional work performed by the Contractor will not be paid by Owner without signed approval of these changes prior to implementing changes. Submit a copy of signed change order upon billing.

3.4 PROJECT MANAGEMENT

A. Contractor shall designate a project manager to act as the single point of contact. Project manager shall oversee all work performed to ensure a quality installation compliant with specifications as outlined in documents (which includes all specifications and drawings). The General Contractor to review a copy of resume of the on-site Project Manager and each on-site teams.

B. The Contractor project manager/supervisor shall attend meetings arranged by Owner’s representatives, and/or other parties affected by work of this Division 27.

C. Contractor shall provide written progress reports to Owner’s representative and other parties affected by work of this Division 27. This progress report must include:

1. Update time schedule with estimate time of completion. This must be in MS Project format or equal to software, also showing the time baseline.
2. Work performed last week.
3. Work planned for the upcoming week.
4. Percentage complete of work performed.

5. Identify potential risks that can impact scope and/or the time schedule.

3.5 DELIVERY AND STORAGE

A. The Contractor shall assume custody and responsibility for the items upon delivery and determining that the contents are complete and in satisfactory condition for installation.

B. Delivery, loss, storage and protection: All materials and equipment delivered and placed in storage shall be stored with protection from the weather, humidity, and temperature variation, dirt, and dust, or other contaminants.

C. Coordinate deliveries and submittals with the General Contractor/Owner to ensure a timely schedule installation.

D. Contractor shall be responsible for all handling and control of cabling equipment. Contractor is liable for any material loss due to delivery and storage problems.

E. Coordinate with General Contractor/Owner on location of storage materials.

3.6 AS-BUILTS

A. Record copy and as-built drawings:

1. Provide record copy drawings periodically throughout the project as requested by the General Contractor or Owner and at end of the project on CD-ROM. Record copy drawings at the end of the project shall be in CAD format and include notations reflecting the as built conditions of any additions to or variation from the drawings provided such as, but not limited to cable paths and termination points. CAD drawings are to incorporate test data imported from the test instruments.

2. The as built drawings shall include, but are not limited to block diagrams, frame and cable labeling, cable termination points, equipment room layouts, rack elevations and frame installation details. The as-builts shall include all field changes made up to construction completion:

   a. Field directed changes to cross connect and patching schedule.

   b. Horizontal cable routing changes.

   c. Backbone cable routing or location changes, inclusive outside plant physical pathways (if within scope of this project).

   d. Associated detail drawings.

3.7 CLEANING

A. After completing system installation, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, dust, and construction debris and repair damaged finish, including chips, scratches, and abrasions. This includes touching up paint removed for grounding.

B. Contractor shall provide a clean work environment, free from trash/rubbish accumulated during and after cabling installation.

C. Maintain construction materials and refuse within the area of work. Clean the work area at the end of each day.

D. Contractor shall keep all liquids (drinks, sodas, etc.) off finished floors, carpets, tiles racks and equipment. If any liquid damage to above finishes or equipment, Contractor shall provide professional services to clean or repair scratched/soiled finishes or damaged equipment at own expense.

3.8 PAINTING

A. Touch up marred and bared surfaces of primed, galvanized, and finish painted equipment, materials, and accessories installed.

B. Restore patched surfaces as close to the original condition and finish as reasonably possible. Where patching occurs in smooth painted surface, extend final paint coat over entire unbroken surface containing patch, after patched area has received two coats of primer and two coats of finished paint.

3.9 PROJECT CLOSEOUT REQUIREMENTS

A. Final project closeout tasks

1. Deliver all spare parts listed in each specification section. Deliver to Owner chosen location.
2. All equipment labeled per specifications.
3. All equipment cleaned and ready for use.

B. Contractor Requirements

1. Marked up drawings and specifications provided to Engineer for incorporation of as-built drawings or to serve as the as-built drawings depending on the project requirements. As-built drawings shall be clean and legible.
2. Operation and Maintenance (O&M) Manuals shall include the following:
    a. Contractor contact for warranty work.
    b. Approved shop drawings, incorporating all review comments.
    c. Warranty copies
    d. Operation and maintenance instructions
    e. Proposed test forms for fiber/copper backbone and horizontal UTP cables.

C. Two (2) final approved O&M Manuals shall be delivered to Owner. Each manual shall be an appropriately sized 3-ring binder with a vinyl cover and printed spine and cover labels. Each section shall have a printed divider tab. Each section shall be listed in a table of contents at the beginning of the manual.

END OF SECTION

(ELECTRONIC DOCUMENT RELEASE & SUBSTITUTION REQUEST FORMS ATTACHED)

Document Release Form

Information Requested:

Project Name:
Drawings Requested:

Media Type: (Check all that are applicable)

- ☐ AutoCAD DWG Files (Version _____)
- ☐ REVIT Files (Version _____)
- ☐ Adobe PDF Files
- ☐ Other

Requesting Party:

Name:

Company:

Signature:

Date:

Address 1:

Address 2:

Email Address:

Phone #:

KEDbluestone Use:

Form Sent By:

Date:

KEDbluestone Project #:

Data contained on these electronic files are part of our instruments of service and shall not be used by you or anyone else receiving these data through or from you for any purpose other than as a convenience in the preparation of shop drawings for the referenced project. Any other use or reuse by you or by others will be at your sole risk and without liability or legal exposure to us. You agree to make no claim and hereby waive, to the fullest extent permitted by law, any claim or cause of action of any nature against us, our officers, directors, employees, agents or subconsultants that may arise out of or in connection with your use of the electronic files. Furthermore, you shall, to the fullest extent permitted by law, indemnify and hold us harmless against all damages, liabilities or costs, including reasonable attorneys' fees and defense costs, arising out of or resulting from your use of these electronic files. These electronic files are not construction documents. Differences may exist between these electronic files and corresponding hard-copy construction documents. We make no representation regarding the accuracy or completeness of the electronic files you receive. In the event that a conflict arises between the signed or sealed hard-copy construction documents prepared by us and the electronic files, the signed or sealed hard-copy construction documents shall govern. You are responsible for determining if any conflict exists. By your use of these electronic files, you are not relieved of your duty to fully comply with the contract documents, including, and without limitation, the need to check, confirm and coordinate all dimensions and details, take field measurements, verify field conditions and coordinate your work with that of other contractors for the project. Because information presented on the electronic files can be modified, unintentionally or otherwise, we reserve the right to remove all indicia of ownership and/or involvement from each electronic display.

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SUBSTITUTION REQUEST FORM (DURING BIDDING)

We submit for your consideration the following product instead of the specified item for the following project:

PROJECT: _____

SPEC. SECTION	SPEC. TITLE	PARAGRAPH	SPECIFIED ITEM
_____	_____	_____	_____

Proposed Substitution: _____

MANUFACTURER	TRADE NAME	MODEL NO.
_____	_____	_____

Attached data includes product description, specifications, drawings, photographs, and performance and test data adequate for evaluation of the request; applicable portions of the data are clearly identified.

Attached data also includes a description of changes to the Contract Documents that the proposed substitution will require for its proper installation.

The Undersigned certifies:

- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.
- Same warranty will be furnished for proposed substitution as for specified product.
- Same maintenance service and source of replacement parts, as applicable, is available.
- Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.
- Proposed substitution does not affect dimensions and functional clearances.
- Payment will be made for changes to building design, including Architectural and Engineering design, detailing, and construction costs caused by the substitution.

Submitted by:

_____

Signature

_____

Firm

_____

Telephone Email Date

Engineer's Review and Action

☐ Substitution Approved
☐ Substitution Approved As Noted
☐ Substitution Rejected
☐ Substitution Request Received Too Late

Signed by:

_____

Date

Supporting Data Attached:

☐ Drawings ☐ Product Data ☐ Samples ☐ Tests ☐ Reports ☐ Other _____

SUBSTITUTION REQUEST FORM (AFTER BIDDING)

We submit for your consideration the following product instead of the specified item for the following project:

PROJECT: _____

SPEC. SECTION SPEC. TITLE PARAGRAPH SPECIFIED ITEM

_____ _____ _____ _____

Proposed Substitution: _____

MANUFACTURER TRADE NAME MODEL NO.

_____ _____ _____

INSTALLER PHONE NO.

_____ _____

History: ☐ New Product ☐ 2-5 years old ☐ 5-10 years old ☐ More than 10 years old

Differences between proposed substitution and specified product: _____
_____
_____

Proposed substitution affects other parts of Work: ☐ No ☐ Yes; explain _____
_____

Proposed substitution changes Contract Time: ☐ No ☐ Yes [Add] [Deduct] _____ days

Savings to Owner for accepting substitution: $_____

The Undersigned certifies:

- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.
- Same warranty will be furnished for proposed substitution as for specified product.

- Same maintenance service and source of replacement parts, as applicable, is available.
- Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.
- Cost data as stated above is complete. Claims for additional costs related to accepted substitution which may subsequently become apparent are to be waived.
- Proposed substitution does not affect dimensions and functional clearances.
- Payment will be made for changes to building design, including Architectural and Engineering design, detailing, and construction costs caused by the substitution.
- Coordination, installation, and changes in the Work as necessary for accepted substitution will be complete in all respects.

Submitted by:

_____

Signature

_____

Firm

_____

Telephone Email Date

Engineer's Review and Action

☐ Substitution Approved
☐ Substitution Approved As Noted
☐ Substitution Rejected
☐ Substitution Request Received Too Late

Signed by:

_____

Date

Supporting Data Attached:

☐ Drawings ☐ Product Data ☐ Samples ☐ Tests ☐ Reports ☐ Other _____

SECTION 27 05 26

GROUNDING/EARTHING AND BONDING

PART 1 - GENERAL

1.1 SCOPE

A. Perform all Work required to provide and install the following Grounding/Earthing and Bonding for Communications Systems.

B. This section includes minimum requirements for the following:

1. Grounding/Earthing System
2. Telecommunications Grounding Busbar (TGB)
3. Telecommunications Main Ground Busbar (TMGB)
4. Rack Grounding/Earthing and Bonding

C. All cables and related terminations, support and grounding/earthing hardware shall be furnished, installed, wired, tested, labeled, and documented by the telecommunications contractor as detailed in this document.

D. Product specifications, general design considerations, and installation guidelines are provided in this document. Quantities grounding/earthing products, typical installation details and cable routing will be provided as an attachment to this document. If the bid documents are in conflict, this specification shall take precedence. The successful vendor shall meet or exceed all requirements for the cable system described in this document.

1.2 REFERENCES

A. The following industry standards are the basis for the grounding/earthing and bonding system described in this document

1. NFPA: NFPA-70 National Electric Code (NEC)
2. IEEE: Std 1100 IEEE Recommend Practice for Powering and Grounding Electronic Equipment (IEEE Emerald Book)
3. TIA/EIA:
   a. TIA-942 Telecommunications Infrastructure Standard for Data Centers
   b. J-STD-607-A Commercial Building Grounding/Bonding Requirements
   c. TIA/EIA-606 Administration Standard for the Telecommunications Infrastructure of Commercial Buildings
4. International Standard: BS EN 50310:2000 Application of equipotential bonding and earthing in Buildings with information technology equipment.

B. The most recent versions of all documents apply to this project. If there is a conflict between applicable documents, the order above shall dictate the order of precedence in resolving the issue unless an enforceable local or national code is in effect.

1.3 APPROVED PRODUCTS

A. Approved grounding/earthing system manufacturer: Panduit

B. Approved telecommunications grounding busbar manufacturer: Panduit

C. Approved rack grounding kit manufacturer: Panduit

1.4 QUALITY ASSURANCE

A. See the Panduit Electrical Product Warranty on www. Panduit.com/warranty

1.5 DEFINITIONS

A. Bonding – The permanent joining of metallic parts to form an electrically conductive path that will assure electrical continuity and the capacity to conduct safety any current likely to be imposed.

B. Mesh Common Bonding Network (MCBN) – The mesh CBN (MCBN) can be readily utilized for efficient direct bonding of equipment and other apparatus to the grounding system. Such an arrangement provides efficient grounding and inter/intra-unit bonding of metal cabinets, racks and miscellaneous metal objects (especially when they are not powered). Additionally, the MCBN ensures grounding reliability of the equipment in the event the equipment grounding conductor of the serving power circuit is comprised or disconnected during maintenance. Electrostatic charge buildup and dissipation is also greatly aided by the multiple grounding paths of the CBN. See Figure 1.

C. Ground/Earth (Earth)/Earthing is an international term equivalent to grounding) – A conducting connection, whether intentional or incidental, by which an electric circuit or equipment is connected to earth, or to some conducting body relatively large extent that serves in place of the earth.

D. Retrofit Rack Grounding/Earthing – The application of grounding/earthing products and technology where equipment is already deployed and functioning within the equipment rack.

E. Retrofit Cabinet Grounding/Earthing – The application of grounding/earthing products and technology where equipment is already deployed and functioning within the equipment cabinet.

1.6 OVERVIEW

A. A primary purpose of the grounding/earthing and bonding system is to create an adequate capacity path for electrical surges and transient voltages to return to their source (which may include the earth).

B. Lightning, fault currents, circuit switching (motors turning on and off), activation of surge protective devices (SPDs) and electrostatic discharge are common causes of these electrical surges and transient voltages. An effective grounding/earthing and bonding system minimizes the detrimental effects of these electrical surges and transient voltages, which include degraded network performance and reliability and increased safety risks.

C. A properly constructed protection system includes a number of subsystems including:

1. Grounding electrode system
2. Lightning protection system
3. Surge suppression
4. AC/DC power systems grounding
5. Telecommunications supplemental grounding and bonding

D. While each subsystem is designed with a specific intent in mind, the systems interact and enhance the overall capability of the entire protection system. This specification focuses primarily on the telecommunications supplemental grounding and bonding subsystem, hereafter referred to as the grounding, bonding, or grounding/earthing system.

E. The grounding/earthing system must be intentional, visually verifiable, adequately sized to handle expected currents safely, and directs these potentially damaging currents away from sensitive network equipment. As such, grounding/earthing must be purposeful in its design and installation. Four issues require special consideration:

1. Although AC powered equipment typically has a power cord that contains a ground/earth wire, the integrity of this path cannot be easily verified. Thus, many equipment manufacturers require grounding/earthing above and beyond that which is specified by

local electrical codes, such as the National Electrical Code, etc. Always follow the grounding/earthing recommendations of the manufacturer when installing equipment.

2. While the building steel and metallic water piping must be bonded to the grounding/earthing system for safety reasons, neither may be substituted for the telecommunications bonding backbone (TBB).
3. Electrical continuity throughout each rack or cabinet is required to minimize safety risks. Hardware typically supplied with bolt-together racks is not designed for grounding/earthing purposes. Additionally, most racks and cabinets are deliberately bonded, continuity between members is incidental, and in many cases, unlikely.
4. Amy metallic component that is part of the data center, including equipment, racks, cabinets, ladder racks, enclosures, cable trays, etc., must be bonded to the grounding/earthing system.

F. The ground/earth system must be designed for high reliability. Therefore, the grounding/earthing system shall meet the following criteria:

G. Local electrical codes shall be adhered to.

H. The grounding/earthing system shall comply with ANSI/TIA-942, J-STD-607-A, IEEE Std 1100™ (IEEE Emerald Book), and in international regions BS EN 50310:2000.

I. All grounding/earthing conductors shall be copper.

J. Lugs, HTAPs, grounding strips, and busbars shall be UL Listed and made of premium quality tin-plated electrolytic copper that provides low electrical resistance while inhibiting corrosion. Antioxidant shall be used when making bonding connections in the field.

K. Wherever possible, two-hole lugs shall be used because they resist loosening when twisted (bumped) or exposed to vibration. All lugs shall be irreversible compression and meet NEBS Level 3 as tested by Telcordia. Lugs with inspection windows shall be used in all non-corrosive environments so that connections may be inspected for full conductor insertion (battery rooms are an exception where windowless lugs may be used).

L. Die index numbers shall be embossed on all compression connections to allow crimp inspection.

M. Cable assemblies shall be UL Listed and CSA Certified. Cable shall be a distinctive green or green/yellow in color, and all jackets shall be UL, VW-1 flame rated.

PART 2 - PRODUCTS

2.1 EQUIVALENT PRODUCTS

A. Panduit shall manufacture all products, including but not limited to grounding/earthing and bonding for communications systems. There will be no substitutions allowed.

2.2 GROUNDING/EARTHING AND BONDING

A. A telecommunications Main Grounding Busbar (TMGB) shall be located at the service entrance. A Telecommunications Grounding Busbar (TGB) shall be located in each telecommunications space. The TGB will be grounded/earthed to the Telecommunications Main Grounding Busbar (TMGB).

B. The TMGB shall be bonded to building steel and grounded/earthed to the electrical service ground according to J-STD-607-A guidelines. Each TGB shall be bonded to building steel and the electrical panel serving equipment in the telecommunications space. See Figure 1 below.

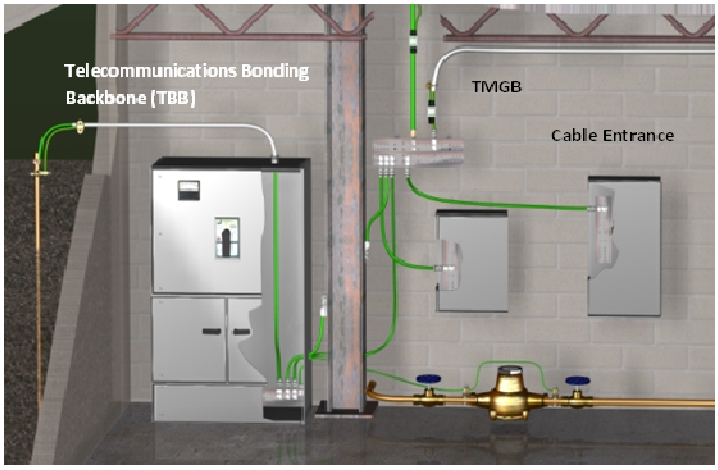


Figure 1 – Service Entrance Grounding

The gauge of the connecting ground/earth cable, known as the Telecommunications Bonding Backbone (TBB) will follow J-STD-607-A guidelines, as is shown in the table below.

1. Sizing of the TBB	
TBB Length in Linear meters (feet)	TBB Size AWG
Less than 4 (13)	6 (16mm²)
4-6 (14-20)	4 (25mm²)
6-8 (21-26)	3 (25mm²)
8-10 (27-33)	2 (35mm²)
10-13 (34-41)	1 (35mm²)
13-16 (42-52)	1/0 (50mm²)
16-20 (53-66)	2/0 (70mm²)
Greater than 20 (66)	3/0 (95mm²)

C. Route the TBB to each TGB in as straight a path as possible. The TBB should be installed as a continuous conductor, avoiding splices where possible. Use Panduit part number series HTWC to tap into the TBB where necessary. When more than one TBB is used, bond them together using the TGBs on the top floor and every third floor in between with a conductor known as a grounding equalizer (GE). Use the J-STD-607-A guidelines for sizing of the TBB when sizing the GE (shown in the table above).

2.3 COMPONENTS, KITS AND HARDWARE

A. Panduit® StructuredGround™ Grounding System (StructuredEarth™ Earthing System) kits, components, and hardware shall be used to construct the grounding/earthing system.

B. Use Panduit GB4 series BICSI/J-STD-607-A telecommunications grounding busbars for the TMGB, which is ideally located at the AC service entrance. Use a Panduit GB2 series busbar

for the TGB in each of the other telecommunications/equipment spaces throughout the building. Use Panduit LCC-W series lugs when connecting conductors to the TMGB and TGB.

2.4 CONSTRUCTION OF THE GROUNDING/EARTHING SYSTEM

A. Avoid routing grounding/earthing conductors in metal conduits. If the grounding/earthing conductor must be routed through a metal conduit, bond each end of the conduit to the grounding/earthing conductor. Use Panduit GPL series grounding clamps to bond to the conduit, a Panduit HTWC HTAP with clear cover to bond to the grounding/earthing conductor, and a #6 AWG copper conductor to connect the GPL grounding clamp to the HTWC HTAP.

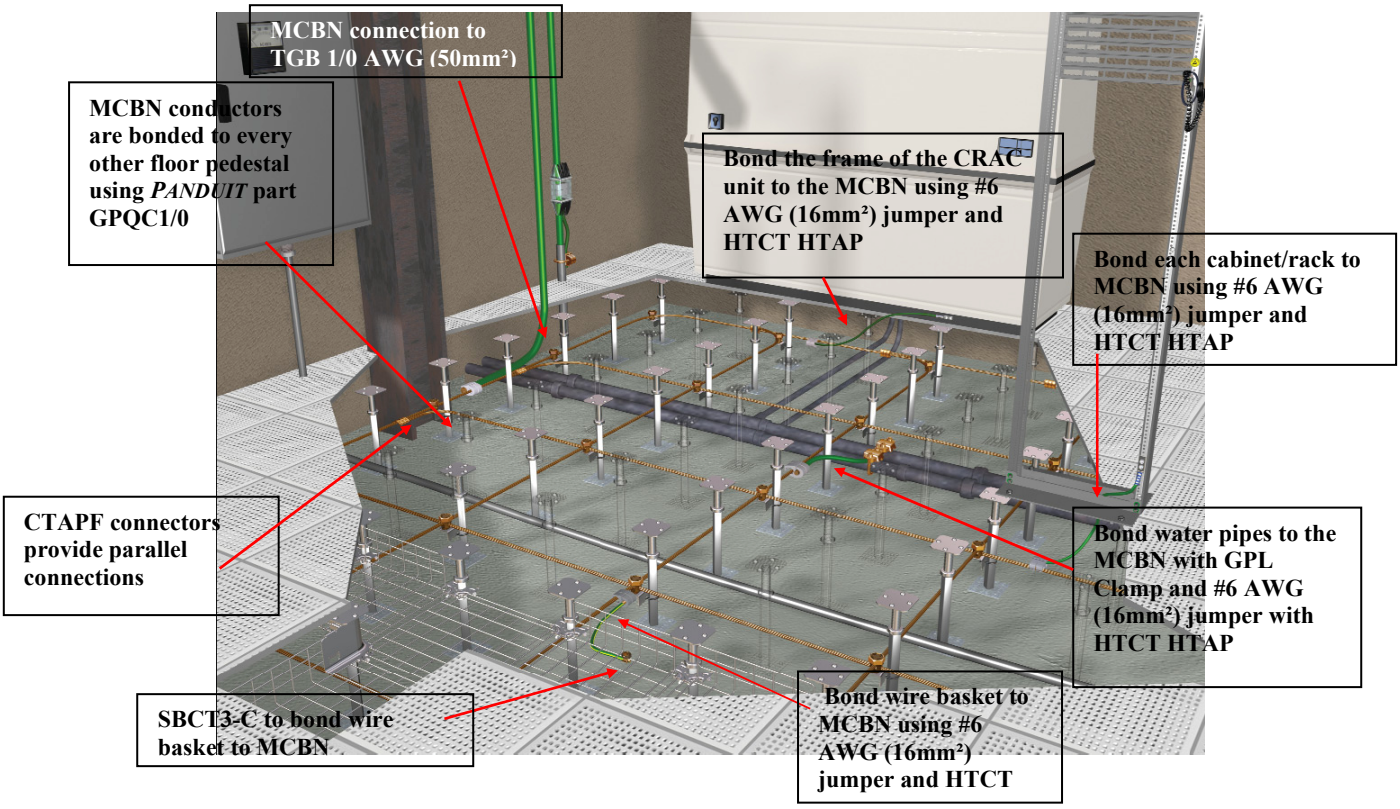
B. In telecommunications spaces with a small number of racks or cabinets, it may be most convenient to bond the grounding/earthing jumper cable directly to the TGB. Larger spaces require a mesh Common Bonding Network, as described below.

Cable Sizes for Other Grounding/Earthing Applications Not Specifically Described Elsewhere in This Document	
Purpose	Copper Code Cable Size
Aisle ground (overhead) of the common bonding network	Minimum #2 AWG (35mm²)
Aisle ground (under floor) of the mesh common bonding network	Minimum # 6 AWG (16mm²)
Bonding conductor to each PDU or panel board serving the room.	Size per NEC 250.122 & manufacturer recommendations
Bonding conductor to HVAC equipment	#6 AWG (16mm²)
Building columns	#4 AWG (25mm²)
2. Cable ladders and trays	#6 AWG (16mm²)
Conduit, water pipe, duct	#6 AWG (16mm²)

C. Raised Floor (Access Floor) mesh Common Bonding Network – The following requirements shall apply when constructing the MCBN under the floor:

1. The under the floor MCBN shall be constructed of a #2 AWG (35mm^2) or smaller gauge bonding conductor, but never smaller than a #6 AWG (16mm^2) conductor. The MCBN should be connected to the Telecommunications Grounding busbar (TGB) using a 1/0 AWG (50mm^2) or larger conductor.
2. MCBN grid shall be installed on every other pedestal, this allows for bonding of one (1) pedestal from each access floor tile to the MCBN. A grounding clamp shall create a bond between conductors at each intersection and to the access floor by bonding the pedestals to the MCBN conductors. *PANDUIT* part number GPQC1/0 shall be utilized for ¾" (19.1mm) and 1" (25.4mm) round or square pedestals and where MCBN conductors range from #6 AWG (16mm²) – 1/0 AWG (50mm²). MCBN grid shall be bonded no further than every 5th pedestal to be compliant with TIA-942 standard.
3. Use HTCT HTAP connectors for series bonds (such as from the rack to the mesh CBN) and either HTCT or CTAPF connectors to provide parallel connections within the auxiliary grounding system (such as when bonding conductors to the outer ring that encompasses the raised floor).

Figure 2 – Mesh Common Bonding Network and Wire Basket Bonding



D. Wire Basket Bonding

1. Wire baskets shall be bonded per the manufacturer's installation instructions. Bond shall be made in accordance with Figure 2 above to the mesh Common Bonding Network.
2. Attached a #6 AWG (16mm^2) jumper to the Wire Basket with a split bolt, Panduit part series SBCT. Then use a HTCT HTAP to attach the other end of the jumper to the mesh CBN.
3. Overhead Common Bonding Network and Ladder Rack Bonding
4. The overhead common bonding network shall be constructed of a minimum of a #2 AWG (35mm²) or larger gauge wire. The CBN shall be bonded to the TGB using a 2-hole copper compression connector, *PANDUIT* part series LCC-W or metric equivalent.
5. Ladder racks shall be bonded per the manufacturer's installation instructions. The bond shall be made in accordance with Figure 3 below to the mesh Common Bonding Network.

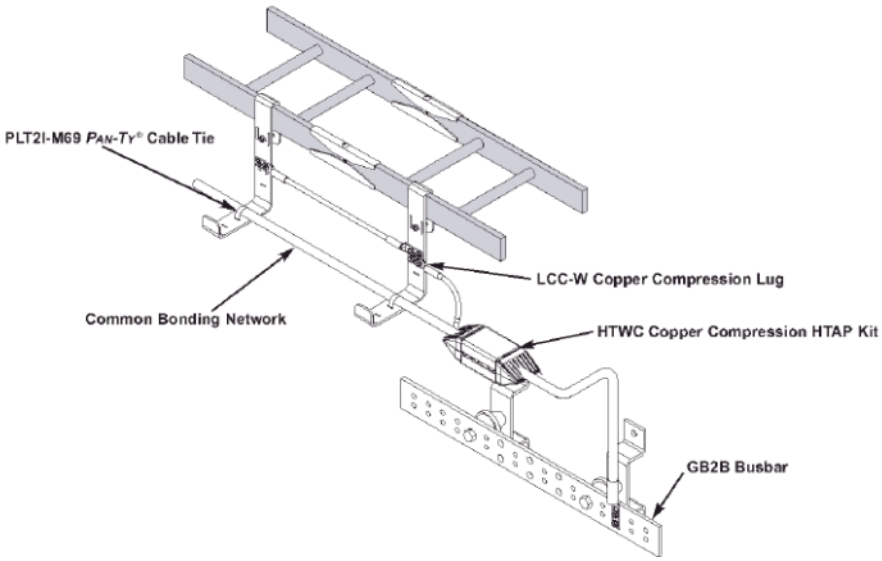


Figure 3 – Overhead Common Bonding Network and Ladder Rack Bonding

6. To provide electrical continuity between ladder rack segments use Panduit® StructuredGround™ Auxiliary Cable Bracket, Panduit part number GACB-1. When installed, the paint piercing teeth on the bracket remove paint from the ladder rack sections providing an electrical bond. There shall also be a grounding jumper, Panduit part number GACBJ618U, that connects to the auxiliary cable brackets to bond the sections of the ladder rack together.

2.5 RACK GROUNDING/EARTHING

A. Equipment and racks shall be bonded in accordance with the methods prescribed in ANSI/TIA-942, as is shown in Figure 4 below.

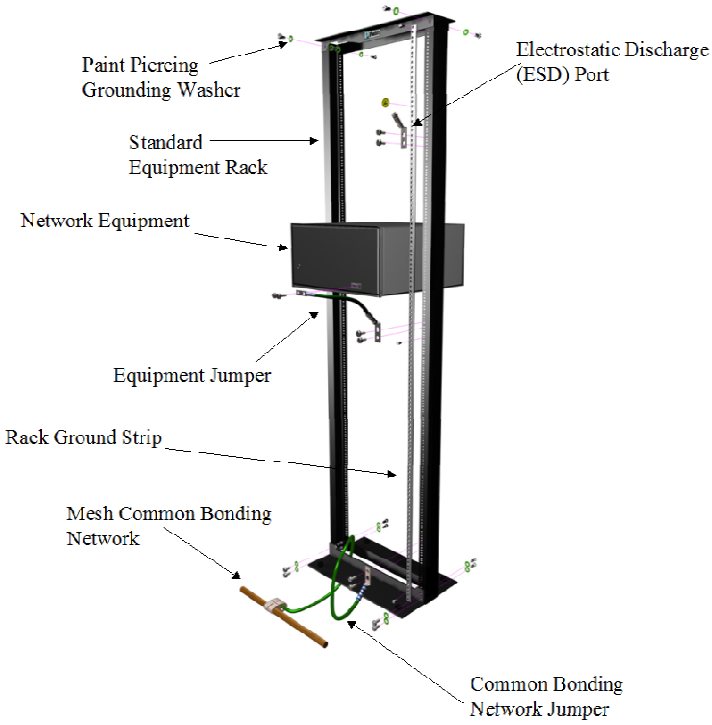


Figure 4 - Properly Grounded/Earthed Rack (Back of Rack Shown)

B. To provide electrical continuity continuity between rack elements, *PANDUIT* paint piercing grounding washers, series RGW, shall be used where rack sections bolt together, on both sides, under the head of the bolt and between the nut and rack.

C. All racks shall utilize a full-length rack ground strip, PANDUIT series RGS, attached to the rear of the side rail with the thread-forming screws provided to ensure metal-to-metal contact.

D. Mount an electrostatic discharge (ESD) port kit, PANDUIT series RGESD, directly to the rack grounding strip on the back of the rack at approximately 48 inches (122cm) from the floor. Mount a second RGESD directly to the vertical mounting rail of the rack in the front at approximately the same height. Use the thread-forming screws provided to form a bond to the rack. Place the ESD protection identification stickers directly above the ESD ports.

E. When the equipment manufacturer provides a location for mounting a grounding connection, that connection shall be utilized. Use the appropriate PANDUIT RG series jumper for the equipment being installed and the thread-forming screws provided in the kit.

F. Use PANDUIT part number series RGCBNJ (Common Bonding Network Jumper) to attach the rack ground strip to the mesh CBN. This kit includes the #6 AWG cable with one factory installed two-hole lug and hardware to connect to the busbar and one HTCT HTAP to connect to the mesh CBN. In addition, all components can be utilized if your mesh common bonding network is below or overhead. Do not bond racks or cabinets serially. Use the HTCT HTAP that comes with the kit to bond the conductor directly to the mesh common bonding network.

G. Patch panels will be bonded to racks using the appropriate PANDUIT bonding screws, series RGTBS. Mounting rails may utilize cage nuts, threaded holes or thru hole mounting fasteners to secure patch panels to the rails.

PART 3 - EXECUTION

3.1 GROUNDING SYSTEM

A. The communications grounding system shall be designed and/or approved by a qualified PE, licensed in the state that the work is to be performed. The communications grounding system shall adhere to the recommendations of the ANSI/TIA-942 and J-STD-607-A standards, and

shall be installed in accordance with best industry practice. International regions shall adhere to the recommendations of the BS EN 50310:2000 standard.

B. A licensed electrical contractor shall perform installation and termination of the main bonding conductor to the building service entrance ground.

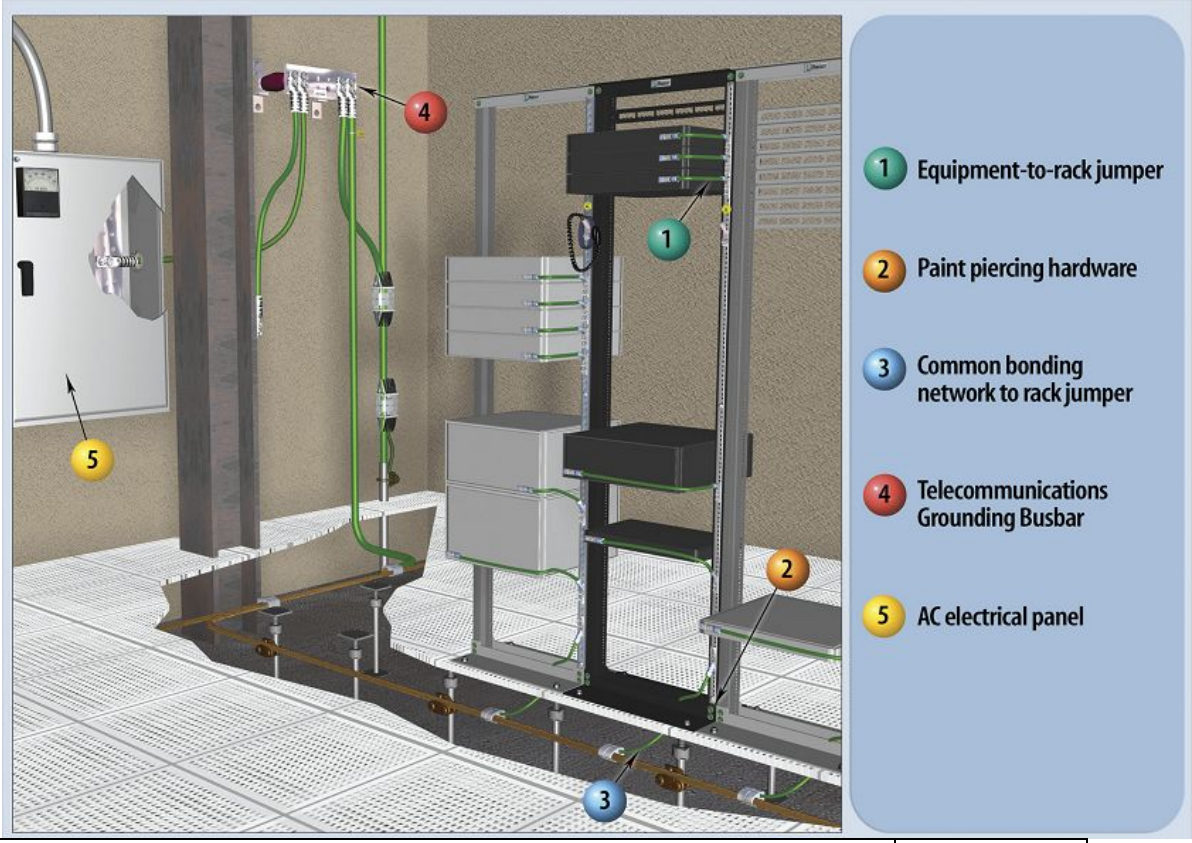
3.2 INSPECTION OF THE GROUNDING SYSTEM

A. The following describes the process of properly inspecting information technology telecommunications supplemental grounding and bonding systems.

B. An answer of “yes” for each question on the inspection list indicates that the components of the grounding and bonding system have been installed to commonly referenced industry standards.

C. Use the room/rack/cabinet number space on each sheet to provide each measurement set with a unique identification number so that issues found during the inspection can be addressed later.

D. Bonding inspections for each telecommunications space: Room Number _____



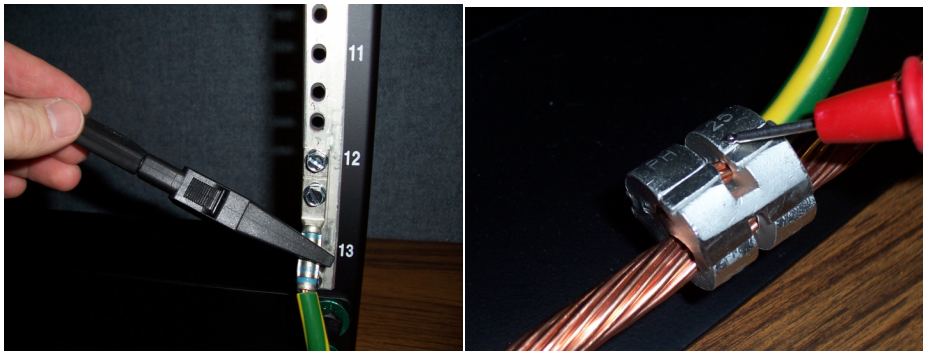
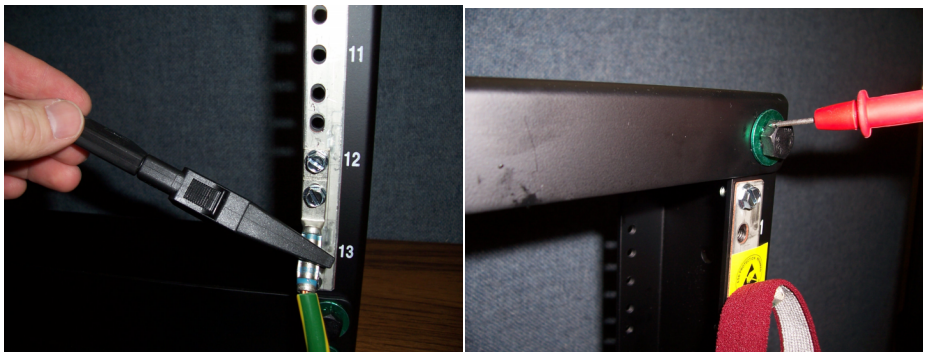
Is a Telecommunications Grounding Busbar (TGB) present?	☐ Yes ☐ No
Have the following bonds been made to the TGB?	
The AC electrical panel	☐ Yes ☐ No
Accessible building steel	☐ Yes ☐ No
The Mesh Common Bonding Network[1]	☐ Yes ☐ No
The Telecommunications Bonding Backbone[2]	☐ Yes ☐ No

1. The Mesh Common Bonding Network (MCBN) is the conductor or group of conductors that extend from the TGB to each bay in the room. The MCBN can be installed above the bays or under the access floor.
2. The Telecommunications Bonding Backbone (TBB) is the conductor that bonds every TGB in the bonding network together. The TBB may not be present in every installation.

Using a clamp-on amp meter, check for AC and DC current on each of the bonds listed above. A reading of zero amps AC and DC may be indicative of an open connection. A reading of greater than one amp may be indicative of fault conditions somewhere in the power system. Clamp the meter around the grounding conductor in question  Are the AC and DC currents at acceptable levels?	☐ Yes ☐ No
Are the bend radii of all these conductors greater than twelve inches?	☐ Yes ☐ No
Are all the bonds to the TGB made with two-hole compression lugs?	☐ Yes ☐ No
Is each conductor bonded to the TGB labeled or tagged “Do not disconnect”?	☐ Yes ☐ No

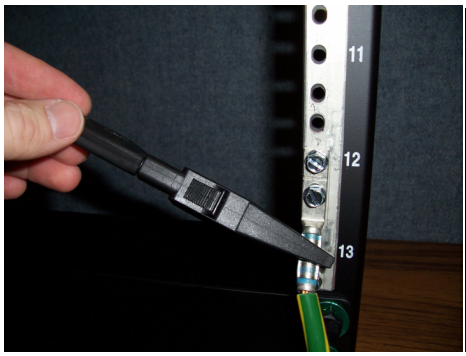
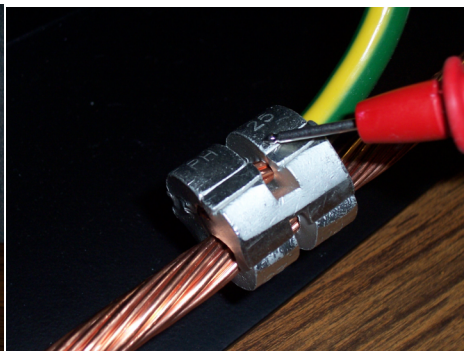
E. Bonding inspections for each rack: Rack Number _____

Are electrostatic discharge (ESD) wrist strap ports available on the front and back of each rack?	☐ Yes ☐ No
Are two-hole compression lugs compression HTAPs used wherever possible?	☐ Yes ☐ No

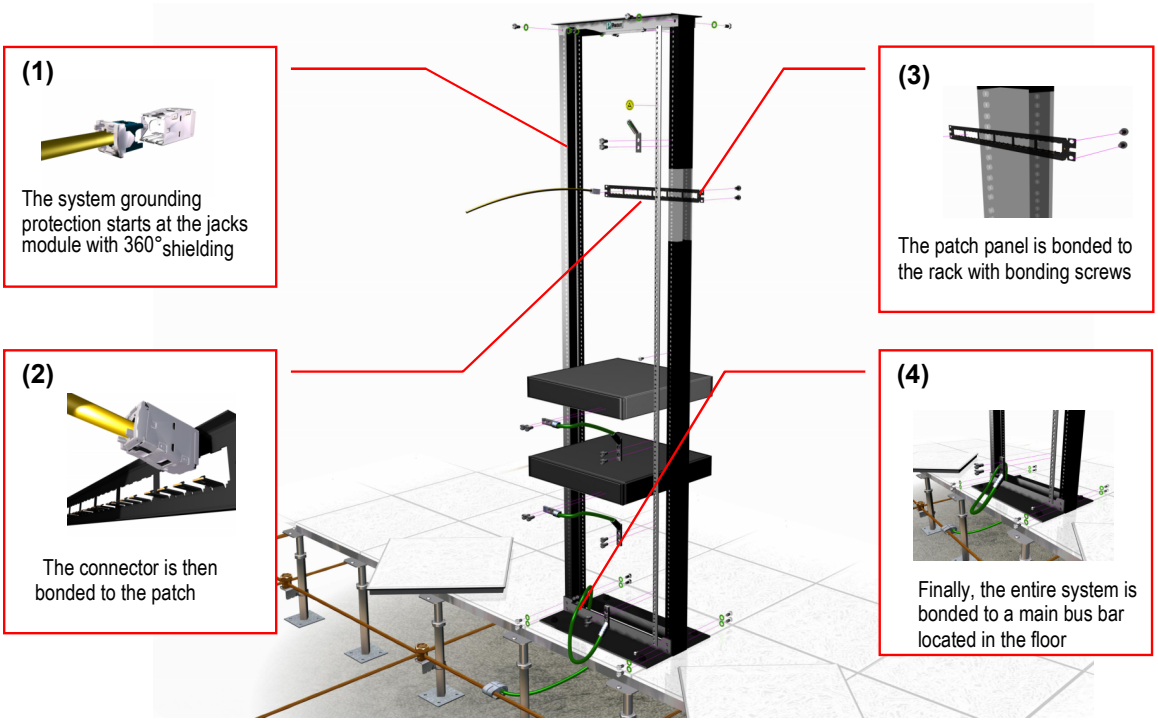
Using a two-point resistance meter, measure the DC resistance between the common bonding network (CBN) to rack jumper and the HTAP connecting the jumper to the mesh common bonding network as shown below. One probe on the CBN jumper: One probe on the HTAP:  Is the DC resistance ≤ 0.1Ω?	☐ Yes ☐ No
Using a two-point resistance meter, measure the DC resistance between each section of the rack and the common bonding network to rack jumper as shown below. One probe on the CBN jumper: One probe on the washer:  Is the DC resistance ≤ 0.1Ω for each section of rack?	☐ Yes ☐ No
Using a two-point resistance meter, measure the DC resistance between the mounting flange of each piece of powered equipment and the common bonding network to rack jumper. Is the DC resistance ≤ 0.1Ω for each piece of equipment?	☐ Yes ☐ No

F. Bonding inspections for each cabinet: Cabinet Number _____

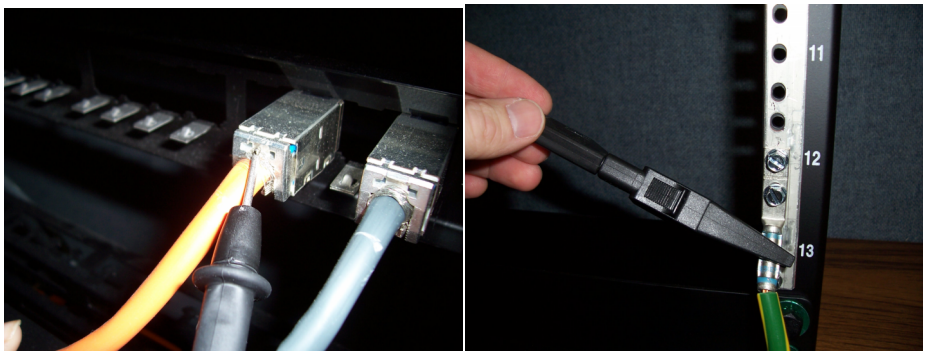
Are electrostatic discharge (ESD) wrist strap ports available on the front and back of each cabinet?	☐ Yes ☐ No

Are two-hole compression lugs compression HTAPs used wherever possible?	☐ Yes ☐ No
Using a two-point resistance meter, measure the DC resistance between the common bonding network (CBN) to rack jumper and the HTAP connecting the jumper to the mesh common bonding network as shown below. One probe on the CBN jumper:  One probe on the HTAP:  Is the DC resistance ≤ 0.1Ω?	☐ Yes ☐ No
Using a two-point resistance meter, measure the DC resistance between equipment mounting rails and the common bonding network jumper. Is the DC resistance ≤ 0.1Ω for each equipment mounting rail?	☐ Yes ☐ No
Using a two-point resistance meter, measure the DC resistance between the mounting flange of each piece of powered equipment and the common bonding network to rack jumper. Is the DC resistance ≤ 0.1Ω for each piece of equipment?	☐ Yes ☐ No

G. Bonding inspections for shielded cables: Rack/Cabinet Number _____



H.

Has the bay passed all the rack or cabinet bonding inspections?	☐ Yes ☐ No
Using a two-point resistance meter, measure the DC resistance between each cable shield and the common bonding network (CBN) to rack jumper as shown below. One probe on the shield: One probe on the CBN jumper:  Is the DC resistance ≤ 0.1Ω between each module and the CBN rack jumper?	☐ Yes ☐ No

END OF SECTION

SECTION 27 05 28

PATHWAYS FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Specifications throughout all Divisions of the Project Manual are directly applicable to this Section, and this Section is directly applicable to them.

1.2 SUMMARY

A. This section includes the minimum requirements for communications cable pathway installations.

1. Horizontal Cable Routing
2. Products
3. Common Requirement for Communications Installations
4. Separation from EMI Sources
5. Sleeve Installation for Communications Penetrations
6. Penetration of Building Surfaces
7. Cutting and Patching

1.3 REFERENCE STANDARDS AND CODES

A. See Section 270513.

1.4 INTRABUILDING CABLE ROUTING

A. Adequate riser sleeve/slot space shall be available with the ability to ingress the area at a later date in all telecommunications rooms, such that no drilling of additional sleeves/slots are necessary.

B. The backbone cables shall be installed in a star topology, emanating from the main cross-connect to each telecommunications room. An intermediate cross-connect may be present between the main cross-connect and the horizontal cross-connect.

C. Backbone pathways shall be installed or selected such that the minimum bend radius and pulling tension of backbone cables is kept within cable manufacturer specifications both during and after installation.

1.5 INTERBUILDING CABLE ROUTING

A. The backbone subsystem shall include cable installed between buildings via underground, tunnel, direct-buried, aerial or any combination of these from the main cross-connect to an intermediate cross-connect in a multi-building campus.

B. In an underground system, adequate underground conduit space shall be available and accessible at each building via the Entrance Facility or the Maintenance holes. The conduits shall not exceed a fill factor of 40%.

C. All underground systems shall be designed to prevent water runoff from entering the building.

D. The backbone cables shall be installed in a star topology, emanating from the main cross-connect to each satellite building telecommunications room.

E. Backbone pathways shall be installed or selected such that the minimum bend radius and pulling tension of backbone cables is kept within cable manufacturer specifications both during and after installation.

1.6 HORIZONTAL CABLE ROUTING

A. All horizontal cables shall not exceed 90 m from the telecommunications outlets in the work area to the horizontal cross connect.

B. Consolidation points shall not be used.

C. Horizontal pathways shall be installed or selected such that the minimum bend radius of horizontal cables is kept within manufacturer specifications both during and after installation.

D. In open ceiling cabling, cable supports shall be provided by means that is structurally independent of the suspended ceiling, its framework, or supports. These supports shall be spaced no more than 1.5 m apart. NOTE: Cable tie-downs should maintain a minimum distance of 0.6 m apart when within 5 m of the termination point. Contact Owner to get project specific requirements on use of “J-hooks” and/or “Bridle Rings”.

E. For voice or data applications, 4-pair copper balanced twisted-pair cables shall be run using a star topology from the telecommunications room serving that floor to every individual information outlet. The Owner prior to installation of the cabling shall approve all cable routes.

F. The Contractor shall observe the bend radius and pulling strength requirements of the 4 pair copper balanced twisted-pair optic cable during handling and installation.

G. Each run of 4-pair copper twisted-pair cable between horizontal portions of the cross-connect in the telecommunication closet and the information outlet shall not contain splices.

H. In a false ceiling environment, a minimum of 75 mm shall be observed between the cable supports and the false ceiling.

I. Continuous conduit runs installed by the contractor should not exceed 30.5 m or contain more than two (2) 90 degree bends without utilizing appropriately sized pull boxes.

J. All horizontal pathways shall be designed, installed and grounded to meet applicable local and national building and electrical codes.

K. The number of horizontal cables placed in a cable support or pathway shall be limited to a number of cables that will not cause a geometric shape of the cables to be altered. Under no circumstances should cables in the horizontal pathway be bundled. This is to minimize “alien” cross talk.

L. Maximum conduit pathway capacity shall not exceed a 40% fill. However, perimeter and furniture fill ratio is limited to 60% fill for moves, adds and changes.

M. Horizontal distribution cables shall not be exposed in the work area or other locations with public access.

PART 2 - PRODUCTS

2.1 GENERAL

A. All materials shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.

2.2 SUBMITTALS

A. See Section 270513.

2.3 CABLE PATHWAYS

A. Cable Support: NRTL labeled and designed to prevent degradation of cable performance and pinch points that could damage cable. Also to be installed independently of “Other Trades” support system.

1. Wire Mesh Cable Tray
2. Support brackets with cable tie slots for fastening cable ties to brackets.

3. Lacing bars, spools, J-hooks, and D-rings.
4. Straps and other devices.

B. Approved manufacturers:
1. Snake Tray
2. Cooper B-Line
3. Chatsworth Products, Inc. (CPI)
4. Cope
5. Similar products, after approval by Owner

2.4 SLEEVES FOR PATHWAYS AND CABLES

A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends, with plastic bushings.

B. Sleeves for Rectangular Openings: Galvanized sheet steel.
1. Minimum Metal Thickness:
a. For sleeve cross-section rectangle perimeter less than 50 inches and no side more than 16 inches, thickness shall be 0.052 inch.
b. For sleeve cross-section rectangle perimeter equal to, or more than, 50 inches and 1 or more sides equal to, or more than, 16 inches, thickness shall be 0.138 inch.

2.5 GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.6 FIRESTOPPING

A. Subject to compliance with requirements, provide products of one of the following manufacturers
1. Hilti Firestop Systems
2. 3M, Electrical Products Division, St. Paul, Minnesota
3. Metacaulk; Rectorseal Corp., Houston, Texas
4. Specified Technologies Inc., Somerville, New Jersey
5. United States Gypsum Company

B. Provide materials classified by UL to provide fire barrier equal to time rating of construction being penetrated.

C. Provide asbestos free materials that comply with applicable Codes and have been tested in accordance with UL 1479 or ASTM E 814.

D. Fire Rated Cable Pathways: Device modules comprised of steel raceway with intumescent foam pads allowing 0 to 100 percent cable fill, the following products are acceptable
1. Specified Technologies Inc. (STI) EZ-PATH™ Fire Rated Pathway
2. Or equivalent product from different manufacturer, after approval by Owner.

PART 3 - EXECUTION

3.1 COMMON REQUIREMENTS FOR COMMUNICATIONS INSTALLATION

A. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.

B. All installation shall be in accordance with manufacturer's published recommendations.

C. Install to facilitate service, maintenance, and repair or replacement of components of both communications equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.

D. Right of Way: Give to piping systems installed at a required slope.

3.2 SEPARATION FROM EMI SOURCES

A. Comply with TIA/EIA-569-A recommendations for separating unshielded copper voice and data communication cable from potential EMI sources, including electrical power lines and equipment.

B. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:

1. Electrical Equipment Rating Less than 2 kVA: A minimum of 5 inches
2. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches.
3. Electrical Equipment Rating More than 5 kVA: A minimum of 24 inches

C. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:

1. Electrical Equipment Rating Less than 2 kVA: A minimum of 2-1/2 inches
2. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches.
3. Electrical Equipment Rating More than 5 kVA: A minimum of 12 inches

D. Separation between communications cables in grounded metallic raceways and power lines and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:

1. Electrical Equipment Rating Less than 2 kVA: No requirement
2. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches.
3. Electrical Equipment Rating More than 5 kVA: A minimum of 6 inches

E. Separation between Communications Cables and Electrical Motors and Transformers, 5 kVA or higher: A minimum of 48 inches.

F. Separation between Communications Cables and Fluorescent Fixtures: A minimum of 5 inches.

3.3 SLEEVE INSTALLATION FOR COMMUNICATION PENETRATIONS

A. Communications penetrations occur when pathways, cables, wireways, or cable trays penetrate concrete slabs, concrete or masonry walls, or fire-rated floor and wall assemblies.

B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.

C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.

D. Each pipe sleeve, horizontal or vertical, shall have a plastic type "end-bushing" on both ends to protect cables from abrasion when pulled through sleeves. The "end-bushing" shall be installed prior to install cables through sleeve.

E. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.

F. Cut sleeves to length for mounting flush with both surfaces of walls with respect to plastic "end-bushings". The plastic "end-bushing" shall be plenum rated if applied in plenum space.

G. Extend sleeves installed in floors 2 inches above finished floor level with respect to plastic “end-bushings”. The plastic “end-bushing” shall be plenum rated if applied in plenum space.

H. Size pipe sleeves to provide ¼” annular clear space between sleeve and pathway or cable, unless indicated otherwise.

I. Seal space outside of sleeves with grout for penetrations of concrete and masonry. Promptly pack grout solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect grout while curing.

J. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and pathway or cable, using joint sealant appropriate for size, depth, and location of joint.

K. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pathway and cable penetrations. Install sleeves and seal pathway and cable penetration sleeves with firestop materials. Comply with requirements in Division 07 Section “Penetration Firestopping.”

L. Roof-Penetration Sleeves: Weather seal penetration of individual pathways and cables with flexible boot-type flashing units applied in coordination with roofing work.

3.4 SLEEVE-SEAL INSTALLATION

A. Install to seal exterior wall penetrations.

B. Use type and number of sealing elements recommended by manufacturer for pathway or cable material and size. Position pathway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pathway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

C. Provide sleeves for new conduit and cable penetrations of building construction.

1. Openings to accept sleeves in new building construction will be formed in building construction by the Contractor for General Construction work. Openings to accept sleeves in existing building construction shall be provided under this division of the Specifications. Refer to Article, CUTTING AND PATCHING in this Section.

2. Use galvanized rigid conduit sleeves for penetrations through exterior masonry/concrete walls and foundations, concrete floor slabs on grade and above grade, and concrete-filled decks.

3. Use only fire-rated listed assemblies for the type of sleeve being installed through CMU walls or gypsum walls for communications penetrations. Sleeve type shall be galvanized rigid conduit.

D. Where conduits are installed before building construction being penetrated, install sleeves loose around conduits. Split, fit, and weld steel sleeves over existing conduits, with respect to anything flammable in the surrounding environment.

E. Secure sleeves firmly in place using filling and patching materials (grout) that match with surrounding construction.

F. In floor penetrations, extend sleeve 4” above finished floor unless noted otherwise. In wall penetrations, cut sleeves flush with wall surface and use metal escutcheon plates in finished interior areas.

G. Seal voids between sleeves and building construction with joint sealants. Make allowances for and coordinate the Work with installation of firestopping, conduit insulation, and waterproofing as applicable.

H. The Contractor shall be fully responsible for final and correct location of sleeves. Sleeves which are omitted or incorrectly located in existing building construction, shall be corrected and provided by the Communications Contractor, at no additional costs to the Owner.

3.5 PENETRATION OF BUILDING SERVICES

A. Above Grade Level or Non-waterproof Areas

1. Seal each annular space between conduits or cable and building surfaces. Pack space with Oakum, other rope packing, or backer rod materials and cover with fire-resistant sealant or other protection materials.

2. Provide sleeves as specified in Article, SLEEVE-SEAL INSTALLATION in this Section for conduit and cable penetrations. Seal each space between conduit or cable and sleeve. Sealing shall be as specified in above paragraph.

B. Waterproof Areas (Above and Below Grade)

1. In new and existing construction for penetration through concrete below grade, ground water level, or in other waterproof areas, provide through-wall and floor seals having galvanized fittings, sealing assemblies, and sleeves as specified.

2. In existing construction when core bore drilled openings are used for conduit penetrations below grade, ground water level, or in other waterproof areas, provide sealing.

C. Fire-resistant Areas

1. Provide through-penetration firestop systems for penetrations through fire-rated walls, floors, and other partitions of building construction. Comply with requirements in Division 07 Section “Penetration Firestopping.”

2. In walls or partitions with 2-hour or less fire ratings, provide only metallic outlet or device boxes installed per UL Fire Resistance Director, NEC, and other national building code requirements.

3.6 CUTTING AND PATCHING

A. Provide openings, cutting, coring, and patching of openings in existing building construction as required. Patching includes openings and voids left in existing construction as a result of demolition.

B. The Work shall include necessary assemblies and materials to maintain required fire ratings.

C. Perform cutting as to not impair structural stability of building construction and system. Do not drill holes or weld attachments to beams and other structural members without prior written approval from the Owner’s Representative. Contact the Engineer-of-Record for guidance.

D. The Work shall be done by a craftsperson skilled in the particular trades affected.

E. Patching materials shall match existing materials in type and quality. Patching shall be done in a manner to match appearance of adjacent surfaces.

3.7 RETROFIT-CUTOVER

A. Furnish equipment, materials, labor and services, and perform operations required to retrofit/cutover existing cabling systems. Removals shown are general indications and may not indicate full extent of removals which may be required to complete Work.

B. Furnish equipment, materials, labor and services, and performing operations required to enable continued functioning of existing system until cutover to new system.

C. Remove wiring, punch blocks, cabinets, outlets, raceways, and equipment not required for new system.

1. Abandon flush mounted device and junction boxes and cover with blank plate to match the current room décor.

2. Remove surface telecommunications outlets and pathways unless said removal will damage the existing finish on surfaces, or physically damage the structure.

3. Remove wiring from abandoned conduits and raceways from the work area outlet back to the corresponding termination point in the Telecommunication Room. Place a trailer string in vacated conduits and raceways.

4. Remove labeling at both ends for abandoned cables/wiring.

5. The collected abandoned cables/wiring shall be collected and removed from site by Contractor.

D. Perform the work in neat and workmanlike manner in accordance with the applicable codes, standards and AHJ.

E. Removal and replacement of existing ceilings:

1. Carefully remove existing ceilings as required to perform the work. Store removed tiles in an area designated by the Owner. Modify and augment existing suspension systems as necessary. Restore ceiling systems to their original finish.

2. Repair any damage to ceilings due to modifications, removal, and replacement of same. Replace damaged ceiling tiles, including tiles with holes or openings left as a result of demolition, with materials of like kind.

F. Existing equipment or material shall not be reused without specific approval of the Owner's Representative except as noted below:

1. Existing cable terminal housings may be reused if in good condition.

G. Equipment and materials to be removed and not desired by the Owner shall be removed from site promptly.

H. Equipment and material to be removed and that is desired by the Owner shall be moved to an on-site storage location as directed by the Owner.

3.8 FIRESTOPPING

A. Performance Requirements

1. Fire rated pathway devices shall be the preferred product and shall be installed in all locations where frequent cable moves, add-ons and changes will occur.

2. Where non-mechanical products are utilized, provide products that upon curing do no re-emulsify, dissolve, leach, breakdown or otherwise deteriorate over time from exposure to atmospheric moisture, sweating pipes, ponding water or other forms of moisture characteristic during or after construction.

3. Where it is not practical to use a mechanical device, openings within floors and walls designed to accommodate telecommunications and data cabling shall be provided with re-enterable products that do not cure or dry.

4. Openings for cable trays shall be sealed using re-enterable firestopping pillows.

B. Quality Assurance

1. Product/Systems: Provide firestopping systems that comply with the following requirements:

a. Firestopping tests are performed by a qualified, testing and inspection agency. A qualified testing and inspection agency is UL, or another agency performing testing and follow-up inspection services for firestop system acceptable to authorities having jurisdiction.

b. Firestopping products bear the classification marking of qualified testing and inspection agency.

c. Installer Qualifications: Experience in performing work of this section who is qualified by the firestopping manufacturer as having been provided the necessary training to install firestop products in accordance with specified requirements.

C. Project Conditions

1. Do not install firestopping products when ambient or substrate temperatures are outside limitations recommended by manufacturer.
2. Do not install firestopping products when substrates are wet due to rain, frost, condensation, or other causes.
3. Maintain minimum temperature before, during and for a minimum three (3) days after installation of materials.
4. Do not use materials that contain flammable solvents.
5. Coordinate construction of openings and penetrating items to ensure that through-penetration firestop systems are installed according to specified requirements.
6. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate through-penetration firestop systems.
7. Schedule installation of firestopping after completion of penetrating item installation but prior to covering or concealing of openings.

END OF SECTION

SECTION 27 05 53

IDENTIFICATION FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 SCOPE

A. Perform all Work required to provide and install the following systems identification indicated by the Contract Documents with supplementary items necessary for proper installation.

B. The contractor shall develop and submit for approval a labeling system for the structure cabling installation. The Owner will negotiate an appropriate labeling scheme with the successful contractor. At a minimum, the labeling system shall clearly identify all components of the structured cabling system: racks, cables, panels and outlets. The labeling system shall designate the cables origin and destination and a unique identifier for the cable within the system. Racks and patch panels shall be labeled to identify the location within the structured cable system infrastructure. All labeling information shall be recorded on the as-built drawings and all test documents shall reflect the appropriate labeling scheme.

1.2 REFERENCES

A. Several industry standards define the identification of the network physical infrastructure. All materials, installation and workmanship shall comply with the applicable requirements and standards addressed within the following references:

1. TIA-942 Telecommunications Infrastructure Standard for Data Centers
2. TIA/EIA-606B Administration Standard for Telecommunication Infrastructure
3. NFPA 70E-2004 Standard for Electrical Safety in the Workplace

B. All materials, installation and workmanship shall comply with the applicable requirements and standards addressed within the following references:

1.3 SUBMITTALS

A. Product Data: The Contractor shall submit catalog cut-sheets that include manufacturer, trade name, and complete model number for each product specified. Model number shall be handwritten and/or highlighted to indicate exact selection. Identify applicable specification section reference for each product.

B. Qualification Data: For firms and person specified in “Quality Assurance” Article.

1.4 QUALITY ASSURANCE

A. Provided products shall meet the following requirements: Items of the same classification shall be identical. This requirement includes equipment, assemblies, parts and components.

B. Assure that the “as installed” system is correctly and completely documented including engineered drawings, manuals, and operational procedures in such a manner as to support maintenance and future expansion of the system.

C. Materials and equipment: Equipment shall be rated for continuous operation under the ambient environmental temperature, humidity, and vibration conditions encountered at the installed location. The equipment shall meet the following requirements:

1. Interior controlled environment: 60 to 100 degrees F dry bulb and 20 to 90 percent relative humidity, non-condensing.
2. Interior uncontrolled environment: 0 to 130 degrees F dry bulb and 10 to 95 percent relative humidity, non-condensing.
3. Exterior environments: Minus 30 degrees to 130 degrees F dry bulb, and 10 to 100 percent relative humidity, condensing.

4. Hazardous environment: All system components located in areas where fire or explosion hazards may exist because of flammable gas or vapors, flammable liquids, combustible dust, or ignitable fibers or flyings, shall be rated and installed according to Chapter 5 of the NEC and as shown.

5. Listing and Labeling: Provide products specified in this Section that are listed and labeled, as defined in the NEC Article 100.

PART 2 - PRODUCTS

2.1 EQUIPMENT TYPE

A. All label printing will be machine generated by Panduit Easy-Mark labeling software and Panduit desktop and hand-held printers using indelible thermal transfer ribbons or cartridges. Panduit self-laminating labels or Turn-Tell™ labels will be used on cable jackets, appropriately sized to the OD of the cable, and placed within view at the termination point on each end. Outlet, patch panel and wiring block labels shall be installed on, or in, the space provided on the device.

1. Computer Printable Labels

   a. Machine generated labels provide clear communication. Labels are designed for specific data center infrastructure applications insuring a proper fit and long life.

   b. Data cables shall be identified with self-laminated cable markers that can be rotated for visibility from any angle, and allow repositioning on the cable to align legends for improved aesthetics (Turn-Tell Labels).

   c. Cabinets and equipment shall be identified with thermal transfer printed, die-cut, microcellular foam with a polyester printable surface and high-tack adhesive (Raised Panel Labels).

   d. Fiber Optic cables shall be identified with non-adhesive, thermal transfer printable, flag style markers that permit the repositioning of the marker for greater visibility and improved aesthetics (Flag Labels).

   e. Cable bundle shall be identified with non-adhesive thermal transfer printable marker plates attached with nylon cable ties or hook and loop ties. Marker plates shall offer crisp, clear legends and shall meet requirements for MIL-STD-202G, Notice 12 Method 215J (Thermal Transfer Printable Marker Plates).

2. Easy-Mark Labeling Software

   a. The Labeling Software insures that data center infrastructure identifiers conform to applicable Standards.

   b. Labels and identifiers shall be produced with labeling software that guides the user through the process of creating labels used throughout the data center providing faster and more reliable infrastructure identification (Easy-Mark Labeling Software).

   c. Labels and identifiers shall be produced with labeling software that facilitates quick and easy extraction of identifiers from CAD drawings saving time and reducing errors caused by manual entry of data into labeling software (CAD-Connect Labeling Software)

3. LS8EQ Portable Printing System

   a. The LS8EQ printer produces durable, clear identification labels on site.

   b. Labels and identifiers shall be printed on hand-held thermal transfer printer increasing labeling productivity. Printer labels shall be contained in fast loading label cassette containing an integrated memory device for automatic formatting,

recall of last legend and number of labels remaining on the cassette. The printer shall provide a partial cut feature to allow the flexibility of tear-apart strips of labels for quicker installation.

c. Labels and identifiers shall be printed on a compact and rugged portable thermal transfer printer that fits in one hand. The printer shall have a large, backlit display, QWERTY keyboard, USB interface for importing data and printing labels from a wireless laptop or desktop computer. Printer shall simplify the creation of labels for network components through built-in data center labeling tools. Printer labels shall be contained in fast loading label cassette containing an integrated memory device for automatic formatting, recall of last legend and number of labels remaining on the cassette. The printer shall provide a partial cut feature to allow the flexibility of tear-apart strips of labels for quicker installation (LS8EQ).

4. Physical Network Security Devices
   a. Physical Network Security devices insure that network connection points are protected from unauthorized or unintended access or disconnection.
   b. RJ45 Plug Lock In Device
   c. RJ45 Plug Block-out Device
   d. SC Connector Block-out Device
   e. LC Connector Lock In Device
   f. LC Connector Block-out Device
5. Facility Safety Signs
   a. Provide clear, concise communication of facility hazards and infrastructure mechanical systems.
   b. Snap-on Pipe Markers
6. Electrical Safety Signs
   a. Clearly define electrical hazards and power paths.
   b. Arc Flash Warning Signs

2.2 ACCEPTABLE MANUFACTURERS

A. Panduit (Basis of Design)

PART 3 - EXECUTION

3.1 INSTALLATION

A. TIA/EIA-606-B: Four (4) classes of administration are specified in the standard, to accommodate diverse degrees of complexity present in the telecommunications infrastructure. The specifications for each class include requirements for identifiers, records, and labeling.

1. Class 1: Address the administration needs of a premises that is served by a single telecommunications space (TS) containing its telecommunications equipment. Required in Class 1 administration are identifiers for the TS, cabinets or racks, patch panels and termination blocks, ports or termination block positions, patch cables, cabling subsystem 1 links or horizontal links, equipment and workspace outlets, consolidation points, zone enclosures, splices, and all telecommunications grounding and bonding systems.

B. Telecommunication Space Labeling

1. Each TS should be identified with a scheme that defines the location of the space. The location should be defined with the floor and room number or other room designation. A typical telecommunication space would have the following scheme: 1DC2. This identifier

would defined that this is DATA CENTER 2 LOCATED ON THE FIRST FLOOR OF THE BUILDING.

C. Component Locations in the Telecommunications Space

1. Locations for components in the TS can be determined either by using the grid coordinates for the space or assigning unique numbers to the various cabinet and wall segments in the space.

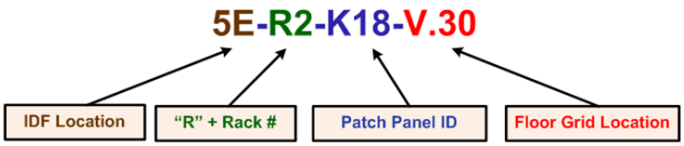
D. Grid Labeling

1. Component locations in a TS are determined using an X-Y coordinate system that is usually based on the floor tile system in the data center space. Using alphabetic designations on one axis of the room and numerical designations on the other axis of the room create a series of alphanumeric designations that can be established for each floor tile in a data center space. These floor tile designations are the basis for determining the location of data center devices.

E. Workstation Labeling

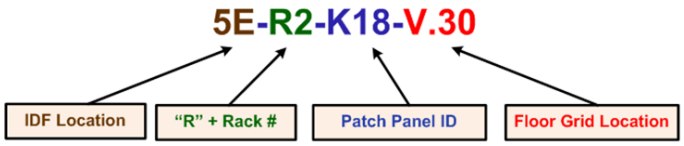
1. The labeling of the data outlets should correspond with the label on the patch panel in the IDF/MDF room. The label format should follow this structure:

2. Every jack module must be labeled according to this standard. The letters “I” and “O” are skipped to avoid confusion with the numbers “1” and “0” respectively.



F. Labeling

1. The labeling of the horizontal cabling should correspond with the label on the outlet and the patch panel. This horizontal link identifier, unique within the building, shall be used



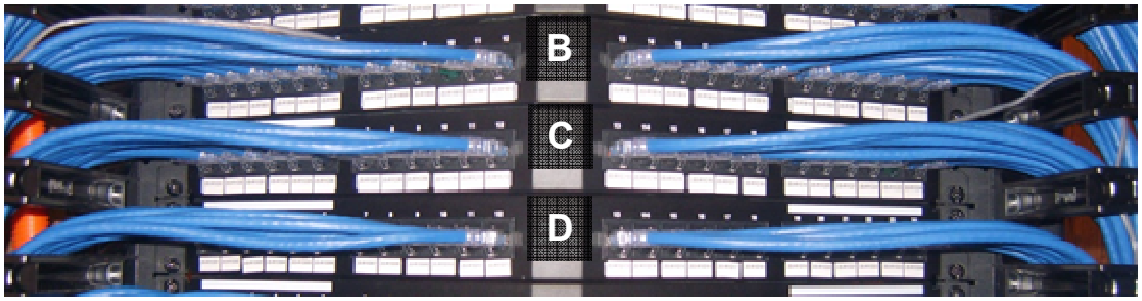
for every horizontal cable. Follow the below labeling format:

Note: The letters “I” and “O” are skipped to avoid confusion with the numbers “1” and “0” respectively.

G. Patch Panel Type and Labeling

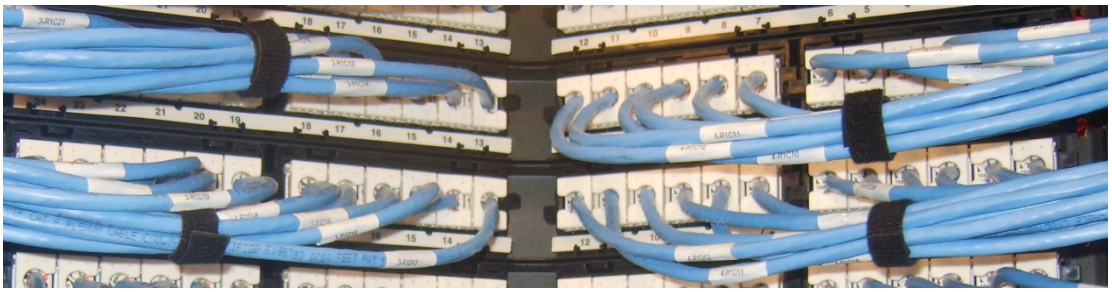
1. Nationwide requires the use of 24-port angled modular patch panels as specified in Appendix C. The patch panels should be labeled from top to bottom with the letters: A, B, C, D, E, F,G, H, J, K, L, M, N, P, Q, R (notice: the letters “I” and “O” are skipped to avoid confusion with the numbers “1” and “0” respectively).
2. The label on each patch panel port should match the label on telecommunications outlet.\
3. There should not be any spaces in the rack between the patch panels.
4. The label underneath each patch panel port should include floor identifier and the workstation grid coordinates. Above each port is the manufacturer’s pre-printed port number which matches the cable label on the back of the port as well as the label at the cube location (section 2.4).

Patch Panel Front View



The horizontal cables should be labeled on the backside of the patch panel so that the label on the cable matches the label on the front of the patch panel.

Patch Panel Rear View

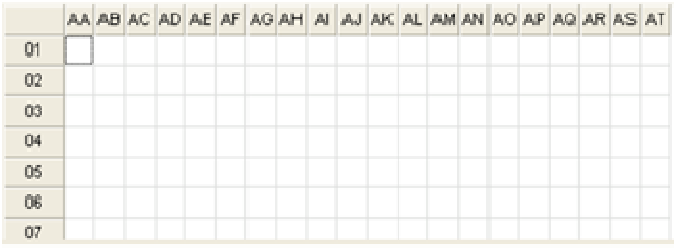


Patch Panel Rear View (Close Up)



3.2 Network Switches

A. Nationwide's current standard for access layer switches is either Cisco's 6-slot 6506-E or 9-slot 6509-E switch, depending on the number of telecommunications outlets terminated to the TR/ER. The 6506-E chassis can support a maximum of 240 telecommunications outlets (5*48) while the 6509-E chassis can support a maximum of 384 (8*48). Also, it may be sometimes necessary to provision 2 network switches to provide the required port density for a new facility. The following chart provides a guide for switch type and quantity selection.



1. Grid Label Recommendations

Printer Type	**Laser/Inkjet**
Label P/N	C850X1100YJJ

B. Cabinet/Rack Labeling

1. The floor tile designations are used to identify each cabinet or rack in the data center. The cabinet/rack location is based on which floor tile the right front corner of the cabinet/rack rests upon. Cabinets and racks should have location labels applied to the top and bottom of both the front and rear of the device. These labels should be visible whether or not doors are closed or opened on the cabinets.
2. A typical cabinet/rack label would have the following scheme: AB04. This identifier would define that the cabinet/rack is located with its RIGHT FRONT CORNER AT THE INTERSECTION OF ROW AB AND COLUMN 04.
3. Cable/Rack Label Recommendation:

Printer Type	**Laser/Inkjet**	**LS8E**	**Desktop Thermal**
Label Area	2.00 x 1.00	2.00 x 1.00	2.00 x 1.00
Label P/N	C200X100YJJ	C200X100YPC	C200X100YPT

			C200X100APT C200X100AMT

C. Panel Labeling

1. Once the cabinet/rack identifiers are established then the various panels in the cabinet/rack should be identified. The designation for the panel positions in a cabinet/rack can be either an alphabetic designation or a two-digit number that represent the rack unit number (RU) where the top-left mounting screw lands in the cabinet/rack. Using the RU method provides the data center manager with greater flexibility since it allows for panels and equipment to be added or removed later and not disrupt the designation of panel identifiers.



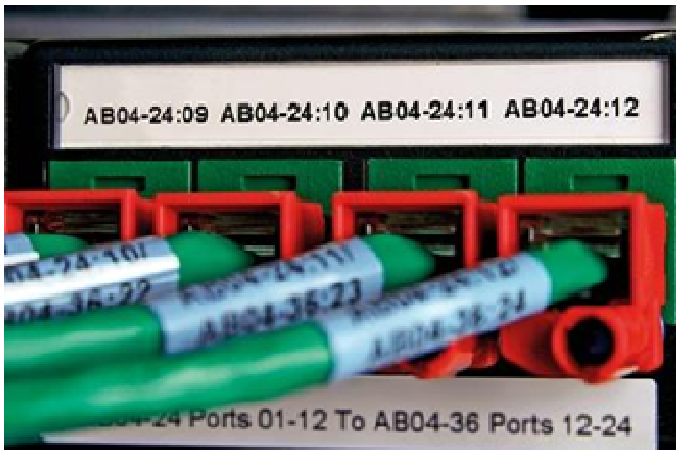
2. A typical panel label would have the following scheme: AB04-24. This identifier would define that the top left mounting screw of the panel is located at the 24th rack unit position in the cabinet/rack located grid AB04 in the data center.

3. Panel Label Recommendation:

Printer Type	Laser/Inkjet	LS8E	Desktop Thermal
Label P/N	C100X050YJJ	C100X050YPC	C100X050APT C100X050A0T

D. Port Labeling

1. Port identifiers are very important in that they will define the connectivity of cabling within the data center infrastructure. Many patch panels come from the factory with numbers already screen-printed above the ports. If this is the case then there is no need to re-label those patch panels. If the patch panels are not pre-printed with port numbers then labels will need to be created to identify the port numbers. The numbering sequence should proceed from left to right and top to bottom for all ports on a patch panel. The number of digits used for all numbers on a patch panel should be consistent with the total number of ports on that patch panel. For example a 48-port patch panel should be labeled 01 through 48 and a 144-port patch panel should be labeled 001 through 144.



2. A typical port label would have the following scheme: AB04-24:12. This identifier can be decoded to define that this port 12 located on panel 24 in cabinet/rack AB04. This is somewhat redundant information given that the cabinet/rack and panel are clearly identified and are not usually required information on the port label since the cabinet/rack and panel are apparent to the viewer who is standing at the location of the port. Therefore, a typical port label would have the following scheme: 12. This identifier defines that this is port 12.
3. Port Label Recommendations:

Printer Type	**Laser/Inkjet**				
Cable Type	Copper	Copper	Copper	Copper	Fiber
Label Style	Adhesive	Adhesive	Non-Adhesive	Non-Adhesive	Adhesive
Number of Ports	4	6	4	6	n/a
Label P/N	C261X030FJJ	C379X030FJJ	C261X035Y1J	C390X030Y1J	C350X100YJJ

Printer Type	**LS8E**				
Cable Type	Copper	Copper	Copper	Copper	Fiber
Label Style	Adhesive	Adhesive	Non-Adhesive	Non-Adhesive	Adhesive
Number of Ports	4	6	4	6	n/a
Label P/N	C252X030FJC	C379X030FJC	C261X035Y1C	C390X030Y1C	T100X000YPC-BK

Printer Type	**Desktop Thermal**		
Cable Type	Copper	Copper	Fiber
Label Style	Adhesive	Adhesive	Adhesive

Label P/N	C252X030YPT C252X030APT	C379X030YPT C379X030APT	C350X100YJT

E. Cable Labeling and Patch Cord Labeling

1. Cabling on the back and front of the cabinet/rack must be identified. Labeling of cables on the back of the panel is considered cable labeling and the labeling of cables connected to the front of the patch is considered patch cord/equipment cord labeling.
2. Cable labels are identified with information that defines the connection between the near end panel connection and the far end panel connection. A near end connection identifier would consist of the cabinet/rack location, panel location, and port location. The far end connection identifier would consist of the cabinet/rack location, panel location and port location.



a. A typical cable label would have information in the following scheme: AB04-24:01/AB07-36:13. This identifier would be decoded to define the cable connects between cabinet AB04 panel 24 port 01 going to cabinet AB07 panel 36 port 13. The far end of the cable would have a label that would have the same but with the information reversed.

b. Recommended Cable Labels:

Printer Type	**Laser/Inkjet**	**Laser/Inkjet**	**Laser/Inkjet**	**Laser/Inkjet**	**Laser/Inkjet**
Cable Type	Copper	Copper	Fiber	Fiber	Fiber
Cable Diameter	Cat5/5e/6	10G UTP/STP	2mm/3mm	Duplex 3mm	Dia (0.24” to 0.48”)
Marker Type	Self-Laminating	Self-Laminating	Flag	Flag	Self-Laminating
Label P/N	S100X150YAJ	S100X225YAJ	F102X220FJJ	F102X220FJJ	S100X225YAJ

Printer Type	**LS8**	**LS8**	**LS8**	**LS8**	**LS8**

Cable Type	Copper	Copper	Fiber	Fiber	Fiber
Cable Diameter	Cat5/5e/6	10G UTP/STP	2mm/3mm	Duplex 3mm	Dia (0.24" to 0.48")
Marker Type	Self-Laminating	Self-Laminating	Self-Laminating for Label-Core	Self-Laminating for Label-Core	Self-Laminating
Label P/N	S100X150VAC R100X150V1C	S100X225VAC R100X150V1C	S100X160VAC	S100X220VAC	S100X225VAC

Printer Type	Desktop Thermal	Desktop Thermal	Desktop Thermal
Cable Type	Copper	Copper	Fiber
Cable Diameter	Cat5/5e/6	10G UTP/STP	Dia (0.24" to 0.48")
Marker Type	Self-Laminating	Self-Laminating	Self-Laminating
Label P/N	S100X150VAT R100X150V1T	S100X225VAT R100X225V1T	S100X225VAT R100X225V1T

3. Patch Cord/Equipment Cord Labels are identified with information that defines the connection between the near end patch panel front connections and the far end patch panel front connections or equipment connections. A near end connection identifier would consist of the cabinet/rack location, panel location, and port location. The far end connection identifier would consist of the cabinet/rack location, panel location, and port location.



   a. A typical patch cord label would have information in the following scheme: AB04-24:12\AB04-36:24. This identifier would be decoded to define the patch cord connection between cabinet AB04 panel 24 port 12 going to the same cabinet panel 36 port 24. The far end of the cable would have a label that would have the same but with the information reversed.

   b. A typical equipment cord label would have information in the following scheme: AB04-24:01\AB04-Tinley2:A. This identifier would be decoded to define the equipment cord connection between cabinet AB 04 panel 24 port 01 going to the same cabinet port A on equipment named Tinley2. Rack unit location could be substituted for equipment name if necessary.

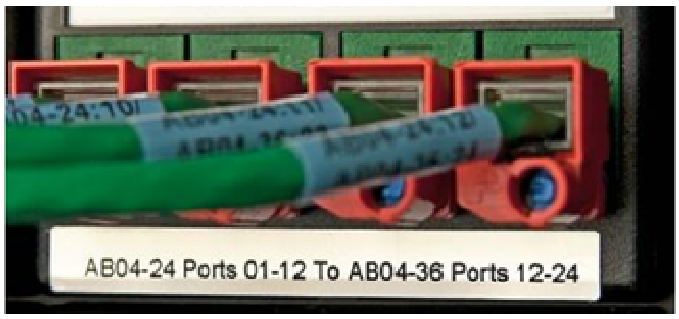
   c. Recommended Patch/Equipment Cord Labels:

Printer Type	Laser/Inkjet	Laser/Inkjet	Laser/Inkjet	Laser/Inkjet	Laser/Inkjet
Cable Type	Copper	Copper	Fiber	Fiber	Fiber
Cable Diameter	Cat5/5e/6	10G UTP/STP	2mm/3mm	Duplex 3mm	Dia (0.24" to 0.48")
Marker Type	Self-Laminating	Self-Laminating	Flag	Flag	Self-Laminating
Label P/N	S100X150YAJ	S100X225YAJ	F102X220FJJ	F102X220FJJ	S100X225YAJ

Printer Type	LS8	LS8	LS8	LS8	LS8
Cable Type	Copper	Copper	Fiber	Fiber	Fiber
Cable Diameter	Cat5/5e/6	10G UTP/STP	2mm/3mm	Duplex 3mm	Dia (0.24" to 0.48")
Marker Type	Self-Laminating	Self-Laminating	Self-Laminating for Label-Core	Self-Laminating for Label-Core	Self-Laminating
Label P/N	S100X150VAC R100X150V1C	S100X225VAC R100X150V1C	S100X160VAC	S100X220VAC	S100X225VAC

Printer Type	Desktop Thermal	Desktop Thermal	Desktop Thermal
Cable Type	Copper	Copper	Copper
Cable Diameter	Cat5/5e/6	10G UTP/STP	Dia (0.24" to 0.48")
Marker Type	Self-Laminating	Self-Laminating	Self-Laminating
Label P/N	S100X150VAT R100X150V1T	S100X225VAT R100X225V1T	S100X225VAT R100X225V1T

4. Patch Panel Connectivity defines the connections between the near-end ports and the far-end ports. This labeling can define the connection of a range of ports on a panel or just define the connection for two (2) individual ports.



a. A typical patch panel connectivity label would have the following scheme: AB04-24: ports 01-12/AB04-36: ports 12-24. This identifier would describe that ports 01

through 12 on panel 24 of cabinet AB04 connect to ports 12 through 24 on panel 36 of cabinet AB04.

b. Recommended Patch Panel Connectivity Labels:

Printer Type	Laser/Inkjet		
Media	Copper	Copper	Fiber
Ports	4 or less	More than 4	n/a
Label P/N	C252X030FJJ	C379X030FJJ	C350X100YJJ

Printer Type	LS8		
Media	Copper	Copper	Fiber
Ports	4 or less	More than 4	n/a
Label P/N	C252X030FJC	C379X030FJC	T100X000VJC-BK

Printer Type	Desktop Thermal		
Media	Copper	Copper	Fiber
Ports	4 or less	More than 4	n/a
Label P/N	C252X030YPT	C379X030YPT	C350X100YJT

F. Labeling for Other Systems

1. In addition to the data connections there are many other systems in a data center that require labeling.

3.3 GROUNDING AND BONDING

A. Labeling of the grounding and bonding system involves the identification of the main grounding busbar, grounding busbars, conductors connecting busbars, conductors connecting devices to busbars, and equalizing conductors.

1. The typical scheme for the main grounding busbar would be: 1-B301-TMGB. This identifier can be decoded to define that this is the main telecommunications grounding busbar located on Floor 1 in Space B301.

2. The typical scheme for a grounding busbar would be: 2-R201-TGB. This identifier can be decoded to define that this is the telecommunications grounding busbar on Floor 2 in Space R201.

a. Recommended Telecommunications Grounding Busbar Labels

Printer Type	Laser/Inkjet	LS8	Desktop Thermal
Label P/N	C400X200YJJ	C200X100YPC	C400X200YPT

3. The typical scheme for the busbar connections would be: 1-B301-TMGB/2-R201-TGB. This identifier can be decoded to define that this is the conductor that connects the main telecommunications grounding busbar located on Floor 1 in Space B301 to the telecommunications grounding busbar on Floor 2 in Space R201.

a. Recommended Busbar Connections Labels

Printer Type	Laser/Inkjet				
Cable Diameter	18-14 AWG	12-10 AWG	8-4 AWG	2-1 AWG	1/0-250 MCM

Marker Type	Self-Laminating	Self-Laminating	Self-Laminating	Self-Laminating	Self-Laminating
Label P/N	S100X075YAJ	S100X125YAJ	S100X225YAJ	S100X400YAJ	S100X650YAJ

Printer Type	**LS8**				
Cable Diameter	18-14 AWG	12-10 AWG	8-4 AWG	2-1 AWG	1/0-250 MCM
Marker Type	Self-Laminating	Self-Laminating	Self-Laminating	Self-Laminating	Self-Laminating
Label P/N	S100X075VAC	S100X125VAC	S100X225VAC	S100X400VAC	S100X650VAC

Printer Type	**Desktop Thermal**				
Cable Diameter	18-14 AWG	12-10 AWG	8-4 AWG	2-1 AWG	1/0-250 MCM
Marker Type	Self-Laminating	Self-Laminating	Self-Laminating	Self-Laminating	Self-Laminating
Label P/N	S100X075VAT	S100X125VAT	S100X225VAT	S100X400VAT	S100X650VAT

END OF SECTION

SECTION 27 08 00

WARRANTY OF STRUCTURED CABLING

PART 1 - GENERAL

1.1 SCOPE

A. Perform all Work required to provide and install the Structured Cabling indicated by the Contract Documents with supplementary items necessary for proper installation and guarantee of warranty.

1.2 SUBMITTALS

A. Product Data

1.3 QUALITY ASSURANCE

A. Manufacturer's Warranty and Application Assurance

1. The Structured Connectivity Solutions Extended Manufacturer's Warranty and Application Assurance

   a. The extended manufacturer's warranty, for a minimum of 20 years from the date of occupancy, shall include providing replacement or repair of defective product(s) and labor for the replacement or repair of such defective product(s) for the period indicated above.

   b. Minimum twenty (20) year application assurance: The application assurance shall cover the failure of the wiring system to support the application which it has designed to support, as well as additional application(s) introduced in the future for a minimum twenty (20) year period.

   c. System certification: Upon successful completion of the installation and subsequent inspection, the Owner shall be provided with a numbered certificate, from the manufacturer(s), registering the installation.

2. Application Assurance

   a. The Application Assurance covers the Registered Manufacturer SCS compliant to support operations of the application(s) that the system was designed to support, as well as additional application(s) that the system was designed to support, as well as additional application(s) defined below. Manufacturer Solutions warrants that the Registered Manufacturer SCS will be free from defects that prevent operation of the specific application(s) for which the Registered Manufacturer SCS was initially designed as long as the design is in compliance with the Manufacturer SCS Performance Specifications for said applications and is in compliance with all other terms and conditions of this warranty.

   b. The Application Assurance also covers the following additional applications:

      1) Those as specified in the current (at the time of installation) Manufacturer SCS Performance Specifications and Addendums; and

      2) In accordance with application standards specifications, any application introduced in the future by recognized standards or user forums that use the relevant TIA 568-C series or ISO/IEC 11801 components and link/channel specifications for cabling, to the extent that such applications are defined to operate over the guaranteed channel performance and/or the installed channel topologies.

3. Term of Warranty

   a. The warranty period will be for a minimum of Twenty (20) years from the date of occupancy.

   b. Moves, additions or changes are covered by the original registration certificate if performed by a Manufacturer Business Partner in compliance with the Manufacturer SCS design, installation and registration requirements.

   c. Administration of Manufacturer SCS cords by the end user is covered by the original registration certificate.

4. Person / Entity Covered

   a. This warranty is for the sole benefit of the person or entity to whom the Manufacturer Solution's registration certificate is issued and any successor in interest to the site in which such Registered Manufacturer SCS was originally installed.

B. Testing and Inspection of Communications Equipment

1. Provide tests specified below, when applicable, and as indicated under individual items of material, equipment, and work specified in this Specification.

   a. Furnish all test equipment and instruments required for the tests.

   b. Responsible, qualified employees of the contractor in the presence of the Owner or an authorized representative shall perform the cable testing.

   c. All individuals involved in the testing phase of the project shall not have been involved in the installation phase nor shall have immediate knowledge of the installation task.

2. End to end performance of all parts and channels will be tested.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 27 08 20

ACCEPTANCE OF COMMUNICATIONS COPPER CABLING

PART 1 - GENERAL

1.1 SCOPE

A. Perform all Work required to provide and install the required remote control and signal cabling indicated by the Contract Documents with supplementary items necessary for proper installation.

1.2 REFERENCES

A. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.

B. All materials, installation and workmanship shall comply with the applicable requirements and standards addressed within the following references.

C. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

D. Specifications throughout all Divisions of the Project Manual are directly applicable to this Section, and this Section is directly applicable to them. See Section 207513.

1.3 SUBMITTALS

A. See Section 270513

B. A schedule (list) of all copper cables to be tested.

C. Sample test reports

D. Copy of latest calibration report of used test equipment.

1.4 QUALITY ASSURANCE

A. Trained technicians who have successfully attended an appropriate training program and have obtained a certificate as proof thereof shall execute the tests. Appropriate training programs include but are not limited to installation certification programs provided by BICSI or the ACP (Association of Cabling Professionals). These certificates may have been issued by any of the following organizations or an equivalent organizations:

1. Manufacturer of the copper cable and/or copper connectors.
2. Manufacturer of the test equipment used for the field certification.
3. Training organizations (e.g., BICSI, A Telecommunications Association headquarters in Tampa, Florida; ACP [Association of Cabling Professionals™] Cabling Business Institute located in Dallas, Texas)

B. The test equipment shall be within the calibration period recommended by the manufacturer in order to achieve the manufacturer-specified measurement accuracy.

C. The Owner or the Owner's representative shall be invited to witness and/or review field-testing.

D. The Owner or the Owner's representative shall be notified of the start date of the testing phase five (5) business days before testing commences.

E. The Owner or the Owner's representative will select a random sample of 10% of the installed links. The Owner or the Owner's representative shall test these randomly selected links and the results are to be stored in accordance with Part 3 of this document. The results obtained shall be compared to the data provided by the installation Contractor. If more than 2% of the sample results differ in terms of the pass/fail determination, the installation Contractor under supervision of the representative shall repeat 100% testing at no cost to the Owner.

PART 2 - PRODUCTS

2.1 GENERAL

A. All materials shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.

2.2 COPPER CERTIFICATION TESTERS

A. The field-test instrument shall be within the calibration period recommended by the manufacturer.

B. Test equipment (tester) for:

1. Category 6: Test equipment shall comply with the accuracy requirements for level III field testers as defined in the TIA Cat 6 Standard.

C. Acceptable Manufacturer

1. Fluke Networks
2. Or approved equal

PART 3 - EXECUTION

3.1 GENERAL

A. Every cabling link in the installation shall be tested for

1. Wire map
2. Length
3. Insertion Loss
4. NEXT Loss
5. PS NEXT Loss
6. ACR-F Loss
7. PS ACR-F Loss
8. Return Loss
9. Propagation Delay
10. Delay Skew

B. End-to-end cabling will be considered defective if it does not pass tests and inspections, based on Category 5E, 6 and CAT6A performance specifications chart below.

Category 6 Performance Specifications Chart	
Parameter	Category 6
Specified Frequency Range	250 MHz
Attenuation	19.8
NEXT	44.3 dB
Power-Sum NEXT	37.1 dB
ACR	18.6 dB
Power-Sum ACR	20.3 dB

ELFEXT	27 dB
Power-Sum ELFEXT	24.8 dB
Return Loss	20.1 dB
Propagation Delay	548 nsec
Delay Skew	50 nsec
Network 5 Supported	1000 Base-TX

C. Alien Crosstalk testing is not required. Please get confirmation hereof from the Owner before testing.

D. The installed twisted-pair horizontal links shall be tested from the Telecommunications Room to the wall outlet in the work area.

E. The test plug shall fall within the values specified in the applicable standard (CAT6) for NEXT Loss, FEXT Loss and Return Loss.

F. The tester interface adapters must be of high quality and the cable shall not show any twisting or kinking resulting from coiling and storing of the tester interface adapters. In order to deliver optimum accuracy, preference is given to a permanent link interface adapter for the tester than can be calibrated to extend the reference plane of the Return Loss measurement to the permanent link interface. The Contractor shall provide proof that the interface has been calibrated within the period recommended by the vendor. To ensure that normal handling on the job does not cause measurable Return Loss change, the adapter cord cable shall not be of twisted-pair construction.

G. A Pass or Fail result for each parameter is determined by comparing the measured values with the specified test limits for that parameter. The test result of a parameter shall be marked with an asterisk (*). When the result is closer to the test limit than the accuracy of the field tester. The field tester manufacturer must provide documentation as an aid to interpret results marked with asterisks. To which extent '*' results shall determine approval or disapproval of the element under test shall be defined in the relevant detail specification, or agreed on as a part of a contractual specification.

3.2 CERTIFYING COPPER CABLE

A. Category 6

1. All tests should be in accordance with the field test specifications defined in ANSI/TIA/EIA-568-B.2-1. "Addendum 1 – Transmission Performance Specifications for 4-pair 100 Ω Category 6 Cabling." This document will be referred to as the "Category 6 Standard."

2. The test parameters are defined in the Category 6 Standard. The test of each link shall contain all of the following parameters as detailed below. In order to pass the test, all measurements (at each frequency in the range from 1 MHz through 250 MHz) must meet or exceed the limit value determined in the above-mentioned standard.

3.3 ACCEPTANCE OF COPPER TEST RESULTS

A. One hundred percent of the installed cabling links must pass the requirements of the applicable standards. Any failing link must be diagnosed and corrected. The corrective action shall be followed with a new test to prove that the corrected link meets the performance requirements. The final and passing result of the tests for all links shall be provided in the final test results documentation, which shall be reviewed, approved and signed by the Contractors RCDD.

B. Acceptance of the test results shall be given in writing after the project is fully completed and tested in accordance with Contract Documents and to the satisfaction of the Owner.

3.4 ADMINISTRATION

A. Test results documentation

1. Test results saved within the field-test instrument shall be transferred into a FLW file so it can be uploaded to Fluke Networks LinkWare software that allows for the maintenance, inspection and archiving of the test records. These test records shall be uploaded to the PC unaltered, i.e., “as saved in the field-test instrument.”
2. The test results documentation shall be available for inspection by the Owner or the Owner’s representative during the installation period and shall be passed to the Owner’s representative within five (5) working days of completion of tests on cabling served by a telecommunications room or of backbone cabling. The installer shall retain a copy to aid preparation of as-built information.
3. The database for the complete project shall be stored and delivered on CD-ROM prior to Owner acceptance of the building. This CD-ROM shall include the software tools required to view, inspect, and print any selection of the test reports.
4. Circuit IDs reported by the test instrument should match the specified label ID.
5. The detailed test results documentation data is to be provided in an electronic database for each tested copper cable and shall contain the following information.
    a. The identification of the customer site as specified by the Owner.
    b. The name of the test limit selected to execute the stored test results.
    c. The name of the personnel performing the test.
    d. The date and time the test results were saved in the memory of the tester.
    e. The manufacturer, model and serial number of the field-test instrument.
    f. The version of the test software and the version of the test limit database held within the test instrument.
    g. The copper identification number.
    h. The length for each copper cable.
    i. The overall Pass/Fail evaluation of the copper link-under-test.

END OF SECTION

SECTION 27 15 00
COMMUNICATIONS HORIZONTAL CABLING

PART 1 - GENERAL

1.1 SCOPE

A. Perform all Work required to provide and install the required remote control and signal cabling indicated by the Contract Documents with supplementary items necessary for proper installation.

1.2 REFERENCES

A. See Section 270513.

B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

C. Specifications throughout all Divisions of the Project Manual are directly applicable to this Section, and this Section is directly applicable to them.

D. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.

E. All materials, installation and workmanship shall comply with the applicable requirements and standards addressed within the following references:

1.3 HORIZONTAL CABLING DESCRIPTION

A. Horizontal cable and its connecting hardware provide the means of transporting signals between the telecommunications outlet/connector and the horizontal cross-connect located in the Telecommunication Room or Equipment Room.

1. Horizontal cabling shall contain no transition point or consolidation point between the horizontal cross-connect and the telecommunications outlet/connector.

2. Bridged taps and splices shall not be installed in the horizontal cabling.

B. The maximum allowable horizontal cable length is 295 feet. This maximum allowable length does not include an allowance for the length of 16 feet to the workstation equipment. The maximum allowable length does not include an allowance for the length of 16 feet in the horizontal cross-connect.

PART 2 - PRODUCTS

2.1 MANUFACTURER HORIZONTAL CABLING

A. Manufacturers: Subject to compliance with requirements, provide telecommunication systems of one (1) of the following: System warranty shall be written through the connectivity manufacturer.

CAT 6 - END TO END SOLUTIONS

1. Panduit TX 6500 Enhanced System

2.2 UTP CABLE

A. Horizontal UTP Cable. Cable shall be label-verified. Cable jacket shall be factory marked at regular intervals indicating verifying organization and performance level. Cable shall blue. Conductors shall be four (4)-pair solid untinned copper 23 AWG. Cable shall be plenum rated CMP per NFPA 70.

2.3 UTP CABLE HARDWARE

A. Data Outlets. Wall outlet plates shall include modular eight (8)-position jacks, quantity as indicated on the Drawings. Modular jacks shall be non-keyed eight (8)-position jacks and the

color blue. A color-coded bezel or icon may be used to identify the modular jack. Modular jack pin/pair configuration shall be T568B. (Verify pin/pair configuration with Owner prior to installation.) Modular jacks shall be unkeyed. Faceplates shall be labeled face plates with recessed labeling field included to accept label card and clear plastic cover. Faceplate material and finish shall match faceplates for other wiring devices in the same room or space (See Division 26 Specification Section Wiring Devices for material and finish). Blank cover plates shall be added for unused openings on face plate.

1. Wall phone to be mounted at 42" A.F.F. Faceplate to consist of two (2) mounting post and stainless steel material.

B. In the communications rooms, horizontal voice and data cables will terminate on RJ45 Patch Panels for VoIP solution.

C. Rack mounted patch panels shall consist of non-keyed eight (8)-position modular jacks, modular connection system with modular jacks, arranged in rows or columns on 19-inch rack mounted panels. Patch panel shall be fully populated. Jack pin/pair configuration shall be T568B. (Verify pin/pair configuration with Owner prior to installation.) Jacks shall be unkeyed. Panels shall be provided with labeling space. Patch panels shall be 48 port. Modular patch panels shall incorporate cable support and or strain relief mechanisms to secure the horizontal cables at the termination block and to ensure that all manufacturers minimum bend radius specifications are adhered to. Provide quantity of patch panels required to accommodate the installed cable plant plus 20% spares.

D. Copper Patch Cords: Factory-made, four (4)-pair RJ-45 connectors on end of cables. These cables shall be used to cross-connect between the network electronics and the horizontal RJ-45 modular patch panel. Provide 100% for all assigned ports on the modular patch panel. Of these cords, provide 40% at 7' and 60% at 10' lengths; terminated with eight (8)-position modular RJ-45 connector at each end. Patch cords shall not be made-up in the field.

1. Patch cord shall have bend-relief-compliant boots and color-coded icons to ensure Category 6 performance. Patch cords shall have latch guards to protect against snagging.
2. Patch cords shall have color-coded boots for circuit identification.
3. Color and quantity: Color yellow for data and color blue for voice, one (1) for each modular jack in faceplate for project plus 20% spare.
4. Contractor to coordinate based on room layout and with Owner prior to ordering/installing patch cords.

E. Work Area Patch Cords: Factory-made, four (4)-pair cables in 10' lengths; terminated with eight (8)-position modular RJ-45 connector at each end. Patch cords shall not be made-up in the field.

1. Patch cords shall have bend-relief-compliant boots and color-coded icons to ensure Category 6 performance. Patch cords shall have latch guards to protect against snagging.
2. Patch cords shall have color-coded boots for circuit identification.
3. Contractor to provide patch cords based on the total quantity of modular patch panel ports.
4. Color and quantity: Gray color, one (1) for each modular jack in faceplate for project plus 20% spares.
5. Contractor to coordinate specific patchcord requirements with owner prior to ordering and installing patch cords.

2.4 GENERAL

A. All materials shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.

B. Cables shall be terminated with connecting hardware of same category or higher.

PART 3 - EXECUTION

3.1 GENERAL

A. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.

B. All installation shall be in accordance with manufacturer's published recommendations.

C. Horizontal UTP cable must be terminated using 8-conductor, 8-position connectors. The pin/pair assignment will be T568B. Use color matching icon.

D. Install plenum cable in environmental air spaces, including plenum ceilings.

E. Cables and conductors shall sweep into termination areas; cables and conductors shall not bend at right angles. Manufacturer's minimum bending radius shall not be exceeded. When there are multiple system type drops to individual workstations, relative position for each system shall be maintained on each system termination block or patch panel.

F. Provide service loops above the ceilings at the workstation location and in the telecommunication closet. At the workstation provide a minimum cable slack of 12-inches for UTP, cables and 40-inches for optical fiber cables. In the telecommunication closets provide a minimum cable slack of 10-feet for both UTP and optical fiber cables. Cable slack shall be neatly installed and supported by ladder rack and ladder rack drop outs above the vertical wire managers in the equipment racks.

G. Unshielded Twisted Pair Cable: Each pair shall be terminated on appropriate outlets, terminal blocks or patch panels. Pairs shall remain twisted together to within the proper distance from the termination. Conductors shall not be damaged when removing insulation. Wire insulation shall not be damaged when removing outer jacket. The pulling tension on a four (4)-pair UTP cables shall not exceed 25 lbs. for a single or bundle of cables.

3.2 COORDINATION

A. Coordinate telecommunications outlet/connector locations with location of power receptacles at each work area with General Contractor/Owner. The telecommunications outlet/connector shall be in close proximity to the power receptacles in each work area.

3.3 INSTALLATION OF CABLES

A. General Requirements for Cabling

1. MUTOA shall not be used.

2. Horizontal Distribution Cable. All cables shall be installed in a continuous raceway from each data outlet box to accessible space above ceiling, nearest cable tray, or bottom of the exposed structural joist. Outlet box shall be 4"x 4" x 2-1/8" deep box with single gang plaster ring. Provide a continuous raceway to telecommunication closet in areas without accessible ceilings. Conduit size shall be 1-inch minimum. Horizontal cabling installed in/out of cable tray shall be bundled at not less than 4' intervals with hook and loop tie wraps. The use of plastic cable ties is strictly prohibited. Provide insulated bushing at each end of conduit prior to installation of cable. The rated cable pulling tension shall not be exceeded. Cable shall not be stressed such that twisting, stretching or kinking occurs. Cable shall not be spliced. Copper cable not in a wire raceway, shall be suspended a minimum of 8-inches above ceilings by cable supports no greater than 48-inches apart. Cable shall not be run through structural members or in contact with pipes, ducts or other

potentially damaging items. Placement of cable parallel to power conductors shall be avoided, if possible; a minimum separation of 12-inches shall be maintained when such placement cannot be avoided. Cables shall be terminated; no cable shall contain unterminated elements. Minimum bending radius shall not be exceeded during installation or once installed. Service loops shall have a 3 feet per cable located at the ceiling at the last support (ex. J-hook, etc.) before entering cable into conduit, wall, and surface raceway. Service loops for modular furniture/movable walls shall have an additional fifteen (15) feet per cable for horizontal cable runs of under 250 feet in length for future office layout change without recabling. Horizontal cabling fed from poke-thru device to furniture raceway shall be managed in flexible spiral wrap and neatly concealed to furniture raceway.

3. Cold-Weather Installation: Follow manufacturer specifications for installation and storage temperatures. Heat lamps shall not be used for heating.

END OF SECTION

SECTION 27 51 19

SOUND MASKING SYSTEM

PART 1 - GENERAL

1.1 SCOPE

A. Perform all Work required to provide and install the required remote control and signal cabling with supplementary items necessary for proper installation.

1.2 RELATED SECTIONS

A. Common Work Results - Section 260005

1.3 DEFINITIONS AND REFERENCES

A. Test and Calibration Conditions: Spaces completely furnished but unoccupied, lights and HVAC systems on, HVAC system testing and balancing completed, ceiling components in place. Additional testing to be provided after space is occupied to adjust for variations in use.

B. Covered spaces: Spaces above which masking speakers are installed.

C. Pink noise: Random noise signal with equal energy in each octave.

D. Sound Masking: Sound that reduces the intelligibility of intruding speech and the distraction from activity noise. Sound that when measured falls inside the “preferred curve”. The masking sound spectrum slopes downward with an increasing frequency. The rate of this slope of sound is 5 dB per octave, having a steeper roll-off above 2 KHz. The low frequency response is determined by the low frequency capabilities of the masking system loudspeakers.

E. ANSI S1.4-1983(R2004) – Sound Level Meters

F. ANSI S1.6 – Preferred Frequencies and Band Numbers for Acousical Measurements

G. ANSI S1.11-2004 – Octave-Band and Factional Octave-Band Analog and Digital Filters

H. ASTM E 1130-02 – Standard Test Method for Objective Measurement of Speech Privacy in Open Offices using Articulation Index.

I. ASTM E 1573-02 – Standard Test Method of Evaluating Masking Sound in Open Office Using A-Weighted and One-Third Octave Band Pressure Levels

1.4 DESCRIPTION OF SYSTEM

J. All masking/paging units must be UL Listed for use in a ceiling plenum.

K. The system must be manufactured in the USA.

L. All equipment and associated hardware shall be fabricated and installed in accordance with the manufacturer’s specified recommendations.

M. All wiring shall be minimum 18 gauge.

N. Location of grounding points shall be determined carefully to insure minimizing of system hum and elimination of ground loops. In addition, all connections of shields and conductors to equipment shall be in accordance with manufacturer’s instructions and best professional practices.

O. In open areas and larger enclosed spaces, the overall sound level produced should have special uniformity of nor more than +/- ½ dB between any two sound generating units.

P. The sound generating units must have an adjustable sound spectrum shaping control in order to meet the varying spectral requirements of drywall ceilings, various types of ceiling tile, air return grilles and openings around lighting fixtures, etc.

1. The spectrum shaping ability shall be variable within the accepted background sound masking range (acoustical preferred curve).

2. Units installed over drywall ceilings should be wired for spectrum control adjustment and remote sound level.
3. Sound-Power Level produced by system: Sound masking system must not exceed NC 40 contour between 400 and 2000Hz, and have smooth roll-off above and below those frequencies when measured 1 meter from speaker.
    a. Final adjusted level: Determine final level for each space individually by measurement as specified.
    b. Measurements: Made under calibration conditions.

Q. Maximum average range of sound power level: 1 dB in the 250, 500, 1000, 2000, 4000 and 6000Hz range for 75 percent of the locations covered.

R. Spatial Uniformity (Directional Effect: People in masked space under normal operating conditions cannot determine source of masking sound.

S. Temporal Uniformity: One minute time-averaged sound pressure level of any octave band of masking sound from 250 to 8000 Hz remains constant in any space to within a standard deviation of 2 dB when measured over a 30-minute period.

T. Sound Quality: No audible hum or noise, other than masking noise, from this system in masked spaces should be detected.

1.5 PERFORMANCE

E. They system shall be capable of producing masking frequencies in the preferred spectrum range.
1. Each unit shall allow smooth and seamless adjustability of the sound spectrum within the preferred curve, to allow for a variety of ceiling conditions.

F. Speaker housings/enclosures must be damped to avoid undesirable resonance.

G. System shall be designed so that individual speaker or component failure will have no impact on the balance of the system.

H. Design of system must be powered by low voltage.
1. Use adequately rated step down transformers
    a. Primary: 120 Volt AC 60 Hz
    b. Secondary: 16-18 Volt AC 60 Hz
2. Power Usage:
    a. Power: Typical consumption, 100 Watts per 18,000 square feet for masking only.
    b. Power: Typical consumption, 200 Watts per 18,000 square feet for masking and paging.

1.6 CODES AND PERMITS

A. Install all work in full accordance with the requirements of all local and governmental departments having jurisdiction over these matters, as well as with any requirements of the NFPA, MEA, BSA, UL and other applicable codes.

B. Secure and pay for necessary approvals, permits, inspections, carting, legal dumping, etc., and deliver the official records of the granting of permits to the Owner without additional cost.

C. Provide signs as required by the municipal authorities.

1.7 QUALIFICATIONS

A. Source Limitations: Obtain sound masking equipment components from a single source that assumes responsibility for compatibility of items used.

B. Components, speakers and power transformers must be UL listed for their appropriate use or listed as an equal to UL through another competent agency.

C. Green: Sound masking equipment must be comprised of at least 50% recycled content.

D. Privacy: Perform a speech and privacy evaluation to provide an articulation index (AI) as per ASTM E1130-02. A report of the AI must be provided with each exclusive project.

E. Manufacture Qualifications: Manufacturer must manufacture sound masking equipment and have a minimum of 10 years sound masking experience. Sound masking product provided must be in existence for a minimum of six years with proven performance criteria for providing speech privacy.

F. Warranty: A 10-year full warranty from the manufacturer must be provided for all sound masking equipment.

G. In-Plenum Speakers only.

1.8 SUBMITTALS

A. Product Data: for each component including nationally recognized testing laboratory listing data.

B. Submit manufacturer's data or shop drawings of the following apparatus, giving full information as to dimensions, materials, and all information pertinent to adequacy of submitted equipment.

1. Masking Sound Speakers
2. Additional necessary masking equipment needed
3. Wire
4. Transformers

C. Shop Drawings: Prepare and submit detailed dimensioned shop drawings for conduit runs (if required) and other distribution services including elevations showing minimum clearances and installed features and devices for system components. Show types and locations of masking speakers and their wiring connections. Channel assignments, and axis orientations. Show ducts, beams, and other significant sound reflecting and absorbing elements in ceiling space and show locations of partitions below ceiling. Include a diagram showing interconnection of major system components for each zone and channel and indicating grounding connections.

D. Each shop drawing shall contain job title and reference(s) to the applicable drawing(s) and/or specification article(s).

E. Product Certificates: Signed by manufacturers of sound masking equipment and components certifying that products furnished comply with requirements.

F. Qualification Data: For firms and persons specified in "Quality Assurance" article.

G. Record of Final Field Tests and Measurements: Include final adjustment of system.

H. Maintenance Data: For sound masking equipment and components (if needed) to include in maintenance manuals specified in Division 1. Include data for each type of product, including all features and operating sequences. Both automatic and manual.

1.9 COORDINATION

A. Coordinate quantity and arrangement of speaker assemblies with ceiling space configuration and with components occupying ceiling space, including structural members, pipes air distribution components, raceways, cable trays, recessed lighting fixtures and other items.

1.10 OPERATING AND MAINTENANCE INSTRUCTIONS

A. Furnish a minimum of four complete sets of operating instructions and service maintenance manuals for the equipment employed in the systems. This shall include wiring diagrams. The information in the manuals and on the drawings shall be sufficiently detailed to allow a technician of normal competence to understand, install, operate, maintain, calibrate and repair the equipment.

B. The Owner's designated operating personnel shall be provided instruction. This shall include instruction in the operation, care and maintenance of the installation. Instruction shall be scheduled at the mutual convenience of the Owner and Subcontractor, after demonstrations and acceptance testing.

1.11 GUARANTEES AND CERTIFICATION

A. System shall be warranted to be free from defects in materials, workmanship, and performance for a 10-year from date of installation.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Basis of Design: Lencore Acoustics, LLC

1 Crossways Park Drive W

Woodbury, NY 11797

Ph:516-682-9292

Fx: 516-682-4785

Website: www.lencore.com

Email: drawingstt9lencore.com

LENCORE CLASSIC

B. Approved Equal To: Atlas and Cambridge

2.2 EQUIPMENT

A. The enclosure for the sound masking speakers shall consist of aluminum or electroplated steel, cylindrical housing.

B. Speakers: 5 '/‹ inch units mounted on metal baffles and arranged for optimum, multi- directional, angular sound distribution. Arrange units for suspension from the building structure above the ceiling.

C. The system must be capable of being zoned on both a global and local level for sound. Global zoning must accommodate a minimum of 50,000 square feet and local zoning will be designed in accordance with the space plan for those areas requiring special attention; i.e. patient rooms, exam rooms, reception areas, provider offices, clerical work areas, open areas, patient check in areas, special work areas, executive areas. All zoning must allow both volume and frequency adjustments within each zone measured at 48" A.F.F. within +/- °7 dBA.

D. LOUDSPEAKER – LM6

I.	Size:	5 1/4 inch wide dispersion
2.	Power Rating:	10 Watts Root Mean Squared (RMS)
3.	Frequency Response:	50-12,000 Hz
4.	Pressure Sensitivity:	SPL - at 1 Watt/m - 90 dB
5.	Impedance:	16 Ohms
6.	Magnet Weight:	10 oz. (283.5 grams)

E. Noise Generator: Octave bands from 50Hz to 8000Hz.

1. Voltage: 16 to 24 Volts AC, 60 Hz
2. Contour Adjustments
3. Spectrum adjustments shall meet acoustical preferred curve

4. Output adjustments
    a. 10 position ste-volume control @ 1.5 dB per step.
    b. Minimum 15 dB remote central volume control

F. Wire: The speaker wiring shall be minimum 18 gauge, stranded, non-shielded, UL Listed, Plenum Rated.

G. Step Down Transformer – 16P40 (16 Units) & 95T-16 (78 Units):

1.	POWER REQUIREMENT	120V ac, 60 Hz
2.	FUSE	6-Amp Reset Circuit Breaker
3.	POWER RATING	95VA
4.	SIZE	4 °/‹ " X 4 °/‹ “ X 4”
5.	TRANSFORMER SPECIFICATIONS	16V/95VA

H. Remote Central Volume Control:

1. The Remote Central Volume Control unit must operate as a central volume control from which universal volume adjustments can be made remotely for a minimum 50 main units (150 total speakers) and covering up to 33,000 square feet system-wide.
2. The unit must consist of an individual self-contained noise generator, audio amplifier, loudspeaker in a damped aluminum enclosure, powered by 16/18 volts AC and is capable of driving one secondary model in addition to the aforementioned.
3. The central volume remote control unit must allow adjustment to the volume of sound masking system remotely.
4. Volume adjustment: A rotating switch accompanied by a wall mountable plate and is adjusted by rotating the dial from 0 to 10.
5. Each remote central volume remote control unit is solid state and consists of a CMOS/MSI digital random sequence noise generator, electronic amplifier, and filter for active spectrum shaping and is equipped with a 10-step volume control, an additional continuous volume control, and the central volume remote adjustment control (as previously described above). Range of sound level: 41-86 dBA. Additionally contained is a continuous and completely separate volume control for paging/music.

I. Programmable Audio-Level Control Unit

1. Automatic Sound Power Level Changes: Two system channel changes, capable of different time settings for each day of the week.
2. Zones
    a. Two (2) independent zones (except for acclimate mode)
    b. Capacity: Minimum of 50,000 SF per zone.
3. Clock Accuracy: +/-2 seconds per day (leap year and DST updated automatically).
4. Battery: Rechargeable lead sealed, 12 volt, 2.2 Ah provides approximately 24 hours backup power.
5. Programming
    a. Programmable attenuation range: 0 to + dB
    b. Slide control attenuation range: +5 to – 5 dB
    c. Minutes per dB change: 1 to 5 minutes
    d. Acclimation attenuation range: -1 to -9
    e. Acclimate days per dB change: 1 to 5 days

f. Acclimatization length: 1 to 54 days not counting Saturday and Sunday

g. Maximum overall attenuation range: +5 to – 18 dB

h. Programmable events: 24 events per day for each zone.

6. Program Memory: Nonvolatile for one year, minimum, without power. When re-energized a power outage, control starts at zero level and automatically advances system sound level at same rate used for programmed level changes.

PART 3 - EXECUTION

3.1 MOUNTING OF MASKING SOUND LOUDSPEAKERS

A. Mountings and loudspeakers shall be concealed above the acoustical ceiling. The loudspeakers shall be suspended from the slab above by chain. The speaker face shall be located at a height equal to one-quarter of the ceiling plenum depth. Where possible, the bottom of each speaker shall be located a minimum of 6” to 8” (150 to 200 mm) above the acoustical ceiling tile. However, it is most important that all units hang at a uniform height throughout to insure a uniformity of sound when the system is turned on.

B. Wiring Method: Install wiring in accordance with all local electrical codes. Conceal cable in accessible ceilings, walls and floors where possible.

C. Pulling Cable: Do not exceed manufacturer’s recommended pulling tensions. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between normal termination points. Remove and discard cable where damaged during installation and replace it with new cable.

D. Exposed Cable: Install parallel to building lines, follow surface contours, and support as recommended by manufacturer.

E. Grounding: As recommended by manufacturers, unless more stringent requirements are indicated. Ground equipment and conductors to eliminate shock hazard and to minimize ground loops. Common mode returns, noise pickup, cross talk and other impairments. Install 5-Ohm ground at main equipment location. Measure, record and report ground resistance.

F. Impedance Matching: For systems components including connecting cable, provide end-to-end level and impedance matched signal paths. Use matching networks and balancing devices at connections where necessary to avoid mismatches.

G. Splies, taps and terminations: Make splices, taps and terminations on numbered terminal strips in junction, pull and outlet boxes; and equipment closures.

H. The speaker locations shown on the drawings are schematic only and may require field modification to avoid major ductwork, structures and other plenum barriers. Additional speakers may be required to provide uniform sound distribution because of these plenum obstructions.

I. All local hanging codes must be reviewed and observed by the installer/contractor.

J. Identification:

1. Identify system components, wiring, cabling, and terminal according to Division 16 Section “Electrical Identification”. Use color coded conductors and apply wire and cable marking tape to designate wires and cables so media are identified in coordination with system wiring diagrams.

2. Identify system components, wiring, cabling, and terminals according to Division 16 Section “Basic Electrical Materials and Methods”. Use color coded conductors and apply wire and cable marking tape to designate wires and cables so media are identified in coordination with system wiring diagrams.

K. All equipment and associated hardware shall be fabricated and installed in accordance with the manufacturer's specified recommendations.

3.2 PRELIMINARY TESTS AND ADJUSTMENTS

A. At the completion of installation of speakers, the Subcontractor shall perform initial tests and adjustment. It is suggested that, with the speakers installed in accordance with specified spacing and orientation, tests be conducted in an open area of 35 ft. x 35 ft. minimum size. Tests shall indicate that all acoustical performance requirements described herein are satisfied.

B. All testing and adjusting of the system shall be accomplished in the absence of the eventual occupants whenever possible. These precautions are essential to insure that the attention of the occupants will not be unnecessarily drawn to the noise or to its source.

C. Tests and adjustments shall be performed as described below:

1. Hum and Noise Level
2. Loudspeaker Operation
3. Freedom from Buzzes, Rattles and Objectional Distortion
4. Gain Control Settings
5. A written report representing the results of the above tests, including numerical values where applicable, shall be submitted for review.

3.3 FINAL TESTS AND ADJUSTMENTS

A. The manufacturers' agent with the support and cooperation of any Subcontractor installer shall perform the acceptance testing of the completed installation. These tests shall be performed to demonstrate that the equipment is fully furnished and installed in compliance with the terms of the Specifications in all Contract Documents. Except as otherwise specified, the Manufacturer or Subcontractor shall provide all instruments, equipment, labor and materials necessary to complete these tests.

B. Manufacturers Field Service: Engage a factory authorized service representative to inspect field assembled components and equipment installation and connections. Report results in writing. Include the following:

1. Operational Test: Start system to confirm proper operation. Remove malfunctioning unts, replace with new units and retest. Make initial sound spectrum and level adjustments for each zone.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
3. Inspection: Verify that units and controls are properly labeled and interconnecting wires and terminals are identified.
4. Sound Masking Power Level Adjustments: Adjust independently for each space to minimum level of 47 dBA to ensure speech privacy between adjacent workstations while complying with other system requirements.

C. The Subcontractor shall project the completion date of tests and adjustments so that he can give a minimum of one week's notice to the active Project Manager.

D. Measurements of system performance shall be made using a calibrated ANSI precision sound level meter set for "slow" meter damping and 'A' scale filtering. The measurements shall be made at not less than twenty test positions at 4' height above the floor level, with gain adjusted to provide the system design level. All interior finishes and furnishings shall be in place. Tests shall be for each floor at times not occupied by personnel.

E. Final Acceptance Testing:

1. Instrumentation: Use a professional quality sound level meter in accordance with ANSI S1.4.
2. Record test observations, readings and corrective actions.
3. System Tests: Include the following for each zone.

4. Relative Sound Power Level:

Band	Open Plan Areas	Enclosed Offices
200	+2.5	-2
250	+3	-2
315	+2	-2.5
400	+1	-3
500	0	-4
630	-1	-5
800	-2	-6
1000	-3	-7
1250	-4	-8.5
1600	-5	-10
2000	-6	-12

Adjust level of masking sound for each space so one third octave band centered at 500 Hz has final selected sound power level for that space. Measure deviation from listed values in one-third octave bands from 400 to 2000 Hz. Measured values must not deviate from those listed by more than 4 dB for open plan areas and 8dB for enclosed offices. The total of individual band deviations in eight bands must not exceed 16 dB for open plan areas and 30 dB for enclosed offices.

5. Walk-Through Test: People in masked spaces cannot discern speaker loations.
6. Temporal Stability Test: Check for uniformity of time by measuring sound level in each of 11 octave bands at one-minute intervals for 30-minute test period. Deviations must not exceed limits specified in “System Description” Article in Part 2.

F. Retest: Correct deficiencies identified by tests and observations and retest until meeting specified requirements.

G. Recording Control Settings and System Adjustments: Record final control settings and programming and final tap setting of speaker matching transformers. Record final sound level measurements and observations.

3.4 ADJUSTMENT

A. Occupancy Adjustments: When requested within 12 months of date of substantial completion manufacturer is to provide on site assistance in adjusting system to suit actual occupied conditions. Provide one visit to site outside normal occupancy hours for this purpose without additional cost to the owner.

3.5 DEMONSTRATION AND TRAINING

A. Engage a factory authorized service representative to train Owner’s maintenance personnel to adjust, operate and maintain services as specified below:
1. Train owner’s maintenance personnel on procedures and schedules starting up and shutting down, troubleshooting, servicing, and maintaining equipment and schedules.
2. Review data in maintenance manual. Refer to Division 1 Section “Contract Closeout”.
3. Review data in maintenance manual. Refer to Division 1 Section “Operation and Maintenance Data”.
4. Schedule training with owner through Architect with at least seven days advance notice.

END OF SECTION

SECTION 28 31 00

FIRE DETECTION AND ALARM

PART 1 - GENERAL

1.1 SCOPE

A. Perform all Work required to provide and install the following fire detection and alarm indicated by the Contract Documents with supplementary items necessary for proper installation. The Work under this section includes the furnishing of all labor, materials, transportation, tools and appliances required in the performance of all operations required for the installation of a complete and working fire detection and alarm system.

1.2 REFERENCES

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Related Sections

1. Division 01 General Requirements
2. Division 07 Thermal and Moisture Protection, Section 078413 Penetration Firestopping
3. Division 08 Openings, Section 087100 Door Hardware
4. Division 23 Heating Ventilating and Air Conditioning Monitoring & Control (HVAC)
5. Division 26 Electrical, Section 260500 Common Work Results for Electrical

1.3 SUBMITTAL

A. Title page with an accurate legend of symbols for all fire alarm devices being installed. The legend must include the quantity and model number for each device.

B. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories. Complete manufacturer's catalog data including supervisory power usage, alarm power usage, physical dimensions, and finish and mounting requirements.

C. Battery capacity calculations: Battery size shall be a minimum of 125% of the calculated requirement. Provide the following supporting information:

1. Supervisory power requirements for all equipment.
2. Alarm power requirements for all equipment.
3. Power supply rating justification showing power requirements for each of the system power supplies. Power supplies shall be sized to furnish the total connected load in a worst-case condition plus 25% spare capacity. This shall include anticipated devices in tenant areas where the base design is a building shell. Coordinate anticipated device layout with Engineer.
4. Voltage drop calculations for wiring runs demonstrating worst-case condition.
5. NAC circuit design shall incorporate a 15% spare capacity for future expansion.
6. When visual notification devices are added to existing systems the submittal shall include a power availability analysis showing the intended source of power, the notification circuit capacity and standby power availability.
7. When audible notification devices are added to existing systems the submittal shall include a power availability analysis showing the intended source of audio, the amplifier used, the notification circuit capacity and standby power availability. All manufacturers'

data pertaining to audible circuits such as noise suppression and wiring limitations shall be included in the submittal.

D. Drawings

1. Prepare drawings using AutoCAD software and include all Contractors' information. The Contractor shall be responsible for verifying all critical dimensions shown on the drawings provided by the Architect.
2. Floor plans: Provide locations for all devices, new and existing (with device number at each addressable device corresponding to control unit programming), appliances, panels, power boosters, equipment, junction / terminal cabinets, risers, electrical power connections individual circuit and raceway routing, number size and type of raceways, and conductors in each raceway. Conduit fill calculations with cross section area percent fill for each type of conductor and raceway. Show all interfaces for all fire safety functions. Identify all fire rated walls within the Project area. Coordinate with Construction Documents
3. Riser diagrams: Provide, for the entire system, the number, size and type of riser raceways and conductors in each riser raceway and number of each type of device per floor and zone. Show door holder interface, elevator control interface, HVAC shutdown interface, fire extinguishing system interface, and all other fire safety interfaces. Show wire styles on the riser diagram for all circuits. The riser schematic shall show locations of all control panels, transponder cabinets, terminal cabinets, NAC power supplies. Locations shown shall be identified by room number.
4. A wire list showing the wire type, gauge, and conductor count for all wires and cables.
5. Complete system point-to-point wiring diagrams with appropriate terminal designations and schematics for all components provided and for interfaces to equipment and cabling supplied under other Divisions or by the Owner.
6. Detailed wiring diagrams: Provide for control panels, modules, power supplies, electrical power connections, auxiliary relays, and annunciators showing termination identifications, size and type conductors, circuit boards, led lamps, indicators, adjustable controls, jumpers, switches, connectors, harnesses terminal strips and connectors. Diagrams shall be drawn to a scale sufficient to show the spatial relationships between components, enclosures and equipment configuration.
7. Duct air velocity where each duct smoke detector employing the use of sampling tubes is installed. Coordinate with Mechanical Contractor and Construction Documents.
8. Provide a fire alarm system function matrix as referenced by 2010 NFPA 72, Figure A.14.6.2.4(9). Matrix shall illustrate alarm input/out events in association with initiation devices. Matrix summary shall include system supervisory and trouble output functions. Include any and all departures, exceptions, variances or substitutions from these specifications and/or drawings at time of bid.

E. Sequence of Operation

1. Submittal shall include a complete written sequence of operations of all functions of the system.
2. In addition to the written sequence of operations, all sequence functions shall be depicted using a sequence of operations matrix chart of all functions showing how the system will react to the activation of each type of device, as recommended by 2010 NFPA 72, Figure A.14.6.2.4(9).
3. Submittal shall include details of all interfaced functions. Details shall include all fire alarm system functions and interconnections applicable to each interface.

F. Operation and Maintenance Data: For all fire alarm equipment, to include in operation and maintenance manuals.

G. Warranty: Sample of special warranty.

1.4 QUALITY ASSURANCE

A. Each and all items of the fire alarm system shall be listed as a product of a single fire alarm system manufacturer under the appropriate category by Underwriters' Laboratories, Inc. (UL), and shall bear the "U.L." label. All control equipment shall be listed under both UL category UOJZ Control Units System as a single unit and under UL category APOU Proprietary Alarm Units. Service under APOU shall be Grade A. Partial listings, or multiple listings for various major sections of the control, shall not be acceptable.

B. The complete installation is to conform to the applicable sections of NFPA 72, NFPA 90A, NFPA 99, NFPA 101, State and Local Code Requirements, NFPA 70 the National Electrical Code with particular attention to Article 760.

C. Additionally, the entire installed system and all integrated system operations shall be within the guidelines of the International Building Code, 2015, the Americans with Disabilities Act, Public Law 101-336, and the FM Global (Factory Mutual (FM)): FM Approval Guide.

D. All control equipment shall have transient protection devices to comply with UL864 requirements.

E. The system controls shall be UL listed for Power Limited Applications per NEC 760. All circuits shall be marked in accordance with NEC 760-23.

F. Supplier Qualifications

1. The document submittal preparation and supervision of installation and testing shall be provided by a technician that is certified NICET level III or a registered fire protection engineer. The NICET certified technician shall be on site for the supervision and testing of the system. Factory engineers from the equipment manufacturer, thoroughly familiar and knowledgeable with all equipment utilized, shall provide additional technical support at the site as required by the Owner or his authorized representative.

2. Provide the services of a factory trained and certified representative or technician, experienced in the installation and operation of the type of system provided. The representative shall be licensed in the State if required by law.

3. The technician shall supervise installation, software documentation, adjustment, preliminary testing, final testing and certification of the system. The technician shall provide the required instruction to the owner's personnel in the system operation and maintenance.

4. The supplies shall furnish evidence they have an experienced service organization, which carries a stock of spare and repair parts for the system being furnished.

5. The equipment supplier shall be authorized and trained by the manufacturer to calculate, design, install, test, and maintain the air sampling system and shall be able to produce a certificate stating such upon request.

G. Installer Qualifications

1. Installers shall have a minimum of five (5) years' experience installing fire alarm systems.

2. Contractors unable to comply with the provisions of Qualification of Installers shall present proof of engaging the services of a subcontractor qualified to furnish the required services.

1.5 SUMMARY

A. This Specification describes a fire detection and alarm system. The features and capacities described in this Specification are required as a minimum for this project and shall be furnished by the successful contractor.

B. The system shall be in full compliance with national and local codes.

C. The system shall include all required hardware, conduit and fittings, raceways and wiring, firmware, and software to accomplish the requirements of this specification and the contract drawings, whether or not specifically itemized herein.

D. The Contractor shall perform all Work in accordance with the Drawings and Specifications, and subject to the terms and conditions of the Contract. Work shall include, but not be limited to, the following:

1. Fire alarm panel.
2. Remote annunciator(s).
3. Automatic smoke and heat detection.
4. Manual alarm initiation.
5. Air handling unit (AHU) controls to integrate AHU into the fire alarm system operation (where applicable).
6. Monitoring of sprinkler water flow and supervisory alarm switches.
7. Alarm annunciation.
8. Elevator recall.
9. Elevator machine room pre-action sprinkler system and equipment shutdown (Shunt Trip).
10. Smoke damper control (where applicable).
11. Monitoring of suppression system activation and supervisory alarm switches.

E. All equipment furnished shall be new and the latest state of the art products of a single manufacturer, engaged in the manufacturing and sale of fire alarm systems for over five (5) years.

F. The system as specified shall be supplied, installed, tested and approved by the local authority having jurisdiction, and turned over to the Owner in an operational condition.

G. In the interest of job coordination and responsibilities the installing contractor shall contract with a single supplier for fire detection and alarm equipment, engineering, installation, programming, and inspection and tests.

H. All existing fire alarm equipment, wiring, devices and sub-systems that are not shown to be reused shall be removed. All existing fire alarm conduit not reused shall be removed.

I. Existing fire alarm horns, strobes, bells, chimes, door holders, valve tamper switches and waterflow/pressure switches may be reused only as specifically indicated on the Drawings and provided the equipment:

1. Meets this specification section.
2. Is UL listed or FM approved.
3. Is compatible with new equipment being installed.
4. Is verified as operable through contractor testing and inspection.
5. Is warranted as new by the contractor.

1.6 TEMPORARY PROTECTION

A. Where modifications to existing fire alarm devices or equipment cause Interim Life Safety Measures to remain in place for a period of time exceeding 48 hours, temporary protection shall be provided to the affected area.

B. Existing conduit or raceways not shown to be reused shall not be used to serve the temporary protection devices.

C. Temporary protection devices shall be installed in mounting boxes and secured to building structure.

D. Temporary protection installations shall be fully tested and certified by the installing contractor.

E. Proposed temporary protection installations shall be presented to the Owner for acceptance before demolition or shutdown of the existing fire alarm system or devices.

F. Temporary protection shall be left in place until the new fire alarm equipment has been tested and certified compliant and operational by the installing contractor.

1.7 UNIT PRICES

A. List of Unit Price Items and Descriptions: Base bid quantities of fire alarm devices are shown on Drawings and shall be included in the Lump Sum Base Bid. Provide unit prices to add or delete fire alarm devices and maintain a complete and functioning system. Adjustment to add or delete quantities will be made by Change Order to the Contract Sum.

1. Cost to provide device and complete installation, engineering and drawings, programming and testing for an addressable manual fire alarm station as detailed on the Drawings and Specifications. Unit price per addressable manual fire alarm station with 30 feet of conduit and wiring.
2. Cost to provide device and complete installation, engineering and drawings, programming and testing for an addressable smoke detector as detailed on the Drawings and Specifications. Unit price per addressable smoke detector with 30 feet of conduit and wiring.
3. Cost to provide device and complete installation, engineering and drawings, programming and testing for an addressable heat detector as detailed on the Drawings and Specifications. Unit price per addressable heat detector with 30 feet of conduit and wiring.
4. Cost to provide device and complete installation, engineering and drawings, programming, and testing for an addressable duct detector with remote test/reset switch as detailed on the Drawings and Specifications. Unit price per addressable duct detector with 30 feet of conduit and wiring.
5. Cost to provide device and complete installation, engineering and drawings, programming and testing for an addressable monitor module as detailed on the Drawings and Specifications. Unit price per addressable interface module with 30 feet of conduit and wiring.
6. Cost to provide device and complete installation, engineering and drawings, programming and testing for an addressable control module as detailed on the Drawings and Specifications. Unit price per addressable interface module with 30 feet of conduit and wiring.
7. Cost to provide device and complete installation, engineering and drawings, programming and testing for a strobe as detailed on the Drawings and Specifications. Unit price per strobe with 30 feet of conduit and wiring.

8. Cost to provide device and complete installation, engineering and drawings, programming and testing for a horn/strobe as detailed on the Drawings and Specifications. Unit price per horn/strobe with 30 feet of conduit and wiring.

9. Cost to provide device and complete installation, engineering and drawings, programming and testing for a magnetic door holder as detailed on the Drawings and Specifications. Unit price per magnetic door holder with 30 feet of conduit and wiring.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to project site in original, unopened packages with intact and legible manufacturers' labels identifying product and manufacturer, date of manufacture, and shelf life if applicable.

B. Store materials inside, under cover, above ground, and kept dry and protected from physical damage until ready for use. Remove from site and discard wet or damaged materials.

1.9 PROJECT CONDITIONS

A. Installed products or materials shall be free from any damage including, but not limited to, physical insult, dirt and debris, moisture, and mold damage.

B. Environmental Limitations: Do not deliver or install products or materials until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.10 WARRANTY

A. Contractor shall warrant the completed fire alarm system wiring and equipment to be free from inherent defects for a period of one (1) year after system acceptance. The Owner shall determine the date of acceptance. The acceptance date shall not come before substantial completion of the system. The acceptance date shall not come before the system has been completely tested and certified.

B. The Owner reserves the right to make changes to the fire alarm system during the Warranty Period. Such changes do not constitute a waiver of warranty. Contractor shall warrant parts and installation work regardless of any such changes made by Owner, unless the Contractor provides clear and convincing evidence that a specific problem is the result of such changes to the fire alarm system.

C. Contractor shall have readily available all replacement components necessary for emergency warranty repairs. Contractor shall provide a site specific list of service repair part numbers for system components. Standard manufacturer's service repair parts list is not acceptable. The exact parts used on site shall be listed with the correct service repair part numbers.

D. Contractor shall provide written documentation of all warranty service to the Owner. Documentation shall include a description of repairs, any component replaced and the cause of any component failure.

E. Contractor shall maintain a record of warranty repairs on Site. The specific location shall be the monitoring services location.

F. In the last month of the Warranty Period, all System software and firmware, software, drivers, etc. will be upgraded to the latest release (version) in effect at the end of the Warranty Period. Provide 30 days' notice to Owner to allow scheduling and access to system and to allow Owner to upgrade computer equipment if necessary.

G. At any time during the Warranty Period that Contractor is on Site for maintenance, emergency, or normal service, Contractor shall notify the Owner. Contractor shall notify the Owner of all work anticipated being involved for the service work. In addition, no work affecting system operation shall commence until express permission is granted. After the work is completed a work order ticket describing in detail all work performed (i.e. hardware replaced or serviced,

software or firmware modifications made, etc.), hours worked, follow-up work required, etc., must be signed by the Owner. Service tickets shall include an explanation of the cause of any component failure.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Simplex 4100ES Series

B. Siemens Building Technologies

C. Notifier

D. Gamewell-FCI

E. Edwards System Technologies

F. Silent Knight

2.2 SYSTEM CONTROL PANEL

A. Provide a Fire Alarm System panel with the following:

1. Enclosure: The system enclosure shall be sized to carry all the modules required to meet the specification requirements. Enclosure color shall be red.
2. Power Supply: The power supply shall be adequate to provide power for the system needs with a minimum rated output of four (4) amps.
3. Battery/Charger: The battery charger shall be capable of charging up to 25 Ah sealed lead-acid batteries. Batteries shall be mounted within the fire alarm cabinet. Notify Engineer if required battery capacity exceeds cabinet mounting capacity and an external charger/cabinet assembly is required.
4. Signal Line Circuit(s): Communications for up to two hundred and fifty (250) addressable devices.
5. Notification Appliance Circuits: Two (2) NAC circuits in Class B wiring configuration.
6. Auxiliary Output Circuits:
   a. Two (2) Form “C” dry contacts, each rated 2A at 24 VDC.
   b. One (1) relay rated 0.5A at 120 VAC.
7. Optional relays or LED drivers for graphic annunciation.
8. Remote annunciator/control panel outputs.

B. Programming

1. Fully field programmable from the local display or by a PC configuration tool, with Windows-based software for ease of configuration.
2. Auto configuration, allowing initiating devices to be supervised and send alarm signals to the control panel.
3. Capable of being programmed for cross-zone initiating device operation.

C. Display: Backlit LCD (minimum 80 characters) or color touch-screen display.

D. Function Switches:

1. Provide the following switches in addition to any other switches required for the system (switches may be either a mechanical or electrical device/button):
   a. Remote Alarm Transmission By-pass Switch: Shall prevent transmission of all signals to the main fire alarm control unit when in the "off" position. A system trouble signal shall be energized when switch is in the off position.

b. Alarm Silence Switch: Shall disconnect power to alarm notification circuits on the local building alarm system. A system trouble signal shall be activated when switch is in the off position.

c. Alarm Acknowledge Switch: Shall silence the alarm signal whenever the trouble acknowledge switch is operated. This switch shall not reset the alarm signal.

d. Supervisory Acknowledge Switch: Shall silence the alarm signal whenever the supervisory acknowledge switch is operated. This switch shall not reset the supervisory signal.

e. Trouble Acknowledge Switch: Shall silence the trouble signal whenever the trouble acknowledge switch is operated. This switch shall not reset the trouble signal.

f. Reset Switch: Shall reset the system after an alarm, provided the initiating device has been reset. The system shall lock in alarm until reset.

g. Lamp Test Switch: A test switch or other approved convenient means shall be provided to test the indicator lamps.

h. Drill Switch: Shall activate all notification devices without tripping the remote alarm transmitter. This switch is required only for general evacuation systems specified herein.

i. Door Holder By-Pass Switch: Shall prevent doors from releasing during fire alarm tests. A system trouble alarm shall be energized when switch is in the abnormal position.

j. HVAC/Smoke Damper By-Pass: Provide a means to disable HVAC fans from shutting down and/or smoke dampers from closing upon operation of an initiating device designed to interconnect with these devices.

E. Remote Dialers

1. An automatic telephone communicator shall be provided to facilitate remote reporting. The communicator shall be a Silent Knight Model 5104B, or equal, fire control communicator. The dialer shall be installed adjacent to the fire alarm panel. The dialer shall be programmed to report to a monitoring service designated by the Owner.

2. Three (3) relays shall be provided at the dialer location, one (1) to activate upon alarm, one (1) to activate upon a system trouble condition and one (1) to activate upon a supervisory condition. The relays shall be permanently labeled as to their function. The relays shall be controlled from the fire alarm control panel and connected to the panel via supervised signaling circuits. Wherever relays are used the relay shall include an LED indicator which indicates the activated state of the relay. The LED indicator shall allow for visual verification of relay activation without disassembly of the relay or the relay enclosure.

3. The dialer shall be connected to the public switched telephone network upstream of any private telephone system at the protected premises. Two (2) telephone lines, a primary line and a secondary line, shall be provided for the dialer. The telephone lines shall be terminated at the dialer location using RJ31X style jacks.

F. Testing

1. Walk test by a single individual in either a silent or audible mode.

2. Maintenance and Technician access levels with password protection.

G. Interfacing

1. A history log with a minimum of 2000 stored events shall be provided.

2. An interface for a printer or computer shall be provided to allow for down loading of the history log or system configuration download/upload.

H. Approvals: The system shall be UL and ULC listed, FM approved.

I. Response Time: The system response time from alarm to output shall not exceed four (4) seconds.

2.3 REMOTE ANNUNCIATOR

A. Provide and install LCD annunciators as indicated on the Drawings.

B. Shall be a supervised, LCD display containing a minimum of two lines of 40 characters for alarm annunciation in clear English text.

C. Message shall identify building number, floor, zone, etc on the first line and device description and status (pull station, smoke detector, waterflow alarm or trouble condition) on the second line.

D. The initial alarm received shall be indicated as such.

E. A selector switch shall be provided for viewing subsequent alarm messages.

F. The display shall be UL listed for fire alarm application.

G. Coordinate exact locations for LCD annunciators with Owner and the Fire Department.

2.4 INTELLIGENT INITIATING DEVICES

A. The detector shall have an LED indicating detector status and alarm.

1. Where required, there shall be available a programmable remote lamp configurable to remotely duplicate the on-board LED status of another system device with the same software address.

B. Combination Detector:

1.

2. The detector communications shall allow the detector to provide alarm input to the system and alarm output from the system within five (5) seconds. So as to minimize the effort required by the installing and maintenance technician to appropriately configure the detector to ensure optimal system design, the detectors shall be programmable as application specific. Application settings shall be selected in software for a minimum of eleven environmental fire profiles unique to the devices installed location.

3. The detector shall be designed to reduce the possibility of false indications caused by dust, moisture, RFI/EMI, chemical fumes and air movement while factoring in conditions of ambient temperature rise, obscuration rate changes and hot/cold smoke phenomenon into the alarm decision to give the earliest possible real alarm condition report.

4. The detector shall support the use of a relay, or LED remote indicator without requiring an additional software address. Detector wiring shall not require any special shielded cable.

C. Optical Smoke Detector

1. The optical smoke detector shall be an intelligent digital photoelectric detector. Detectors shall be listed for use as open area protective coverage, in duct installation and sampling assembly installation and shall be insensitive to air velocity changes.

2. The detector communications shall allow the detector to provide alarm input to the system and alarm output from the system within four (4) seconds.

3. The detector shall be designed to reduce the possibility of false indications caused by dust, moisture, RFI/EMI, chemical fumes and air movement while factoring in conditions

of ambient temperature rise, obscuration rate changes and hot/cold smoke phenomenon into the alarm decision to give the earliest possible real alarm condition report.

4. The detector shall support the use of a relay, or LED remote indicator without requiring an additional software address. Detector wiring shall not require any special shielded cable.

D. Thermal Detectors

1. Thermal Detectors shall be rated at 135° F fixed temperature and 15° F per minute rate of rise. Detectors shall be constructed to compensate for the thermal lag inherent in conventional type detectors due to the thermal mass, and alarm at the set point of 135°F.
2. The choice of alarm reporting as a fixed temperature detector or a combination of fixed and rate of rise shall be made in system software and be changeable at any time without the necessity of hardware replacement.
3. The detectors furnished shall have a listed spacing for coverage up to 2,500 square feet and shall be installed according to the requirements of NFPA 72 for open area coverage.

E. Duct Detectors

1. For duct detector applications, the smoke detector shall be an intelligent digital photoelectric detector with a programmable heat detector or a digital photoelectric detector.
2. Detectors shall be listed for use as open area protective coverage, in duct installation and sampling assembly installation and shall be insensitive to air velocity changes.
3. The detector communications shall allow the detector to provide alarm input to the system and alarm output from the system within four (4) seconds.
4. The detector shall be mounted in a duct detector housing listed for that purpose. The duct detector shall support the use of a remote test switch, relay or LED remote indicator. The duct detector shall be supplied with the appropriate sampling tubes to fit the installation. Where duct detectors are exposed to the weather, a weatherproof enclosure shall be available. The duct housing cover shall include a test port for functional testing of the detector without cover removal. The duct housing shall include a cover removal switch capable of indicating cover removal status to the fire alarm control panel.
5. Where required there shall be available a duct housing with an on-board relay. Also where required, there shall be a standalone housing available with it's own power supply and test/reset switch that does not require connection to a fire alarm control panel.

F. Detector bases shall be low profile twist lock type with screw clamp terminals and self-wiping contacts. Bases shall be installed on an industry standard, 4" square or octagonal electrical outlet box.

1. Where selective localized control of electrical devices is required for system operation, furnish and install detector base with software programmed addressable relay integral to the base. The relay shall switch electrical loads within relay ratings, as indicated on the drawings. Operation of the addressable control circuit shall be independent of the number of detectors and relays on the circuit or the number in an alarm state. Relay bases shall be rated for resistive or inductive load (120VAC or 30VDC) 3 amps.
2. Where indicated on the drawings, furnish detector base with integral approved audible evacuation alarm signal having an output of 85db @ 10'. The audible signal shall be individually addressable and software programmed for operation.

G. Provide addressable manual stations where shown on the drawings, to be flush or surface mounted as required. Manual stations shall contain the intelligence for reporting address, identity, alarm and trouble to the fire alarm control panel. The manual station communications shall allow the station to provide alarm input to the system and alarm output from the system

within less than four (4) seconds. The manual station shall be equipped with terminal strip and pressure style screw terminals for the connection of field wiring. Surface mounted stations where indicated on the drawings shall be mounted using a manufacturer's prescribed matching red enamel outlet box.

1. Where required, there shall also be available pull stations with break glass, capable of explosion proof installation, capable of weatherproof installation, two (2) stage operation, reset key operation, and metal housings.

H. Addressable Monitor Modules shall be provided to monitor contacts for such items as water-flow, tamper, and PIV switches connected to the fire alarm system. These modules shall be able to monitor a single or dual contact. An address will be provided for each contact. Where remote supervised relay is required the interface shall be equipped with a SPDT relay rated for 4 amps resistive and 3.5 amps inductive.

I. Where needed, a Conventional Zone Module shall connect to the Signal Line Circuit, which will allow the use of conventional initiation devices. This module shall have the ability to support up to 15 convention smoke detectors and an unlimited number of contact devices. This module shall also be capable of monitoring beam detectors and conventional flame detectors. Where required, there shall be an intrinsically safe detection solution for NEMA defined intrinsically safe installations compatible with the conventional zone module.

2.5 NOTIFICATION APPLIANCES

A. Wall Speakers

1. Speaker shall be UL 1480 listed with high quality tone and voice reproduction for connection to a supervised notification appliance circuit.
2. The speaker shall have a four inch cone with a frequency range of 400-4,000 Hz and shall have an operating temperature between 32°F and 120°F.
3. Semi-flush mounted with a high impact, red white flame retardant PC/ABS thermoplastic housing with “FIRE” lettering.
4. 25 or 70 VRMS; multi-tapped output power rated ¼ to 2 watts and produce 79 to 88 dB at 10 feet. Speakers shall be set at 2 watts or as noted on the fire alarm shop drawings.

B. Ceiling Speakers – 4” Cone

1. Speaker shall be UL 1480 listed with high quality tone and voice reproduction for connection to a supervised notification appliance circuit.
2. The speaker shall have a four inch cone with a frequency range of 400-4,000 Hz and shall have an operating temperature between 32°F and 120°F.
3. Semi-flush mounted with a high impact, white red flame retardant PC/ABS thermoplastic housing.
4. 25 or 70 VRMS; multi-tapped output power rated ¼ to 2 watts and produce 79 to 88 dB at 10 feet. Speakers shall be set at 2 watts or as noted on the fire alarm shop drawings.

C. Ceiling Speakers – 8” Cone

1. Speaker shall be UL 1480 listed with high quality tone and voice reproduction for connection to a supervised notification appliance circuit.
2. The speaker shall have an eight inch, molded, fire-retardant/moisture-resistant cone with a frequency range of 85-8,000 Hz.
3. Semi-flush mounted with a white round grille and UL approved companion enclosure.
4. 25 or 70 VRMS; multi-tapped output power rated ½ to 5 watts and produce 94 dB average sensitivity. Speakers shall be set at 2 watts or as noted on the fire alarm shop drawings.

D. Speaker Strobes

1. Speaker shall be UL 1480 listed with high quality tone and voice reproduction for connection to a supervised notification appliance circuit.
2. The speaker shall have a four inch cone with a frequency range of 400-4,000 Hz and shall have an operating temperature between 32°F and 120°F.
3. Semi-flush mounted with a high impact, white red flame retardant PC/ABS thermoplastic housing.
4. 25 or 70 VRMS; multi-tapped output power rated ¼ to 2 watts and produce 79 to 88 dB at 10 feet. Speakers shall be set at 2 watts or as noted on the fire alarm shop drawings.
5. Strobe portion of the appliance shall produce a flash rate of one (1) flash per second over the regulated input voltage range, and shall incorporate a Xenon flashtube or LED source enclosed in a rugged Lexan® lens.
6. Strobe intensity, where multi-candela appliances are specified, shall have field-selectable settings, and shall be rated per UL Standard 1971 for:
    a. 15/30/75/110cd.
    b. 135/185cd.
7. The selector switch for selecting the candela setting shall be tamper resistant and not accessible from the front of the appliance.

E. AC Horn

1. Models shall be UL 464 Listed for Fire Protective Service, and shall include a die-cast metal housing to protect the horn mechanism.
2. Sound output shall be 95 dBA minimum at 10 feet.
3. Mounting options shall include surface mounting for indoor or outdoor applications and semi-flush for indoor applications.
4. The finish shall be textured enamel.
5. All notification appliances shall be listed for “Special Applications”.

F. Mini Horn Appliances

1. Notification appliance shall be electronic, and shall have field-selectable settings for Temporal (Code 3) or continuous horn and support coded-systems operation.
2. The anechoic sound pressure measurement on Temporal (Code 3) and Continuous Horn settings shall each be 87 dBA minimum at 24VDC.
3. All models shall have provision for standard reverse polarity-type supervision and IN / OUT wiring terminals.
4. The appliances shall be mounted indoors, and mount on standard, single-gang electrical back boxes requiring no additional trim plates or adapters.
5. All notification appliances shall be listed for “Special Applications”.

G. Horn and Horn Strobe Appliances

1. Horn strobe and standalone horn appliances shall meet and be listed for:
    a. UL Standard 1971 (Emergency Devices for the Hearing-Impaired for Indoor Fire Protection Service).
    b. Standard 464 (Fire Protective Signaling).
    c. Horn strobe shall be listed for indoor use and shall meet the requirement of FCC Part 15 - Class B.

2. All inputs shall be compatible with standard reverse polarity supervision of circuit wiring by the Fire Alarm Control Panel (FACP).
3. Horn strobe and standalone horn appliances shall have a minimum of three (3) field selectable setting for dBA levels, and shall have a choice of continuous or temporal (Code 3) audible outputs.
4. Horns shall be of low-current design.
5. Housing shall be red with white lettering except where white is used to match existing devices.
6. Strobe portion of the appliance shall produce a flash rate of one (1) flash per second over the regulated input voltage range, and shall incorporate a Xenon flashtube or LED source enclosed in a rugged Lexan® lens.
7. Strobe intensity, where multi-candela appliances are specified, shall have field-selectable settings, and shall be rated per UL Standard 1971 for:
    a. 15/30/75/110cd.
    b. 135/185cd.
8. The selector switch for selecting the candela setting shall be tamper resistant and not accessible from the front of the appliance.
9. All notification appliances shall listed for Special Applications.

H. Strobes
1. Strobes shall meet and be listed for UL Standard 1971 (Emergency Devices for the Hearing-Impaired) for Indoor Fire Protection Service.
2. Strobe shall be listed for indoor use, and shall meet the requirements of FCC Part 15 Class B.
3. Strobe appliances shall produce a flash rate of one (1) flash per second over the regulated voltage range, and shall incorporate a Xenon flashtube or LED source enclosed in a rugged Lexan® lens.
4. All inputs shall be compatible with standard, reverse polarity supervision of circuit wiring by a Fire-Alarm Control Panel (FACP).
5. Strobes shall be of low-current design.
6. Housing shall be red with white lettering except where white is used to match existing devices.
7. Where multi-candela strobes are specified, the strobe intensity shall have field-selectable settings and shall be rated per UL Standard 1971 at:
    a. 15/30/75/110cd for wall mount
    b. 15/30/75/95cd or 115/177cd for ceiling mount
    c. The selector switch for selecting the candela shall be tamper resistant and not accessible from the front of the appliance.
8. The strobes shall be designed for indoor surface of flush mounting

I. Strobe Multi-tone Electronic Appliances
1. Notification appliance shall be electronic and use solid state components. Electromechanical alternatives are not approved.
2. Each electronic appliance shall provide eight (8) field selectable alarm tones. The tones shall consist of: HORN, BELL, MARCH TIME HORN, CODE-3 HORN, CODE-3 TONE,

SLOW WHOOP, SIREN and HI/LO. Tone selection shall be by durable dip switch assembly and not clips or jumpers.

3. The Multi-tone Audible appliance shall be UL Listed under Standard 464 for Audible Signal Appliances.
4. The audible and the strobe shall be able to operate from a single NAC circuit while producing any of these tones. The appliance shall provide two (2) output sound levels: STANDARD and HIGH dBA. The HIGH dBA setting shall provide a minimum 5 dBA increase in sound output at nominal voltage. The HIGH anechoic dBA measurement at 10 feet at the alarm HORN SETTING shall be 99 dBA minimum. All models shall have provisions for standard reverse polarity type supervision and IN/OUT wiring terminals.
5. Combination audible/visual appliances shall incorporate a Xenon flashtube or LED source enclosed in a rugged Lexan® lens or equivalent with solid state circuitry. Strobe shall produce a flash rate of one (1) flash per second minimum over regulated input voltage range. The strobe intensity shall be rated per UL and Listed under Standard 1971 for Signaling Devices for the Hearing Impaired for field selectable 15/30/75/110 candela settings.
6. The combination audible/visual appliances shall be installed indoors and may be surface or flush mounted. They shall mount to standard electrical hardware requiring no additional trim plate or adapter. The aesthetic appearance shall not have any mounting holes or screw heads visible when the installation is completed.
7. Housing shall be red with white lettering except where white is used to match existing devices.
8. All notification appliances shall be listed for “Special Applications”.

J. Sprinkler Horn/Strobe

1. Locate this device directly above the fire department sprinkler connection on the exterior of the building.
2. Sprinkler horn/strobe circuits shall be home run to the FACP for power.
3. Sprinkler horn/strobe control module should be located inside the building near the penetration. Do not use FACP signal output.

K. Synchronization

1. Where multiple strobes are installed in a common space, the strobes shall be synchronized.
2. The strobes shall not drift out of synchronization at any time during operation.
3. Audibles and strobes shall be able to synchronize on a two (2)-wire circuit with the capability to silence the audible, if required.
4. Strobes shall revert to a non-synchronized flash-rate, if the sync module or power supply should fail to operate (i.e. – contacts remain closed).

2.6 GUARDS FOR PHYSICAL PROTECTION

A. Welded wire mesh of size and shape for the manual station, smoke detector, notification device, or other device requiring protection. Install where noted on the Drawings.

B. Factory fabricated and furnished by the manufacturer of the device.

C. White epoxy powder coat finish.

2.7 MAGNETIC DOOR HOLDERS

A. Magnetic door holders shall have an approximate holding force of 35 lbs.

B. Magnetic door holder back boxes shall be mounted to building structure.

C. Retrofit boxes or other boxes mounted to sheetrock only shall not be acceptable.

D. The door portion shall have a stainless steel pivotal mounted armature with shock absorbing nylon bearing.

E. Unit shall be capable of surface, flush, semi-flush or floor mounting as required.

F. Magnetic door holders shall be 120 VAC powered from a dedicated circuit, 24 VDC and powered from a dedicated power supply at the fire alarm control panel, or a dedicated NAC power supply at a designated remote location. The dedicated power supplies shall not share power with notification devices.

G. When magnetic door holders are added to an existing system the submittal shall include a power availability analysis showing the intended source of power, the door holder circuit capacity and standby power capacity.

H. Magnetic door holders shall be installed at a height of 86 inches or less from the finished floor to the center of the back box.

I. Magnetic door holders shall be UL-Listed for their intended purpose.

J. Magnetic door holder operation shall be independent from another operation such as damper or fire shutter control or electric door control.

K. Coordinate mounting with door hardware.

2.8 INSTRUCTION CHART

A. Provide typewritten instruction card mounted behind a Lexan plastic or glass cover in a stainless steel or aluminum frame with a backplate. Install the frame adjacent to the control unit and where operations are performed. The card shall show those steps to be taken by an operator when a signal is received under all conditions, normal, alarm, supervisory, and trouble. Provide an additional copy with the binder for the input output matrix for the sequence of operation. The instructions shall be approved by the Owner before being posted.

PART 3 - EXECUTION

3.1 GENERAL

A. Installation shall be in accordance with NFPA 70, 72, 90A, and 101 as shown on the drawings, and as recommended by the major equipment manufacturer.

B. Existing devices that are reused shall be properly mounted and installed. Where devices are installed on existing shallow backboxes, extension rings of the same material, color and texture of the new fire alarm devices shall be used.

C. All fire detection and alarm system devices, control units and remote annunciators shall be flush mounted when located in finished areas and may be surface mounted when located in unfinished areas.

D. Location of all controls, alarm actuating devices and audible alarm signaling devices shall generally be as shown on the Drawings. In areas where there are no ceilings, install detectors against the building structure in accordance with manufacturer recommendations. In finished areas, devices shall be located in a symmetrical pattern relating to ceiling and/or wall features and, where applicable, ceiling mounted devices shall be located symmetrically with the ceiling grid centered in two directions. Vertically align pull stations and audible/visual alarm signaling devices where possible. Where audio/visual, audio only or visual only devices are surface mounted to surface mounted junction boxes, install the manufacturer’s skirt, which is designed to enhance aesthetics.

E. Strobes shall be flush wall mounted 80 inches above the floor or 6 inches below ceiling, whichever is lower. Locate and mount to maintain a minimum 36 inches clearance from side obstructions

F. Manual pull stations shall be installed not less than 42 inches or more than 48 inches from finished floor to bottom of device and within 60 inches of a stairway or an exit door.

G. The fire alarm panel shall be programmed with a specific description for each device, including device type, room name, and room number using the Owner's final room numbering scheme, which may differ from the architectural plans. For expansion and/or revisions to existing systems, coordinate final programming and descriptions with the Owner.

3.2 BOXES AND ENCLOSURES

A. Boxes shall be installed plumb and firmly in position.

B. Wherever splices are made in J-boxes, wires shall be labeled with the system circuit number and area served. Wire tags shall be affixed to identify the wires. Writing on wires with a marking pen shall not be an acceptable means of wire identification.

C. J-box covers shall be painted red and clearly marked "Fire Alarm".

3.3 CONDUCTORS

A. All wiring shall be installed in EMT conduit.

B. Where a building's fire alarm system is being added to or modified, the wiring method shall match the building's predominant existing wiring method

C. Each conductor shall be identified as shown on the shop drawings with wire markers at terminal points. Attach permanent wire markers within 2 inches of wire termination. Marker legends shall be visible.

D. All wiring shall be supplied and installed in compliance with the requirements of the National Electric Code, NFPA 70, Article 760, and that of the manufacturer.

E. Where fire alarm system wiring is installed exposed, the wiring shall be installed in such a way that maximum protection from physical damage is provided.

F. Provide bushings, connectors, strain relief devices, boxes and covers specifically designed for structured cabling use.

G. Bushings and throats shall be installed for fittings, raceways, boxes or other enclosures prior to installing cables and wiring systems.

H. Wiring for notification appliance circuits shall be a minimum 14 AWG. Wiring for signaling line circuits shall be a minimum 18 AWG.

I. All splices shall be made using solderless connectors. All connectors shall be installed in conformance with manufacturer recommendations.

J. Crimp-on type spade lugs shall be used for terminations of stranded conductors to binder screw or stud type terminals. Spade lugs shall have upset legs and insulation sleeves sized for the conductors.

K. A consistent color code shall be used for conductors throughout the installation. The installation contractor shall submit for approval, prior to installation of wire, a proposed color code for system conductors to allow rapid identification of circuit types.

3.4 SYSTEM OPERATION

A. Refer to the fire alarm operation matrix on the Drawings. Additional information is noted below.

B. Activation of any manual pull station, water flow or pressure switch, heat detector, gaseous suppression system, or smoke detector shall cause the following operations to occur:

1. Continuously sound a temporal pattern general alarm and flash all strobes in the building until reset at the fire alarm control panel.

2. Release all magnetic door holders on the floor from which alarm was initiated after the alert signal.

3. Transmit a separate alarm signal, via the main fire alarm control unit to the fire department.

4. Unlock the electrically locked exit doors within the zone of alarm.

C. Heat detectors in elevator machine rooms shall, in addition to the above functions, disconnect all power to all elevators served by that machine room after a time delay. The time delay shall be programmed within the fire alarm system programming and be equal to the time it takes for the car to travel from the highest to the lowest level, plus 10 seconds.

D. Smoke detectors in the primary elevator lobbies shall, in addition to the above functions, return all elevators in the bank to the secondary floor.

E. Smoke detectors in the remaining elevator lobbies, elevator machine room, or top of hoistway shall, in addition to the above functions, return all elevators in the bank to the primary floor.

F. Operation of a smoke detector at a corridor door used for automatic closing shall release all magnetic door holders on that floor.

G. Operation of a smoke detector at a smoke shutter used for automatic closing shall release only the shutters on that floor.

H. Operation of duct smoke detectors shall cause a system supervisory condition and shut down the ventilation system and close the associated smoke dampers as appropriate.

I. Operation of any sprinkler or standpipe system valve supervisory switch, high/low air pressure switch, or fire pump alarm switch shall cause a system supervisory condition.

J. Manual Voice Paging Sequence:

1. The System shall be configured to allow selective voice paging.

2. If any speaker manual control switches are activated, the control panel operator shall be able to make announcements via the push-to-talk paging microphone over the pre-selected speakers. When manually selecting speakers for voice paging, evacuation or supervisory tones shall not be delivered to the selected speakers.

3. Facility for total building evacuation and paging shall be provided to allow for activation of speakers. This shall be accomplished by means of an “All Circuit” switch.

4. Each voice control panel will be equipped with custom firmware containing custom voice messages for all clear, drill and testing announcements. Voice messages shall be activated via switch controls. Custom messages shall be developed in conjunction with the Owner and Engineer.

5. Emergency voice/alarm communications shall reproduce prerecorded, synthesized or live messages WITH VOICE INTELLIGIBILITY in the occupied area, this being achieved when the quantity lav-s exceeds a Common Intelligibility Scale (CIS) score of 0.70 or better, as specified in B3 of IEC 60849, Sound Systems for Emergency Purposes, second edition. Preliminary test reports shall include documentation of voice intelligibility

3.5 FIELD QUALITY CONTROL

A. All installation and acceptance inspections shall be performed by a licensed fire alarm technician or planner and be documented on the inspection form.

B. It is the Contractor’s responsibility to coordinate all testing between trades to ensure all necessary personnel are present and prepared at scheduled tests.

C. The Contractor shall perform all tests required by NFPA, State, and Local codes.

D. The Contractor shall verify that all fire alarm device descriptions programmed into the system use the FINAL room names and numbers as developed by the Owner which may be different that the names and numbers used on the Construction Documents.

E. The Owner and Engineer shall be notified before the start of the required tests. All items found at variance with the applicable Codes, Drawings, or Specifications during testing or inspection by a representative of the Authority Having Jurisdiction shall be corrected by Contractor at no charge or expense to the Owner.

F. When the systems have been completed and prior to the scheduling of the final inspection, furnish testing equipment and perform the following tests. When any defects are detected, make repairs or install replacement components, and repeat the tests until such time that the complete fire alarm system meets all contract requirements. After the system has passed the initial test the contractor may request a final inspection.

1. Before energizing the cables and wires, check for correct connections and test for short circuits, ground faults, continuity, and insulation.
2. Test the insulation on all installed cable and wiring by standard methods as recommended by the equipment manufacturer.
3. Run water through all flow switches. Check time delay on water flow switches. Submit a report listing all water flow switch operations and their retard time in seconds.
4. Open each alarm initiating and notification circuit to see if trouble signal actuates.
5. Ground each alarm initiation and notification circuit and verify response of trouble signals.

G. Test reports shall be delivered to the General Contractor as completed.

3.6 TESTING

A. General

1. A written acceptance test procedure (ATP) for testing the fire detection and control components and installation shall be prepared by the installer and approved by the Engineer in accordance with NFPA 72 and this specification. The contractor shall be responsible for the performance of the ATP, demonstrating the function of the system and verifying the correct operation of all system components, circuits, and programming.
2. A program matrix shall be prepared by the installing contractor referencing each alarm input to every output function affected as a result of an alarm condition on that input.
3. The Owner and Engineer shall be notified 10 days before the start of the required tests. All items found at variance with the applicable Codes, Drawings, or Specifications during testing or inspection by a representative of the Authority Having Jurisdiction shall be corrected by the Contractor at no charge or expense to the Owner.
4. Prior to the acceptance test, the installing contractor shall prepare a complete listing of all device labels for alphanumeric annunciator display.

B. Preliminary Testing

1. Preliminary testing shall include all testing necessary to certify the correct operation of the entire fire alarm system. The certification of the fire alarm system is required prior to presenting the system for acceptance testing. Preliminary testing shall include as a minimum a pre-functional test, functional performance test and an integrated system test. It is the contractor's responsibility to schedule, perform and document these tests. A representative from the Owner and Engineer may monitor the preliminary tests but the presence of a representative is not required. No part of the fire alarm system is considered to be accepted at any point prior to the final acceptance test.
2. All intelligent devices shall be tested and logged for correct address and sensitivity using test equipment specifically designed for that purpose.
3. Each notification device shall be individually tested and shall be logged by location. The test report shall include the device type, model number, circuit number, candela or wattage setting, individual device location and test results. For each device a passing

note shall indicate the device meets all codes, specifications and manufacturer's recommendations regarding placement, performance and workmanship

4. Wiring runs shall be tested for continuity, short circuits and grounds before system is energized. Resistance, current and voltage readings shall be made as work progresses.
5. Preliminary testing as required by code and state laws shall be performed and properly documented at the appropriate times during the installation process.
6. On larger projects, multiple preliminary tests shall be performed as each portion of work completed dictates. All preliminary tests shall be completed prior to presenting the fire alarm system for acceptance testing.
7. Documentation of the preliminary testing shall be retained by the certifying company and presented at the acceptance test as part of the project documentation package.

C. Acceptance Testing

1. The acceptance inspector shall use the system record drawings in combination with the documents specified in this Specification during the testing procedure to verify operation as programmed. In conducting the acceptance test, the acceptance inspector shall request demonstration of any or all input and output functions. The items tested shall include but not be limited to the following:
   a. A systematic inspection of all system equipment and components to ensure compliance with these specifications.
   b. A comprehensive test of all peripheral devices.
   c. Testing of all network annunciators to ensure correct display of points.
   d. Manual pull stations shall be tested by pulling the handle and reset with key. The break rod shall be installed at the time the manual pull station has passed the acceptance test. The keys for each manual pull station shall be delivered to the Owner's representative at the time of the acceptance test.
   e. Smoke detectors shall be tested using smoke detector test smoke approved for that purpose.
   f. Each visual notification device shall be checked for correct candela settings. Correct operation and jumper settings of each notification devices shall be verified and listed individually in the inspection report.
   g. The system shall be tested in full general alarm mode for a minimum of 10 minutes.
   h. A complete test of all system functions and controls.
2. In addition to the basic system functions, acceptance testing shall include but not be limited to the following systems appropriate.
   a. Smoke damper operation.
   b. Fire/smoke shutter operation.
3. Secondary power capabilities shall be demonstrated as follows:
   a. System primary power shall be disconnected for a period of seven (7) hours. At the end of that period, an alarm condition shall be created and the system shall perform as specified for a period of five (5) minutes.
   b. System primary power shall be restored for 48 hours and system- charging current shall be normal trickle charge for a fully charged battery pack.
   c. System battery voltages and charging currents shall be checked at the fire alarm control panel using the test codes and displayed on the LCD display.

4. Fireman’s HVAC override system functions shall be demonstrated as follows:

    a. On/off control of each controlled element and test for interaction of other automatic and manual control functions while in the override mode.

    b. Correct status display of monitored elements.

    c. Correct logging of activity to printer and historical memory as programmed.

    d. Contractor shall provide skilled technicians to execute testing. Ensure that they are available and present during the agreed-upon schedules and for sufficient duration to complete the necessary tests, adjustments and problem solving.

5. Correct message display, building, room number, and icon location for each alarm input at the control panel, each remote annunciator display and at the voice control panel.

6. System wiring shall be tested to demonstrate correct system response and correct subsequent system operation in the event of:

    a. Open, shorted and grounded signal line circuits.

    b. Open, shorted and grounded notification and releasing circuits.

    c. Primary power or battery disconnected.

3.7 DOCUMENTATION

A. System documentation shall be furnished to the Owner and shall include but not be limited to the following:

1. System record drawings with wiring details including one set of reproducible masters and drawings on a CD ROM in a DXF format suitable for use in a CAD drafting program.

2. Electronic copy of the system operation, installation and maintenance manual.

3. System matrix showing interaction of all input signals with output commands.

4. Documentation of system voltage, current and resistance readings taken during the installation and testing phases of the system installation.

5. System program showing system functions, controls and labeling of equipment and devices.

3.8 SERVICE CONTRACT

A. The Contractor or manufacturer shall offer for the Owner's consideration at the time of system submittal a priced inspection, maintenance, testing and repair contract in full compliance with the requirements of NFPA. The Owner shall have the option of renewing at the price quoted for single or multiple years up to five (5) years. The contract shall include, at a minimum:

1. A semi-annual configuration audit and report.

2. Complete semi-annual test and inspection, including but not limited to:

    a. Verification of agent storage container pressure.

    b. Verification of agent weight in each agent storage container, either by weighing or through the use of integral liquid level indicator(s). External ultrasonic liquid level measurement devices shall not be used.

    c. Operation of each initiating device, with verification of proper response.

    d. Verification of the complete system sequence of operation, not including shutdown of critical equipment.

e. Verification of proper operation of all indicating devices and signals.

3. Cleaning and sensitivity verification of all smoke detectors. All smoke detectors that do not meet sensitivity verification or do not perform as required in testing shall be exchanged at no additional charge.

4. System firmware and software upgrades for the fire alarm control panel, as required to maintain the listing requirement of the authority having jurisdiction.

5. Under this service contract, trained technicians shall perform inspections and diagnostic tests of panel functions, auxiliary and monitoring functions, and all accessible peripheral devices listed and currently connected to the facility Life Safety System (Fire Alarm System). Tests will be scheduled in advance, and at the convenience of the Owner's schedule.

6. Up to four (4) hours of annual training for the Owner's staff.

7. There shall be no minimum billing for service calls not covered under the Contract. Only actual time for service shall be billed.

8. Emergency service personnel shall be available 24 hours per day, 7 days per week, 365 days per year, to respond to any emergency request. Request for routine or emergency service and /or repairs shall be responded to within eight (8) hours.

9. All accessible components and devices shall be logged for:

   a. Test results and applicable voltage readings.

   b. Any discrepancies found shall be noted individually and on a separate summary page.

   c. NFPA 72 approved documentation.

10. A log book shall be provided. All inspection, testing, service, and maintenance shall be logged by the performing contractor. All documentation associated with the inspection shall be provided to the Owner with three (3) business days of the inspection. Documentation shall include, but not limited to, the following:

    a. Name of the activity.

    b. Date of the activity.

    c. Required frequency of the activity.

    d. Name and contact information, including affiliation, of the person who performed the activity.

    e. NFPA standard(s) referenced for the activity.

    f. Results of the activity.

3.9 TRAINING

A. Formal training for the operation and maintenance of all fire alarm equipment and the systems specified herein shall be given by factory trained and certified personnel.

B. The training shall not take place until all system devices, annunciators and controls have been installed and certified operational by the licensed fire alarm technician. The certifying technician shall be present throughout the training sessions.

C. The Contractor and/or the Systems Manufacturer's representative shall provide a typewritten "Sequence of Operation" including a trouble shooting guide of the entire system. The sequence of operation will be shown for each input in the system in a matrix format and provided in a loose leaf binder. When reading the sequence of operation, the reader will be able to quickly and easily determine what output will occur upon activation of any input in the system. The INPUT/OUTPUT matrix format shall be as shown in Appendix A to NFPA 72.

D. The installation contractor shall furnish training as follows for a minimum of four employees of the system user:

1. Training in the receipt, handling and acknowledgment of alarms.
2. Training in the system operation including manual control of output functions from the system control panel.
3. Training in the testing of the system including logging of detector sensitivity, field test of devices and response to common troubles.
4. The total training requirement shall be a minimum of two (2) hours, but shall be sufficient to cover all items specified.

END OF SECTION

ATTACHMENT "A" PRERECORDED VOICE MESSAGES TEXT

ALL CLEAR

Attention, may I have your attention please.
The fire alarm condition has been cleared.
I repeat.
The fire alarm condition has been cleared.
All systems have been returned to normal.
Thank you for your co-operation.

ALL CLEAR IN SPANISH

Su atencion, por favor
El estado de alerta de fuego ha sido resuelto.
Repito
El estado de alerta de fuego ha sido resuelto.
Todos los sistemas se han normalizado.
Gracias por su cooperacion

TESTING

Attention, may I have your attention please.
We are conducting a test of the life safety system.
Please disregard the audio signals and flashing lights, as they are only a test.
Thank you.

TESTING IN SPANISH

Su atencion, por favor.
Estamos conduciendo una prueba del sistema de seguridad.
Por favor, ignore las senales de audio y las luces intermitentes, porque son solo una prueba.
Gracias

TESTING COMPLETED

Attention, may I have your attention please.
We have completed our test of the life safety system.
All systems have been returned to normal.
Thank you for your co-operation.

TESTING COMPLETED IN SPANISH

Su atencion por favor
Hemos completado nuestra prueba del sistema de seguridad.
Todos los sistemas se han normalizedo.
Repito
Hemos completado nuestra prueba del sistema de seguridad.
Todos los sistemas se han normalizado.
Gracias por su cooperacion.

DRILL MESSAGE

Attention, may I have your attention please.
This is a practice fire drill.
Please follow RACE procedures.
Thank you.

DRILL MESSAGE IN SPANISH

Su atencion por favor.
Este es un simulacro de incendio.
Por favor, siga los procedimientos de R-A-C-E
Gracias

DRILL COMPLETED

Attention, may I have your attention please.
This has been a fire drill.
I repeat
This has been a fire drill.
This is an all-clear notification.
Thank you for your co-operation

DRILL COMPLETED IN SPANISH

Su atencion por favor.
Esto ha sido un simulacro de incendio.
Repito.
Esto ha sido un simulacro de incendio.
Esta es la senal de finalizacion del simulacro.
Gracias por su cooperacion.

END OF ATTACHMENT “A” - SECTION 283100