Item 7hh
June 21, 2018

COLLEGE OF DUPAGE
REGULAR BOARD MEETING

BOARD APPROVAL

---

1. SUBJECT

Library Media Room Project - Student Resource Center

2. REASON FOR CONSIDERATION

A construction contract exceeding the statutory limit of $50,000 must be approved by the Board of Trustees.

3. BACKGROUND INFORMATION

Increasing demand for existing media lab resources and services has created a need for additional space to provide expert help to patrons and optimize space utilization. This project converts and enlarges existing Library classroom SRC 2030 to media lab space. Work will include shifting the east wall approximately six feet east, constructing of two huddle rooms, two media edit booths and providing sixteen edit stations/work carrels.

A legal notice for an Invitation to Bid (Bid # 2018-B0059) was published on May 10, 2018 in the Daily Herald; the invitation was also posted to the College of DuPage Purchasing website and distributed to in-district Chambers of Commerce. Fifty-one (51) vendors were directly solicited. Forty-one (41) vendors downloaded the bid document. A pre-bid meeting was held on May 16, 2018 at 11:00 a.m. in the College of DuPage Purchasing Department Conference Room (BIC 1B03A). A public opening of the bids was held on May 25, 2018 at 9:00 a.m. in the College of DuPage Purchasing Department Conference Room (BIC 1B03A). The following individuals were in attendance: Jacoby Radford (COD Purchasing Manager/Facilitator), Susan Castellanos (COD Buyer/Recorder), Don Inman (COD Senior Project Manager), John Gandor (COD Manager, Facilities/Construction Accountant/Agent of the Board), and four (4) vendor representatives. Four (4) bids were received. No women/minority owned businesses submitted bids.

The following is a recap of the of the bid tabulation:

Vendor	Total Base Bid
Integral Construction Inc.	**$173,200.00**
Reef LLC	$265,500.00
Orbis Construction Inc.	$277,500.00
Structures Construction LLC.	$283,200.00

Recommended award in bold to the lowest responsible bidder.

No alternatives were requested in this bid package; therefore, none is offered in the bid responses.

A successful scope review meeting has been conducted with the lowest bidder, Integral Construction, Inc., who has recently successfully completed several projects at the College.

Budget Status

	FY2018	FY2019 - Proposed		
GL Account	YTD Spend	Annual Budget	YTD Spend	Available Balance
03-90-39029-5804001	$ -	$ 193,587	$ -	$ 193,587
Library Media Room Renovation: Building Remodeling Exps.				
			FY2019 Request	**$ 173,200**

**FY2019 Budget not yet adopted. YTD Spend as of 06/05/2018.*

This purchase supports Goal #8 of the Strategic Long Term Plan: Maintaining, improving and developing structures, systems, and facilities necessary for the delivery of high quality education and meaningful cultural events.

This purchase complies with State Statute, Board Policy and Administrative Procedures.

4. RECOMMENDATION

That the Board of Trustees awards the Library Media Room Project – Student Resource Center contract to the lowest responsible bidder, Integral Construction, Inc., 320 Rocbaar Drive, Romeoville, IL 60446 for the lump sum bid amount of $173,200.00.

Staff Contact: Bruce Schmiedl – Director, Facilities Planning & Development

Item 7hh
June 21, 2018

SIGNATURE PAGE FOR

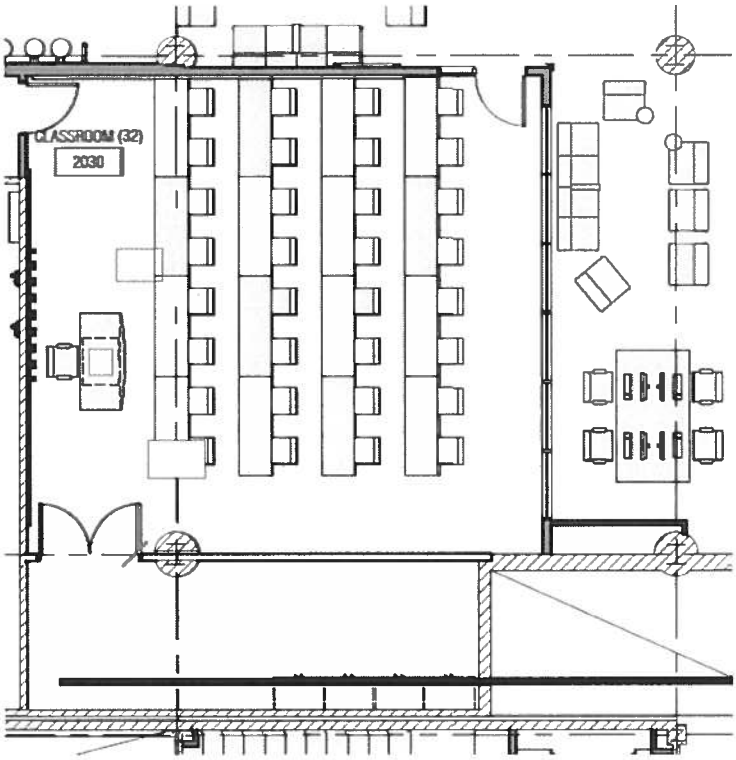
Library Media Room Project – Student Resource Center

ITEM(S) ON REQUEST

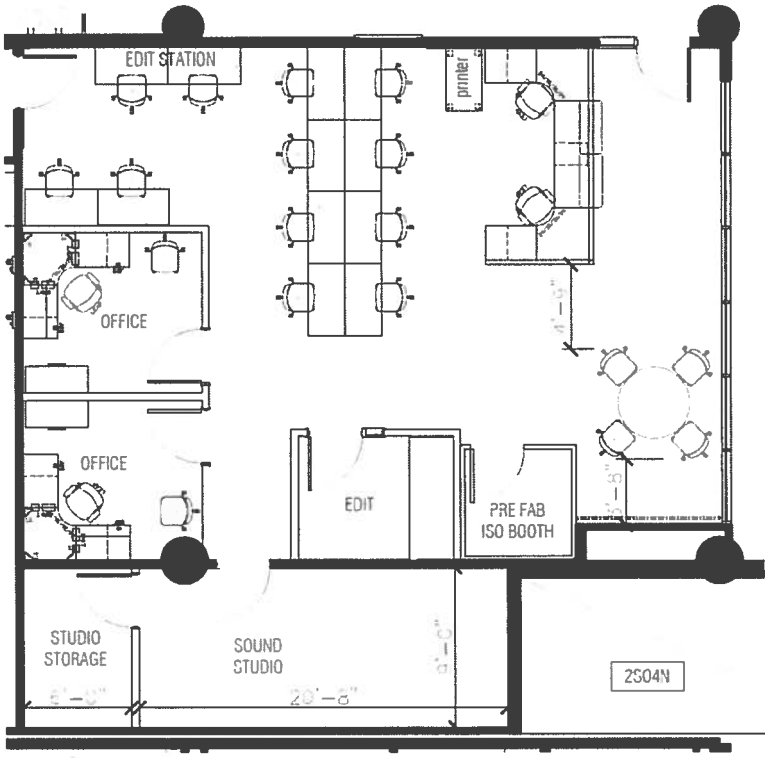
That the Board of Trustees awards the Library Media Room Project - Student Resource Center contract to the lowest responsible bidder, Integral Construction, Inc., 320 Rocbaar Drive, Romeoville, IL 60446 for the lump sum bid amount of $173,200.00.

BOARD CHAIR	DATE 6/21/18
BOARD SECRETARY Christine M. Jamie	DATE 6/21/18

Existing Class Room



New Media Lab (November 2018)



College of DuPage

Purchasing Department

425 Fawell Boulevard
Glen Ellyn, Illinois 60137-6599
PHONE (630) 942-2355
FAX (630) 942-4322

2018-B0059 Student Resource Center Library Media Room Project

ADDENDUM # 1

May 21, 2018

This addendum is being issued to update the specifications and provide additional information.

This information becomes part of the Bid Documents upon receipt. Please review and incorporate into your Bid accordingly.

For which Bids are scheduled to be received on May 25, 2018 no later than 9:00 a.m., Central Time.

Bids will be received by the College of DuPage, District 502, at the office of the Purchasing Manager, Berg Instructional Center (BIC) Building, **Room 1B03**, 425 Fawell Blvd., Glen Ellyn, IL 60137.

The signed Addendum acknowledgment MUST BE RETURNED with your Bid no later than the due date set forth for this Invitation to Bid.

Below are clarifications to this bid:

Section 1 Clarification and Revisions:

1. Refer to Attachment A in this addendum for revisions to the specifications.

Attachment A – Revised Specification

DOCUMENT 00 91 01
ADDENDUM NO. 01

LIBRARY MEDIA LAB RENOVATION

AT

STUDENT RESOURCE CENTER (SRC)
425 22ND ST
GLEN ELLYN, IL 60137

FOR

COLLEGE OF DUPAGE
425 FAWELL BOULEVARD
GLEN ELLYN, IL 60137

1.5 SCOPE

A. This Addendum is issued pursuant to Article 1.1.1 of the AIA General Conditions of the Contract for Construction (A201) in connection with revision of plans and specifications which have been previously issued.

B. When construction is not under contract, all instructions contained herein shall be reflected in the contract sum and this Addendum will be made a part of the Contract Documents, if, as, and when a Contract is awarded.

C. This Addendum forms a part of the Contract Documents and modifies the original Bidding Documents dated 07 MAY 2018. Receipt of this Addendum must be acknowledged in the space provided on the Bid Form. Failure to do so may subject the Bidder to disqualification.

1.6 CHANGES TO THE PROCUREMENT & CONTRACTING REQUIREMENTS GROUP

A. Section 00 01 10 - Table of Contents: The attached revised Section 00 01 10 - Table of Contents, 3 pages, with the revised date 21 May 2018, is hereby made a part of the Contract Documents. Procurement & Contracting Requirements sections of the same number and earlier dates and revisions are hereby void.

1.7 CHANGES TO THE SPECIFICATION GROUP

A. Section 08 71 00 – Finish Door Hardware: The attached revised Section 08 71 00 – Finish Door Hardware, 12 pages, with the revised date 21 May 2018, is hereby

made a part of the Contract Documents. Procurement & Contracting Requirements sections of the same number and earlier dates and revisions are hereby void.

1.8 CHANGES TO DRAWINGS

A. Sheet E00-05 – Technology System Notes and Details:

1. Detail Panduit #DP Series CAT-6 24 & 48 Port Patch Panel: 24 Port Patch Panel is not to be utilized.
2. Data Jack and Patch Panel Labeling Detail: Upper row of data jacks and labels to be arranged in the same manner as the lower row, such that drop location labels to always be below the related data jack with the number above the data jack.
3. Data Jack and Patch Panel Labeling Detail: The “A” and “B” labels on the cover plate to be reversed with “A” on the left and “B” on the right.

END OF ADDENDUM NO. 01

DOCUMENT NO. 00 01 10
TABLE OF CONTENTS

The complete Project Manual for this project consists of this entire bound volume which is not to be separated for any reason. The Architect and Owner will not be responsible for any assumptions made by a Contractor or Subcontractor who does not receive a complete bound Project Manual containing all sections and documents listed in the Table of Contents.

The following listed documents comprise the Project Manual for the College of DuPage – Library Media Lab Renovation. Where numerical sequence of Sections or Divisions is interrupted, such interruptions are intentional.

PROJECT MANUAL

DIVISION 07 - THERMAL AND MOISTURE PROTECTION

DIVISION 08 – OPENINGS

DIVISION 09 - FINISHES

DIVISION 21 – FIRE SUPPRESSION

DIVISION 23 – HEATING, VENTILATING AND AIR CONDITIONING

DIVISION 26 – ELECTRICAL

DIVISION 27 – COMMUNICATIONS

DIVISION 28 – ELECTRONIC SAFETY AND SECURITY

NOTE:

Section number and title in **bold** indicates revised document or section.

* Indicates added document or section.

** Indicates replacement section for previously issued document or section of same name and number.

Strike-through of section number and title indicates document or section deleted.

END OF DOCUMENT

SECTION 08 71 00
FINISH DOOR HARDWARE

PART 1 - GENERAL

1.1 SUMMARY

A. Finish door hardware for swing, sliding and folding doors.

B. Related Sections:

1. Hollow metal doors and frames: Section 08 11 13
2. Flush wood doors: Section 08 14 16
3. Painting: Section 09 91 00

1.2 SUBMITTALS

A. Manufacturer's Literature: Materials description, specifications, installation and maintenance instructions and catalog cut sheets for all items scheduled.

B. Samples:

1. Samples for Verification: Submit minimum 2-by-4-inch plate samples of each type of finish required, except primed finish.
2. Lockset Lever and Rose: One (1) lockset with rose, if any, of each design and finish scheduled in the reviewed hardware schedule. Samples will be returned at the completion of the Work.

C. Hardware Schedule:

1. Provide hardware schedule containing a complete listing of all finish hardware items required for the project, whether or not specifically named in the Specifications or indicated on the Drawings. The Architect's review of the schedule is not to be construed to relieve the Contractor of responsibility for errors or omissions in the schedule, nor of the responsibility to completely equip the project with finish hardware.
2. Include in the schedule each door location, hand of door, complete list of each hardware set item per set, finish, manufacturer of each item and keying information. Use same reference numbers and letters for doors and sets as those on the Contract Documents.

D. Keying Schedule: Submit separate detailed keying schedule for approval indicating clearly how the Owner’s final instructions on keying of locks have been fulfilled.

E. Template Notification: Written notification that required templates and a copy of the final reviewed hardware schedule have been sent to the hollow metal door and frame, manufacturers for use in fabrication.

F. Warranties: Copies of warranty for each item requiring a warranty.

G. Operation and Maintenance Manuals: Upon completion, furnish two (2) complete maintenance manuals to the Owner. Include the following items:

1. Approved hardware schedule, catalog cuts and keying schedule.
2. Hardware installation and adjustment instructions.
3. Manufacturer's written warranty information.
4. Wiring diagrams and operational descriptions for all electronic openings.

1.3 QUALITY ASSURANCE

A. Supplier Qualifications:

1. The hardware supplier is to be an industry recognized company who has maintained and has been furnishing hardware in the project's vicinity for a period of not less than two (2) years.
2. The supplier of the finish hardware is to be a firm with not less than five (5) years of consecutive experience in supplying finish hardware of the quantity and quantity specified for projects similar in size and complexity.
3. The supplier of the finish hardware is to be a firm technically qualified and experienced in supplying building structures with finish hardware.
4. The supplier is to employ a experienced certified Architectural Hardware Consultant (AHC) who is to be available, at reasonable times during the course of the hardware submittals, supply and installation, for consultation about the project hardware requirements to the Owner, Architect and Contractor.
5. Refinements such as butt knuckle, clearance, strike lip lengths and adjustments, beveling of lock faces, handing of doors and centering of backsets will be expected and is to be indicated in the submitted hardware schedule.

B. Supplier Responsibilities: The supplier is responsible for thoroughly detailing the entire project to assure that the items specified will properly function in the indicated locations. Should the items specified not work properly, it is the responsibility of the supplier to furnish suitable items of comparable quality as approved by the Architect to those being furnished throughout the project at no additional cost to the Owner.

C. Installer Qualifications: An experienced installer who has completed 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. Source Limitations: Obtain each type and variety of door hardware from a single manufacturer, unless otherwise indicated.

E. Hardware Sets: 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 are to be brought to the attention of the Architect with corrections made prior to the end of the bidding process. Omitted items not included in a hardware sets are

to be scheduled with the appropriate additional hardware required for proper application and functionality.

F. Underwriters' Laboratory Requirements:

1. Furnish hardware in accordance with NFPA Standard No. 80 and 101 for openings specified, shown or scheduled to receive fire-rated UL labels. In case of conflict between type of hardware specified and type required for fire protection, furnish type required by NFPA and UL at no additional cost to the Owner.
2. Furnish hardware of type approved by UL for usage with the types and sizes of fire doors and frames required. Unless otherwise shown on the Drawings or specified, arrange fire doors to remain in the normally closed position by furnishing each unit with an automatic closing device. Furnish active latch bolts of UL approved throw.
3. Provide exit hardware for fire-rated openings bearing UL markings.

G. Electrified Door Hardware: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

H. Regulatory Requirements: Comply with provisions of the following:

1. Where indicated to comply with accessibility requirements, comply with Americans with Disabilities Act (ADA), "Accessibility Guidelines for Buildings and Facilities".
2. NFPA 101: Comply with the following for means of egress doors:
   a. Latches, Locks, and Exit Devices: Not more than 15 lbf to release the latch. Locks are not to require the use of a key, tool, or special knowledge for operation.
   b. Door Closers: Not more than 30 lbf to set door in motion and not more than 15 lbf to open door to minimum required width.
   c. Thresholds: Not more than 1/2 inch high.

I. Reference Standards:

1. ANSI/BHMA A156

1.4 COORDINATION

A. Coordinate layout and installation of recessed pivots and or closers with floor construction and finishes. Cast anchoring inserts into concrete.

B. Templates: Distribute door hardware templates for doors, frames, and other work specified to be factory prepared for installing door hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

C. Keying Meeting: Conduct meeting with the Owner or Owner's representative prior to submitting the Key schedule for Owner's review. Incorporate keying meeting decisions into final keying schedule including, but not limited to, the following:

1. Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
2. Final key system schematic diagram.
3. Requirements for key control system.
4. Address for delivery of keys.

1.5 DELIVERY, STORAGE AND HANDLING

A. Handle finish hardware in such a manner as to prevent damage. Store in a clean, dry, secure place.

B. Package each set of hardware items together in sets, identified with set numbers in accordance with the final reviewed hardware schedule.

1. Package each item of hardware separately and labeled separately.
2. Include in each package appropriate fastening installation instructions and templates.
3. Deliver a complete schedule with shipped hardware.

C. Should marking of any item become separated from the item, return the item to the supplier for marking.

D. Immediately remove from the job site all damaged or otherwise unsuitable items when so ascertained and replace with an identical item at no additional cost to the Owner.

1.6 WARRANTY

A. Provide Hardware Manufacturer's standard written form in which the hardware item manufacturer agrees to repair or replace door hardware components that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including excessive deflection, cracking, or breakage.
b. Faulty operation of operators and door hardware.
c. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.

2. Warranty Period: Three (3) years from date of Substantial Completion, except as follows:

a. Mortise Locksets: Five (5) years from date of Substantial Completion.
b. Cylindrical Locksets (Grade 1): Five (5) years from date of Substantial Completion.
c. Manual Closers: Ten (10) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS & FINISHES

A. Materials and equipment are contained in the Hardware Schedule.

B. Unless otherwise specified, provide various items of hardware with color and finish matching the finish specified for locksets and latchsets.

C. Provide finishes of the same designation, that come from two or more sources, which match when the items are viewed at arms length and approximately 2 feet apart.

D. Provide hue of color of each finish matching whether or not the base metal is cast, forged or stamped, or when plating is applied over steel, brass or bronze.

E. Provide manufacturer's standard painted finish over bonderized and prime coated metal surfaces where required; the lacquer or enamel matching the finish of the locksets and latchsets unless otherwise specified.

F. Hardware Finishes:

1. Provide finishes as indicated in the herein hardware sets. Provide all other hardware with matching finish unless noted otherwise.
2. The designations used in schedules and elsewhere to indicate hardware finishes are those listed in ANSI/BHMA A156.18 including coordination with traditional U.S. finishes shown by certain manufacturers for their products
3. 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.

2.2 TEMPLATES

A. Fabricate locks, hinges, closers and other hardware, to be mounted on hollow metal doors and frames to templates; furnish with machine screws. Furnish templates to hollow metal door and frame manufacturers and other manufacturers requiring such templates.

2.3 FASTENINGS

A. Furnish hardware with screws and other fastenings suitable to assure permanent anchorage. Where exposed, provide fastenings of countersunk oval head type, (except use flat head for hinges), and matching finish of hardware being attached. Provide concealed fastenings. Exposed through and sex bolts are not acceptable. Do not attach hardware with self-tapping or sheet metal screws. Fasten floor type stops and holders to the floor with machine screws into expansion shields.

2.4 ACCEPTABLE MANUFACTURERS

A. Proprietary names used to designate hardware in the schedule are not intended to imply that products of the manufacturer are required to the exclusion of equivalent products of other herein named or listed manufacturers. The Architect is to be informed in writing in accordance with Section 01 60 00 “Product Requirements” for approval of hardware items and manufacturers not specified on the project prior to submitting the hardware schedule.

1. The manufacturer for each specified hardware item is noted in each hardware set of the Hardware Schedule by abbreviations i.e. (MC) noted below for each hardware item.

B. Manufacturer’s Abbreviations:

1. HA – Hager
2. ME – Medco
3. MK – McKinney
4. LC – LCN
5. GL – Glynn-Johnson
6. NG – National Guard
7. PE – Pemko
8. RO – Rockwood
9. SC – Schlage
10. ST – Stanley
11. IV – Ives
12. OT – By Others

2.5 HARDWARE ITEMS

A. Hanging Devices:

1. Butt Hinges:
   a. Complying with ANSI/BHMA A156.1 Grade 1.
   b. Provide one (1) hinge for every 30 inches of door height.
   c. Provide non-removable pins on all lockable reverse bevel doors.
   d. Provide butt hinges as manufactured by one of the following:
      1) Hager (HA)
      2) McKinney (MC)
      3) Stanley (ST)

B. Flush Bolts And Accessories:

1. Provide manual and automatic flush bolts, dust-proof strikes and related accessories as indicated in the hardware schedule sets.
2. Complying with BHMA A156.16, Grade 1.
3. Provide items as manufactured by one of the following:
   a. Ives (IV)
   b. Trimco (TR)
   c. Rockwood (RO)

C. Cylinders And Keying:

1. Initiate and conduct meeting(s) with Owner to determine system keyway(s) and structure. Furnish Owner's written approval of the system.
   a. Existing factory registered master key system.
   b. Construction keying: Furnish temporary keyed-alike cylinders/cores. Remove at substantial completion and install permanent cylinders/cores in Owner's presence. Demonstrate that construction key no longer operates.
   c. Temporary cylinders/cores remain Supplier's property.
   d. Furnish 10 construction keys.
   e. Furnish 2 construction control keys.
   f. Re-combinate entire project at no extra expense to Owner if missing any keys.
2. Cylinders:
   a. Provide manufacture's standard cylinders and keys of same manufacturer as locksets provided.
   b. Complying with BHMA A156.5, Grade 1.
   c. Provide cylinders as manufactured by the following:
      1) Medeco KeyMark 7-pin S.F.I.C.
   d. All cylinder cores to be face stamped by Medeco as directed by Owner's Lock shop.
3. Keying:
   a. Complying with BHMA A156.28.
   b. Provide locks and cylinders construction master-keyed or temporary cylinders in quantities as directed by General Contractor. Provide all locks and cylinders to be master-keyed or grandmaster-keyed into new key system as directed by the Owner. Provide factory keyed all locks and cylinders. Furnish the following key amounts:
      1) Two (2) cut keys per lock
      2) Two (2) key blanks for each KeyMark core
   c. Send master keys, key blanks, cores and bitting list directly from the factory to the Owner in sealed boxes. Submit signed receipt indicating such quantities received and person receiving to the following address:
      1) College of DuPage
         Facilities Operations & Maintenance – Lock shop
         425 Fawell Blvd.
         Glen Ellyn, IL 60137-6599
   d. All keys to be stamped with "Do Not Duplicate" and appropriate key set.

D. Locking Devices:

1. Mortise Locksets:
   a. Complying with ANSI/BHMA 156.13 Series 1000, Grade 1 Certified.
   b. Provide mortise locksets as manufactured by the following:
      1) Schlage (SC) L9000BD Series x 06N lever/rose design
      2) No substitutions

E. Door Closers - Surface Mounted Door Closers – Heavy Duty:

1. Complying with ANSI/BHMA 156.4, Grade 1 Certified.
2. Do not install closers on exterior or corridor side of doors where possible.

3. Provide surface mounted door closers as manufactured by one of the following:
   a. LCN (LC) 4041 Series
   b. No substitutions

F. Door Trim and Protective Plates:

1. Complying with BHMA A156.6.
2. Provide kick, mop and armor plates fabricated from .050 gauge stainless steel with beveled edges all four sides. Provide heights and widths indicated in the hardware sets.
3. Push plates, pull plates, door pulls and other miscellaneous door trim to be furnished as specified.
4. Provide items as manufactured by one of the following:
   a. Rockwood (RO)
   b. Hiawatha (HI) J102
   c. Trimco (TR) K0050

G. Push Bar:
1. Complying with BHMA A156.6
2. Provide items as manufactured by one of the following:
   a. Rockwood (RO) 47
   b. No substitutions

H. Wall Mounted Door Stops:

1. Complying with BHMA A156.16, Grade 1.
2. Provide wall stops for all doors unless otherwise indicated.
3. Provide wall stops as manufactured by one of the following:
   a. Ives (IV) WS406CVX
   b. Hiawatha (HI) W1326R
   c. Trimco (TR) 1270WX

I. Overhead Stops and Holders:

1. Complying with BHMA A156.8, Grade 1
2. Templating of both surface and concealed overhead stops and holders allows for 85 to 115 degree stop/hold open position.
3. Provide overhead holders as manufactured by one of the following:
   a. Surface mounted: Glynn-Johnson 90 Series
   b. Concealed: Glynn-Johnson 100 Series
   c. No substitutions

J. Weather –Stripping, Gasketing and Thresholds:

1. Provide items as indicated in the hardware sets.
2. Complying with the following:
   a. Weather-Stripping & Gasketing: BHMA A156.22.
   b. Thresholds: BHMA A156.21.
3. Provide threshold units comply with the Americans with Disabilities Act (ADA.)
4. Fire-rated openings, 90min or less duration: use thresholds to interrupt floor covering material under the door where that material has a critical radiant

flux value less than 0.22 watts per square centimeter, per NFPA 253. Use threshold unit as scheduled. If none scheduled, request direction from Architect.

5. Sound control openings: Threshold set in bed of mastic sealant.
6. Provide items as manufactured by one of the following:
   a. Gasketing: National Guard Products 5050B
   b. Threashold: National Guard Products 513, 896S
   c. Pemko (PE)
   d. Reese (RS)

K. Silencers: Furnish rubber door silencers at all hollow metal and/or wood frames; two (2) per pair and three (3) per single door frame.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine and verify all conditions of hardware installations. Installation of finish hardware and related items constitute acceptance of the existing conditions.

3.2 PRE-INSTALLATION ORIENTATION

A. After delivery of hardware and prior to its installation, meet with the installer and manufacturers. Compare approved samples with actual hardware delivered to assure acceptability. Review catalogs, brochures, installation instructions and the final hardware schedule. Rehearse installation procedures and workmanship, with special techniques of installation.

3.3 INSTALLATION

A. 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.

B. Install finish hardware plumb, level and true to line. Install each hardware item in compliance with the manufacturer's printed instructions and recommendations.

C. Install finish hardware using supplied templates for each item. Cut and fit substrate to avoid substrate damage and weakening. Cover cut-outs with hardware item. Mortise work in correct locations and size, without gouging, splintering or causing irregularities in the finished work.

D. Where cutting and fitting is required on substrates to be painted or stained, install, fit and adjust hardware prior to finishing work. Remove finish hardware and place in original packaging. Reinstall hardware after finishing.

E. Attach thresholds to concrete surfaces using drilled-in lead expansion shields and countersunk flat-head bronze or stainless steel screws. Set thresholds in a continuous bed of polyurethane sealant.

3.4 MOUNTING HEIGHTS OF HARDWARE

A. 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. Custom Steel Doors and Frames: DHI's "Recommended Locations for Builders' Hardware for Custom Steel Doors and Frames.
3. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."

B. Where standards or specified heights conflict, consult the Architect for interpretation prior to mounting hardware.

3.5 FIELD QUALITY CONTROL

A. The Architect and hardware supplier will do a final inspection prior to building completion to ensure that all hardware was correctly installed and is in proper working order.

B. Prior to the installation of hardware, manufacturer's representatives for locksets, closers, and exit devices is to arrange and hold a jobsite meeting to instruct the hardware installer's personnel on the proper installation of their respective products. Send a letter of compliance to the Architect indicating when this meeting is to be held and who will be in attendance.

3.6 CLEANING, TRAINING AND FINAL ADJUSTMENT

A. Adjust and check each operating item of hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate freely and smoothly or as intended for the application made.

B. Immediately prior to acceptance of the building by the Owner, lubricate hardware with graphite or special oil, test and adjust moving parts. Clean hardware to remove dust and stains.

C. Instruct Owner's designated personnel in adjustment and maintenance of hardware and finishes during hardware adjustment. Furnish special tools to the Owner's Representative as required to adjust and maintain hardware.

D. Where door hardware is installed more than one month prior to Final Completion or partial occupancy of a space or area, return to the installation during the week prior to Final Completion or partial occupancy and make final check and adjustment of all hardware items in such space or area. Clean operating items as necessary to

restore to proper function and finish of hardware and doors. Adjust door control devices to compensate for final operation of heating and ventilating equipment and air movement so that all items operate properly.

3.7 PROTECTION

A. Protect exposed hardware installed on doors during the construction phase. Install hardware at the latest possible time frame to avoid damage from construction activities. Replace all such damaged hardware at no additional cost to the Owner.

3.8 HARDWARE SCHEDULE

		BHMA Finish No.	MFR.

A. Set 1 (CLIENT REQUESTS TO DISABLE ELECTRIFIED HARDWARE AND CARD READER ACCESS):

3 Hinges	Reuse Existing		
1 Classroom Lock	Reuse Existing		
1 Cylinder Core	Reuse Existing		
1 Floor Stop	Reuse Existing		

B. Set 2:

3 Hinges	BB1279 4.5 X 4.5	26D	HA
1 Storeroom Lock	L9080BD 06N	626	SC
1 Cylinder Core	As Required	626	ME
1 Wall Stop	WS406CVX	630	IV

C. Set 3:

3 Hinges	BB1279 4.5 X 4.5 NRP	26D	HA
1 Classroom Lock	L9070BD 06N	626	SC
1 Cylinder Core	As Required	626	MD
1 Set Acoustic Gasketing	5050C		NG
1 Threshold	896S	613	NG
~~1 Floor Stop~~	~~IVES FS439~~	~~630~~	~~IV~~
1 Wall Stop	**WS406CVX**	**630**	**IV**

D. Set 4:

3 Hinges	BB1279 4.5 X 4.5 NRP	26D	HA
1 Classroom Lock	L9070BD 06N	626	SC
1 Cylinder Core	As Required	626	MD
1 Set Acoustic Gasketing	5050C		NG
1 Threshold	896S	613	NG
~~1 Wall Stop~~	~~WS406CVX~~	~~630~~	~~IV~~
1 Overhead Stop	**904H-US32D**	**630**	**GJ**

E. Set 5:

3 Hinges	BB1279 4.5 X 4.5 NRP	26D	HA
1 Classroom Lock	L9070BD 06N	626	SC
1 Cylinder Core	As Required	626	MD
1 Wall Stop	WS406CVX	630	IV

END OF SECTION

2018-B0059 Student Resource Center Library Media Room Project

ADDENDUM # 1

May 18, 2018

This signed Addendum is required to be returned with your Bid no later than the due date set forth for this Invitation to Bid. If you have already submitted your Bid, please submit this signed form via email to purchasing@cod.edu.

You can submit this completed addendum to the Purchasing Office by one of the means below:

All issued addenda must be signed and returned to the College as per the instructions in the addenda or bid will not be accepted.

ACKNOWLEDGMENT
You can submit this completed addendum to the Purchasing Office by one of the means below:

1. If you have not yet submitted your bid please sign this addendum and include with your sealed bid**.**
2. If you have already submitted your bid, please sign and return to the Purchasing office via email at purchasing@cod.edu no later than the scheduled bid deadline. We will make sure it accompanies your bid.

You also have the option of withdrawing your bid, if necessary.

ACKNOWLEDGEMENT:

I HAVE RECEIVED THIS ADDENDUM #_____

Company Name: _____

Address: _____

Authorized Signature: _____

BIDDER: _____

College of DuPage

COMMUNITY COLLEGE DISTRICT NO. 502

BID NUMBER: 2018-B0059

STUDENT RESOURCE CENTER LIBRARY MEDIA ROOM PROJECT

BIDS DUE: **FRIDAY, MAY 25, 2018 AT 9:00 A.M. CENTRAL TIME**

In the event of College closure due to inclement weather, bid deadline will be extended to the next business day at the same time.

RETURN BIDS TO:

COLLEGE OF DUPAGE
PURCHASING DEPARTMENT
BIC BUILDING, ROOM 1B03
425 FAWELL BLVD.
GLEN ELLYN, ILLINOIS 60137

Issue Date:	**May 10, 2018**

ISSUED BY THE COLLEGE OF DUPAGE PURCHASING DEPARTMENT

Bid No. 2018-B0059

COLLEGE OF DUPAGE

Purchasing Department

425 Fawell Boulevard
Glen Ellyn, Illinois 60137-6599
http://www.cod.edu

PHONE (630) 942-2217

May 10, 2018

INVITATION FOR BID

Sealed bids for **Student Resource Center Library Media Room Project** will be received by the College of DuPage, District 502, at the office of the Purchasing Manager, Berg Instructional Center (BIC) Building, Room 1B03, 425 Fawell Blvd., Glen Ellyn, IL 60137, until **9:00 a.m. Central Time, Friday, May 25, 2018,** at which time they will be publicly opened. In the event of College closure due to inclement weather, bid deadline will be extended to the next business day at the same time.

A pre-bid meeting has been scheduled for **Wednesday, May 16, 2018 at 11:00 a.m.** in the Purchasing Office, BIC 1B03 at 425 Fawell Blvd., Glen Ellyn, IL. 60137. A site visit will immediately follow. The pre-bid conference is not mandatory, but highly recommended.

Any bid received after the date and time stated above will be returned unopened. College of DuPage shall not be responsible for bids that are not received at the specific office location indicated above by the stated deadline. Failure by a delivery service company or person to meet the deadline will not excuse the Respondent from the deadline requirement. It is solely, the bidder's responsibility, to ensure that adequate time is allowed for timely and accurate delivery.

Prices offered shall be F.O.B. Destination, College of DuPage, 425 Fawell Blvd., Glen Ellyn, IL 60137. Prices must be firm. No bids will be accepted on the basis of a price prevailing at the time of shipment.

The award(s) of the contract will be made to the lowest responsible and qualified bidder whose bid complies with all the requirements prescribed. Brand or trade names in bid specifications are used for identification purpose only.

Respondents may download the Bid in addition and any future addenda from the College's Purchasing website at the following URL address: http://cod.edu/about/purchasing/requests/index.aspx.

No bid shall be withdrawn for a period of ninety (90) days after the bid opening date without the consent of the College.

LEGAL NOTICE

BID NOTICE

No. 2018-B0059

The College of DuPage is accepting sealed bids for **Student Resource Center Library Media Room Project.** Bid documents may be downloaded from the Purchasing Website at www.cod.edu/about/purchasing/requests by clicking on the link for this bid and following the instructions.

Bids are due to the College of DuPage Purchasing Department in the Berg Instructional Center (BIC) Building, Room 1B03, 425 Fawell Blvd., Glen Ellyn, IL 60137 up to and no later than **9:00 a.m. Central Time, Friday, May 25, 2018,** at which time they will publicly opened.

A Bid Security in the form of a bid bond, cashier's check or certified check in the amount of 10% of the total base bid is required for this project.

A pre-bid conference and site visit is scheduled for **Wednesday, May 16, 2018 at 11:00 a.m**. in the Purchasing Office, BIC 1B03 at 425 Fawell Blvd, Glen Ellyn Il 60137. A site visit will immediately follow. The pre-bid conference is not mandatory, but highly recommended.

The College of DuPage is committed to the economic development of disadvantaged business enterprises; qualified Minority, Women, and Persons with Disabilities Owned Businesses are highly encouraged to participate

College of DuPage Board of Trustees Reserves the right to reject any and all responses. This invitation is issued in the name of the Board of Trustees of College of DuPage, Community College District 502, Glen Ellyn, Illinois.

Table of Contents

BID SUBMISSION CHECKLIST

Things to Remember When Submitting a Response to an Invitation to Bid for the College of DuPage

1. ☐ **Read the *entire* document.** In your review, note critical items such as: blackout period, required goods and services, submittal dates, submission requirements, etc.

2. ☐ **Note the contact information provided.** The Purchasing Office Buyer at purchasing@cod.edu is the single point of contact for this Invitation to Bid and is the only person with whom you are allowed to communicate regarding this bid. This person is an excellent source of information for any questions you may have.

3. ☐ **Take advantage of the "question and answer" period.** Submit your questions to the Purchasing Department by the date in the Invitation to Bid and view the answers given in the formal addenda issued for the Invitation to Bid. All addenda issued for an Invitation to Bid will be emailed to each company that downloaded the bid documents and will include all questions asked and answered concerning the Invitation to Bid. Please ensure when downloading the bid documents, you use a valid email address.

4. ☐ **Do not alter, add to, or delete and part of the Bid documents without prior approval.** Please refer to the section titled *Exceptions* for instruction on how to request a deviation to the original Invitation to Bid.

5. ☐ **Ensure all Addenda are signed.** Before submitting your response, check the College Purchasing website at http://www.cod.edu/about/purchasing/requests/index.aspx to see whether any addenda were issued for this Bid request. If so, you must submit a signed copy of the addenda along with your bid response.

6. ☐ **Review and read the bid document again to make sure you have addressed all requirements.**
   *Your original response and the requested electronic copy (flash drive) must be identical and be complete.
   *Bids will not be accepted if Sections 6, 7, and 8 are not completed. (Please note there are two (2) signature lines in Section 8 that must be signed.)
   *If your company is a Certified Women-Owned, Minority-owned, or Persons with Disability-owned business, please include a copy of any and all certifications.

7. ☐ **Submit your response on time.** Note the date and time listed on the front page of the Invitation to Bid and be sure to submit all required items on time. Late responses will not be accepted and will be returned, unopened. Ensure the box (s) containing your proposal is appropriately labeled. Please allow adequate time for delivery to the Purchasing Department.

8. ☐ **Important dates to know:**

   - Bid Publication Date – 5/10/18
   - Pre-Bid Meeting – 5/16/18 at 11:00 a.m. Central Time
   - Questions Due – 5/17/18 by 12:00 p.m. Central Time
   - Bids Due – 5/25/18 at 9:00 a.m. Central Time
   - Target Board Approval Date – 6/21/18

1.0 GENERAL INFORMATION

1.1 DEFINITIONS

A. **BIDDER** shall mean the individual or business entity submitting a Bid to supply any or all of the services or goods required by the Bid Documents.

B. **BID** shall mean the Bid Documents as completed by the Bidder which constitutes the Bidder's offer.

C. **CONTRACT** shall mean the agreement between the College and Contractor as set forth in the Bid Documents and as awarded by the College of DuPage Board of Trustees.

D. **BID DOCUMENTS** shall mean collectively the Instructions to Bidders, General Conditions, Special Conditions, Specifications, Attachments, and Addenda, if any, Bid, Site Inspection Certificate, Contractor Certifications and Forms for Minority Participation. The above documents shall be considered as one integrated document setting forth the obligations of the parties.

E. **CONTRACTOR** shall mean the individual or business entity submitting a Bid and to whom the College of DuPage Board of Trustees awards the Contract.

F. **COLLEGE** shall mean the College of DuPage, Community College District No. 502, a body politic and corporate of the State of Illinois.

G. **DIRECTOR** shall mean the person or persons authorized by the College to act in connection with this Contract. Such authorization shall not include any power to change the scope of the Contract or to obligate the College to pay additional sums beyond the amount of the Contract awarded by the College of DuPage Board of Trustees.

H. **PURCHASING MANAGER** shall mean the Purchasing Manager of the College of DuPage.

I. **SPECIFICATIONS** shall mean the description of the required services, Contract Goods, equipment, personnel, volume and use statistics and all requirements for the scope of work set forth in the Bid Documents.

1.2 BIDS TO CONFORM TO REQUIREMENTS OF LEGAL ADVERTISING

The College will not entertain or consider any Bid responses: (i) received after the exact time specified in the legal advertisements; (ii) not accompanied by the required bid deposit/bond, if required; or (iii) in any other way failing to comply fully with the conditions stated in the legal advertisement.

1.3 COMPLIANCE

Submissions under this Invitation to Bid shall be for items at least equal to or better than the quality and performance characteristics stated herein. The burden of proof that product and services meet specifications shall be documented by the bidder and be provided as part of the submitted bid. Failure to provide complete documentation of the product compliance with specifications required may result in bid rejection.

1.4 COMPLIANCE WITH LAWS - PUBLIC CONTRACTS

This Contract is a competitively bid public contract of the College of DuPage subject to laws and ordinances governing public contracts. The Bidder shall at all times observe and comply with all laws, ordinances, regulations and codes of the Federal, State and other local government agencies which may in any manner affect the preparation of the Bid or the performance of the Contract. If the Bidder observes that any of the Bid Documents are at variance therewith, it shall promptly notify the Purchasing Manager in writing and necessary changes shall be effected by appropriate modification.

1.5 REGULATIONS

The Contractor or Subcontractor, warrants that they are familiar with and they shall comply with all Federal, State, and Local Laws, statutes, ordinances, rules and regulations and the orders and decrees of any courts or administrative bodies or tribunals in any manner affecting the performance of the Contract, including, without limitation, Workmen's Compensation Laws, minimum salary and wage statutes and regulations, laws with respect to permits and licenses and fees in connection therewith, laws regarding maximum working hours and regulations with respect to use of explosives. No plea of misunderstanding or ignorance thereof will be considered. Whenever required, the Contractor, or Subcontractor, shall furnish the college with satisfactory proof of compliance with said Federal, State and Local Laws, statutes, ordinances, rules, regulations, orders, and decrees.

1.6 BID MODIFICATIONS

Unless indicated, it is understood that bids are in strict accordance with specification requirements. Bids shall be deemed final, conclusive, and irrevocable. No bid shall be subject to correction or amendment for any error or miscalculation. Bid prices shall include cost of materials as specified, any applicable discounts and shipping. Installation costs shall be included only when indicated on page one. Installation shall include, but is not limited to, all assembly required, setting in place, and mounting all materials at various campus locations.

1.7 PRICES FIRM

All prices quoted in the Bid shall be firm and will not be subject to increase during the term of the Contract awarded to the Contractor, except as otherwise provided in the Bid Documents.

1.8 AWARD OF CONTRACT

The award of the contract will be made within ninety (90) calendar days after the opening of bids to the lowest responsible and qualified bidder whose bid complies with all the requirements prescribed. The successful bidder will be notified by electronic mail that their bid has been accepted and that they have been awarded the contract. Notification will also be posted on the College's Purchasing website at http://www.cod.edu/about/purchasing/ . Failure to execute performance as per accepted bid may result in legal action by the College of DuPage to recover damages.

If a contract is not awarded within ninety (90) days after the opening of bids, a bidder may file a written request with the Purchasing Manager on the withdrawal of their bid and the Purchasing Manager will permit such withdrawal.

The bid security (if required) of all except the three (3) low bidders will be returned promptly after the bids have been checked, tabulated, and the relation of the bids established. Bid security of the three (3) lowest bidders, if required in legal notice, will be returned as soon as the contract and the bond of the successful bidder have been promptly executed and approved. If contracts cannot be awarded promptly, the College may permit the three (3) lowest bidders to substitute bid bonds for bank cashier's checks, bank drafts or certified checks submitted with their bids. Bid bonds executed by corporate surety companies shall be satisfactory to the Owner, but such substitution shall not be made until a period of fifteen (15) days has elapsed after the date of opening of bids and bond forms furnished by the College shall be used.

1.9 CONSIDERATION OF BIDS

The College reserves the right to reject or accept any or all Bid responses, to extend the bidding period, to waive technicalities in the documents and/or to direct that the project be abandoned or rebid prior to award of the Contract.

1.10 COMPETENCY OF BIDDER

No Bid will be accepted from or Contract awarded to a Bidder that is in arrears or is in default to the College upon any debt or Contract, or that is a defaulter, as surety or otherwise upon any obligation to said College, or has failed to perform faithfully any previous contract with the College.

1.11 BIDDER WARRANTIES

The submission of a Bid shall constitute a warranty that: (i) Bidder has carefully and thoroughly reviewed the Bid Documents and has found them complete and free from ambiguities and sufficient to describe the Contract work; (ii) Bidder and all workmen and/or employees it intends to use in the performance of this Contract are skilled and experienced in the type of work or services called for by the Bid Documents; and (iii) neither the Bidder nor any of its employees, agents, suppliers or subcontractors have relied on any verbal representations from the College, or any of the College's employees, agents, or consultants, in preparing the Bid.

1.12 PAYMENT TERMS

All invoices must be provided to the College for services rendered directly to the College. Undisputed invoices will be paid within sixty (60) days of receipt of properly submitted invoices to the Contractor, in accordance with the Local Government Prompt Payment Act.

1.13 PAYMENT REMITTANCE

All College vendors are required to receive payment from the College via an Automated Clearing House (ACH) transfer. Instructions to register for ACH payments will be sent, upon request, to successful bidders. Failure to comply with the ACH requirements may result in termination of the contract or purchase order. College ACH transfers typically occur the third week of each month. Invoices must be received at least 3 weeks prior to each ACH payment release. You are strongly encouraged to set up your account upon notice of award to avoid a delay payment.

1.14 CASH BILLING DISCOUNTS

Cash billing or percentage discounts for payment will not be considered in evaluating Bids.

1.15 LOCAL BUSINESS PREFERENCE

When two (2) or more responsible bidders submit the same low bid, the contract award will be determined by drawing lots in a public meeting unless one bidder is a local bidder within the District boundaries and one is a non-local bidder, in which event the local bidder will be awarded the contract.

1.16 EQUAL EMPLOYMENT OPPORTUNITY

In the hiring of employees for the performance of work under the Contract and any subcontract thereunder, no Contractor or Subcontractor shall, by reason of race, color, sex, religion, national origin, ancestry, age, marital status, disability, unfavorable military discharge or sexual orientation discriminate against any citizen of the United States, in the employment of Labor or workers, who are qualified and available to perform work to which the employment is related. Neither shall any Contractor or Subcontractor, or any person on behalf of either, discriminate against or intimidate any employee hired for the performance of work under this Contract on account of race, color, sex, religion, national origin, ancestry, age, marital status, disability, unfavorable military discharge or sexual orientation.

1.17 TAX EXEMPTION

College of DuPage District #502 is exempt from Federal, State and Municipal taxes. Exemption certificates will be furnished upon request.

1.18 HOLD HARMLESS CLAUSE

The Respondent agrees to indemnify, hold harmless and defend College of DuPage, its agents, servants, and employees, and each of them against, and hold it and them harmless from, any and all lawsuits, claims, demands, liabilities, losses and expenses, including court costs and attorney’s fees, for or on account of any injury to any person, or any death at any time resulting from such injury, or any damage to property, which may arise or which may be alleged to have arisen out of or in connection with the work covered by this contract.

1.19 CONTRACTORS LIABILITY INSURANCE

The Contractor shall not commence work under this contract until all insurance required herein is obtained and approved by the Owner. Nor shall the Contractor allow any subcontractor to commence work until all similar insurance required of the subcontractor has been so obtained.

The Contractor shall furnish the College of DuPage with a Certificate of Insurance, with College of DuPage, its trustees, officers, agents, employees, and any other parties designated by COD named as an additional insured for Commercial General and Automobile Liability, showing the minimum coverage indicated below. Insurance companies must have a Best Rating of at least A VI and otherwise be acceptable to the College. Workers' compensation insurance shall include a waiver of subrogation in favor of the College of DuPage. The College will also be shown as the certificate holder. Further, the Certificate of Insurance shall state that coverage provided is primary to any other coverage available to College of DuPage. An endorsement page showing coverage must accompany the certificate of insurance. The foregoing certificate shall contain a provision that coverage afforded under the policies will not be cancelled or non-renewed until at least sixty (60) days prior written notice has been given to College of DuPage.

TYPE OF INSURANCE	**MINIMUM INSURANCE COVERAGE** Combined Single Limit Per Occurrence/Aggregate
Commercial General Liability including: 1. Premises – Operations 2. Explosion, Underground and Collapse Hazard 3. Products/Completed Operations 4. Contractual Insurance 5. Broad Form Property Damage 6. Independent Contractors 7. Bodily Injury	$1,000,000 / $2,000,000
Automobile Liability Owned, Non-owned, or Rented	$1,000,000 / $2,000,000
Workers' Compensation and Employers' Liability	As Required by Applicable Laws
Professional Liability	If Performance Specifications are Required by the Contract

1.20 PREVAILING WAGE ACT

When applicable, and as a condition of receiving payment, Contractor must pay its employees prevailing wages in the locality in which the work is to be performed as establish for Public Works (construction and maintenance of a public work) prevailing wage and other requirements under Contract for Public Workers 820 ILCS 130/4. When required by the College Contractor shall provide a copy of the certified payroll on request. Contractor is responsible for contacting the Illinois Department of Labor to ensure understanding of prevailing wage requirements.

The prevailing rates of wages are determined by the Illinois Department of Labor and are available on the Department's official website: http://www.illinois.gov/idol/Laws- Rules/CONMED/Pages/prevailing-wage-rates.aspx. The College of DuPage has adopted the resolution regarding the prevailing wage rates for DuPage County in accordance with Illinois Prevailing Wage Act and are available the College's website: http://www.cod.edu/about/purchasing/illinois_prevailing_wage_act.aspx .

1.21 BUSINESS ENTERPRISE PROGRAM

The College of DuPage encourages the participation of qualified minorities, females, and persons with disabilities owned businesses in public contracts. It is the practice of the College to ensure full and equitable economic opportunities to persons and businesses that compete for business with the College of DuPage, including minorities, females, and persons with disabilities owned business enterprises The College is committed to the economic development of disadvantaged business enterprises and the

award of contracts to businesses owned by minorities, females, and persons with disabilities for services to the extent provided by the Business Enterprise for Minorities, Females and Persons with Disabilities Act (“Act”), 30 ILCS 575.

END OF SECTION

2.0 INSTRUCTIONS TO BIDDERS

2.1 OUTSIDE DOCUMENT DISCLAIMER

The College of DuPage cannot warrant, represent, or guarantee the accuracy or completeness of documents which have not been obtained directly from the College. If you have obtained these documents from a third party source, the College is not responsible for any loss or damage including, but not limited to, time, money, or goodwill arising from errors, inaccuracies or omissions in any third party bid documents.

To obtain official documents, please visit: https://www.cod.edu/about/purchasing/requests/index.aspx . Click on the link for this project, and follow the prompts to enter your information onto our vendor list and download the original documents. This will ensure your contact information is registered on our vendor list, and we can send you any addenda that may be issued. This website is the only official website for prospective bidders to obtain digital copies of bid documents. It is the responsibility of each prospective bidder to verify the completeness of their printed bid documents before submitting a bid and accompanying executed addenda acknowledgement, and other required forms.

2.2 BLACKOUT PERIOD

Under no circumstances are respondents to contact or discuss this Invitation to Bid, or any of the information contained herein or about this project in general, with any College of DuPage trustee, employee, vendor, contractor or subcontractor, other than using the methods outlined in this bid. Respondents are strictly forbidden from visiting the College's locations or approaching any College trustee, employee, vendor, contractor or subcontractor for any information related to this Invitation to Bid or this project without the direct knowledge and authorization in writing in advance from the Purchasing Manager or Buyer. Violation of these provisions may subject the respondent to immediate disqualification.

Initial your understanding of this requirement_____

2.3 REQUESTS FOR INFORMATION/CLARIFICATION

If any firm submitting a bid for this project is in doubt as to the true meaning of the specifications or other documents or any part thereof, bidder shall request clarification from the Purchasing Department. Questions must be submitted in writing and be directed via email to the Purchasing Department at purchasing@cod.edu no later than **May17, 2018 at 12:00 p.m. Central Time**. Questions for which answers are provided will be communicated to all registered recipients of bid documents via addendum. All issued addenda must be signed and returned to the College as per the instructions in the addenda or bid will not be accepted.

2.4 PRE-BID MEETING

The College will hold a Pre-Bid Meeting at the College of DuPage, Glen Ellyn Campus, 425 Fawell Blvd, Berg Instructional Center, Room 1B03A, Glen Ellyn, IL at **11:00 a.m. Central Time on Wednesday, May 16, 2018**. All parties interested in responding to the BID are urged to attend in person. The College will clarify the objectives of the BID and answer questions during the Pre-Bid Meeting.

2.5 BID DEADLINE AND SUBMISSION

To be assured of consideration, Bids must be received by the College of DuPage in the College's in Purchasing Department, BIC-1B03, no later than **9:00 a.m. Central Time on Friday, May 25, 2018.** Failure by a delivery service company or person to meet the deadline will not excuse the Bidder from the deadline requirement. It is solely the Bidder's responsibility to ensure that adequate time is allowed for timely, accurate delivery and that the Bid is received as required.

All Bidders shall submit:

One (1) *sealed* original copy of the Bid and one flash drive containing all completed documents

Bids must be in a sealed envelope and delivered to:

ATTN: Bid No. 2018-B0059
Purchasing Manager
College of DuPage
BIC Building - Room 1B03
425 Fawell Blvd.
Glen Ellyn, Illinois 60137

Bids must be received by the date and hour of the Bid Opening as shown in the legal advertisement. The sealed envelope submitted by the Bidder shall carry the following information on the face of the envelope: Bidder's name, address, Bid Notice Number, advertised date of Bid Opening and the hour designated for Bid Opening as shown in the legal advertisement. Unless otherwise stated, all blank spaces on the bid forms shall be fully completed. Bidder bears all responsibility for error or omissions in the submission of the Bid.

2.6 EXCEPTIONS

If any Respondent intends to take any deviations or exceptions from the Specifications or other bid Documents, Respondent shall submit to the Purchasing Manager/Buyer a written request for a deviation or exception at least 5 business days prior to the date and time of advertised bid opening date. If the Project Manager considers such deviation or exception acceptable, the Purchasing Manager/Buyer shall issue an Addendum setting forth such deviation or exception from the Specifications or other which shall be applicable to all Respondents submitting a response.

If no Addendum is issued by the Purchasing Manager/Buyer, then such deviation or exception shall be deemed rejected.

The College may reject any response containing deviations or exceptions not previously accepted through a written Addendum. A copy of such Addendum will be e-mailed or delivered to each Respondent receiving a set of such bid Documents. Respondent shall acknowledge receipt of each Addendum issued in the space provided on the bid form or via a signed addendum. Failure to acknowledge receipt of addenda may result in disqualification of the Bid. All written requests for deviations or exceptions shall be sent to purchasing@cod.edu.

Initial understanding of this requirement: _____

2.7 ERROR IN BID

Where a bidder claims to have made a mistake, such mistake must be called to the attention of the Purchasing Manager within twenty-four (24) hours after the opening of bids. Within forty-eight (48) hours of the bid opening, bidder shall submit to the College's designated contracting officer original documentary evidence and a detailed explanation of how the mistake was made. Failure to conform to this requirement precludes the bidder from withdrawing its bid based upon a bid mistake. If such notice, proof and explanations have been tendered, and the contracting officer is convinced that a bona fide mistake has been made, the contracting officer may recommend to the Board of Trustees that the bidder be allowed to withdraw its bid and recommend that the bid be awarded to the next lowest responsible, responsive bidder. If the Board determines by majority vote, that the bidder has made a bona fide error, no award will be made upon such bid and the bid security will be returned.

2.8 WITHDRAWAL OF BIDS

Bidders may withdraw their Bids at any time prior to the time specified in the legal advertisement as the date and hour set for the Bid Opening. However, no Bidder shall withdraw, cancel or modify its Bid response for a period of ninety (90) calendar days after said advertised Bid Opening.

2.9 NOTICES

All communications and notices between the College and Bidders regarding the Bid Documents shall be in writing and hand delivered or delivered via United States mail, postage prepaid, or via email. Notices to the Bidders shall be addressed to the name and address or email address provided by the Bidders; notices

to the Purchasing Manager shall be addressed to Purchasing Department, College of DuPage, BIC Building - Room 1B03, 425 Fawell Blvd., Glen Ellyn, Illinois 60137, or purchasing@cod.edu.

2.10 BID DEPOSIT

When required in the legal advertisement, the Bid shall be accompanied by cashier's check, certified check or surety bond in the amount shown in the legal advertisement or as may be prescribed in these Bid Documents. A certified or cashier's check shall be drawn on a responsible bank doing business in the United States and shall be made payable to the order of the College of DuPage. The Surety issuing the bond must have a general rating of "A", and shall be a Class V or higher in the financial size category as defined by Best's Key Rating Guide - Property and Casualty. Failure to submit the bid deposit shall constitute an informal Bid and such Bid shall be rejected.

The Bidder hereby agrees that the bid deposit shall be forfeited to the College as liquidated damages and not as penalty in the event Bidder fails to comply with the terms of this invitation to bid, or otherwise fails or refuses to honor the Bid upon award of the Contract by the College.

The bid deposit of all bidders will be returned, with the exception of the winning Contractor, after the College has awarded the Contract. The bid deposit of the Contractor will be returned after the Contract has been awarded and the Contractor has submitted all insurance documentation and the Performance and Payment Bond, as required by the Bid Documents.

***This project requires a bid deposit in the amount of 10% of the total base bid.**

2.11 PERFORMANCE AND PAYMENT BOND

The successful Bidder shall furnish a Performance and Payment Bond in the full amount of the Contract on the College Bid Form. The Surety issuing the Performance and Payment Bond must have a general rating of "A" and shall be a Class V or higher in the financial size category as defined by Best's Key Rating Guide-Property and Casualty.

In the event that the Bidder fails to furnish the Performance and Payment Bond within fourteen (14) calendar days after service of the Notice of Award, the College may elect to retain Bidder's bid deposit as liquidated damages and not as a penalty and the Contract may be terminated. The parties agree that the sum of the bid deposit is a fair estimate of the amount of damages that the College will sustain due to the Bidder's failure to furnish the Performance and Payment Bond and the termination of the Contract.

END OF SECTION

3.0 BID SPECIFICATIONS

Scope of Work –Student Resource Center Library Media Room Project

All work as indicated on Perkins+Will specifications and drawings in Exhibit A, Project Manual, Exhibit B, Specification Drawings, and as noted below:

This project is intended to be awarded in the late Spring of 2018, with contracts, submittals and coordination to occur which allows demolition to begin the last week in June and complete the fourth week of August.

This project permitting authority is the Village of Glen Ellyn. Prior to the College receiving a permit, the awarded Contractor and their subcontractors must be registered with the Village of Glen Ellyn. The College has submitted the application for permit, and will pay the review and inspection fees to obtain the partial permit for construction. Fire Alarm and Sprinkler submittals are submitted by this contractor. Review and Inspection fees for those two trades are paid by the Contractor, who will be reimbursed by the College.

Awarded bidder will execute unaltered and comply with terms and conditions of sample contract, Exhibit D, attached to this bid package.

Prior to final payment, contractor will provide all certified payrolls and completed prevailing wage forms, Exhibit C, (attached to this bid package) for all companies performing work on the campus under this agreement.

Bidders are aware that the Library will be in operation and all work will be scheduled only with approval of Project Manager, in conjunction with the Library operator. Contractor will provide temporary partitions to accommodate dust control when necessary.

Prior to installing any new data or power lines that will feed furniture, Contractor will coordinator with College staff to determine final location of data ports, receptacles, etc.

END OF SECTION

4.0 BID FORM

2018-B0059 Student Resource Center Library Media Room Project

FIRM NAME, CONTACT NAME and PHONE NUMBER

_____

_____

_____

The below prices include all stipulations and requirements of Addenda No. _____

Proposes to furnish all labor, materials, equipment and services as required to satisfactorily complete all work described here in as required for the construction and completion of the project where bid below.

Student Resource Center Library Media Room Project	
Total Base Bid	$

Comments:

_____

_____

_____

Submitted by: _____(printed)

Submitted by: _____(signed)

END OF SECTION

5.0 BUSINESS ENTERPRISE PROGRAM

STATE OF ILLINOIS
BUSINESS ENTERPRISE PROGRAM
MINORITIES, FEMALES, PERSONS WITH DISABILITY
PARTICIPATION AND UTILIZATION PLAN

The Business Enterprise for Minorities, Females and Persons with Disabilities Act (BEP) establishes a goal for community colleges contracting with businesses that have been certified as owned and controlled by persons who are minorities (MBE), female (FBE/ also referred to as WBE), or persons with disabilities (PDBE) (collectively, BEP certified vendor(s)). 30 ILCS 575

Contract Goal to be Achieved by Vendor: This solicitation includes a specific **BEP** participation goal of 20% based on the availability of BEP certified vendors to perform or provide the anticipated services and/or supplies required by this solicitation.

The BEP participation goal is applicable to all bids or offers. In addition to the award criteria established for this solicitation, the College will award this contract to a Vendor that meets the goal or demonstrates good faith efforts to meet the goal. This goal is applicable to change orders and allowances within the scope of work provided by the BEP certified vendors. If Vendor is an MBE and FBE certified vendor, the entire goal is met and no subcontracting with a BEP certified vendors is required; however, **Vendor must submit a Utilization Plan indicating that the goal will be met by self-performance.**

Following are guidelines for Vendor's completion of the Utilization Plan. The Utilization Plan must demonstrate that Vendor has either: (1) met the entire contract goal; or (2) made good faith efforts towards meeting the goal.

At the time of bid or offer, Vendor, or Vendor's proposed Subcontractor, must be certified with the Illinois Department of Central Management Services as a BEP certified vendor**.**

Failure to complete a Utilization Plan or provide Good Faith Effort documentation shall render the bid or offer non-responsive; and subject to rejection and/or disqualification in the College's sole discretion.

1. If applicable where there is more than one prime vendor, the Utilization Plan should include an executed Joint Venture Agreement specifying the terms and conditions of the relationship between the parties and their relationship and responsibilities to the contract. The Joint Venture Agreement must clearly evidence that the BEP certified vendor will be responsible for a clearly defined portion of the work and that its responsibilities, risks, profits and contributions of capital, and personnel are proportionate to its ownership percentage. It must include specific details related to the parties' contributions of capital, personnel, and equipment and share of the costs of insurance and other items; the scopes to be performed by the BEP certified vendor under its supervision; and the commitment of management, supervisory personnel, and operative personnel employed by the BEP certified vendor to be dedicated to the performance of the contract. Established Joint Venture Agreements will only be credited toward BEP goal achievements for specific work performed by the BEP certified vendor. **Each party to the Joint Venture Agreement must execute the bid or offer prior to submission of the bid or offer to the College.**

2. An agreement between a vendor and a BEP certified vendor in which a BEP certified vendor promises not to provide subcontracting or pricing quotations to other vendors is prohibited. The College may

request additional information to demonstrate compliance. Vendor agrees to cooperate promptly with the College in submitting to interviews, allowing entry to places of business, providing further documentation, and to soliciting the cooperation of a proposed BEP certified vendor. Failure to cooperate by Vendor and BEP certified vendor may render the bidder or offeror non-responsive or not responsible. **The contract will not be awarded to Vendor unless Vendor's Utilization Plan is approved by the College.**

3. **BEP Certified Vendor Locator References:** Vendor may consult CMS' BEP Vendor Directory at www.sell2.illinois.gov/cms/business, as well as the directories of other certifying agencies, but firms **must be certified with CMS as BEP certified vendors at the time of bid or offer.**

4. **Vendor Assurance:** Vendor shall not discriminate on the basis of race, color, national origin, sexual orientation or sex in the performance of this contract. Failure by Vendor to carry out these requirements is a material breach of this contract, which may result in the termination of this contract or such other remedy, as the College deems appropriate. This assurance must be included in each subcontract that Vendor signs with a subcontractor or supplier.

5. **Calculating BEP Certified Vendor Participation:** The Utilization Plan documents work anticipated to be performed, or goods/equipment provided by all BEP certified vendors and paid for upon satisfactory completion/delivery. Only the value of payments made for the work actually performed by BEP certified vendors, by subcontractors or suppliers to such vendors, is counted toward the contract goal. Applicable guidelines for counting payments attributable to contract goals are summarized below:

    5.1 The value of the work actually performed or goods/equipment provided by the BEP certified vendor shall be counted towards the goal. The entire amount of that portion of the contract that is performed by the BEP certified vendor, including supplies purchased or equipment leased by the BEP certified vendor shall be counted, except supplies purchased and equipment rented from the Prime Vendor submitting this bid or offer.

    5.2 A vendor shall count the portion of the total dollar value of the BEP contract equal to the distinct, clearly defined portion of the work of the contract that the BEP certified vendor performs toward the goal. A vendor shall also count the dollar value of work subcontracted to other BEP certified vendor. Work performed by the non- BEP certified party shall not be counted toward the goal. **Work that a BEP certified vendor subcontracts to a non-BEP certified vendor will not count towards the goal.**

    5.3 A Vendor shall count toward the goal 100% of its expenditures for materials and supplies required under the contract and obtained from a BEP certified vendor manufacturer, BEP certified regular dealer, or BEP certified supplier. A Vendor shall count toward the goal the following expenditures to BEP certified vendors that are not manufacturers, regular dealers, or suppliers:

        5.3.1 The fees or commissions charged for providing a bona fide service, such as professional, technical, consultant or managerial services and assistance in the procurement of essential personnel, facilities, equipment, materials or supplies required for performance of the contract, provided that the fee or commission is determined by College to be reasonable and not excessive as compared with fees customarily allowed for similar services.

5.3.2 The fees charged for delivery of materials and supplies required by the contract (but not the cost of the materials and supplies themselves) when the hauler, trucker, or delivery service is not also the manufacturer or a supplier of the materials and supplies being procured, provided that the fee is determined by the College to be reasonable and not excessive as compared with fees customarily allowed for similar services. The BEP certified vendor's trucking firm must be responsible for the management and supervision of the entire trucking operation for which it is responsible on the contract, and must itself own and operate at least one fully licensed, insured and operational truck used on the contract.

5.3.3 The fees or commissions charged for providing any bonds or insurance specifically required for the performance of the contract, provided that the fee or commission is determined by the College to be reasonable and not excessive as compared with fees customarily allowed for similar services.

5.4 BEP certified vendors who are performing on contract as second tier subcontractors may be counted in meeting the established BEP goal for this contract as long as the Prime Vendor can provide documentation indicating the utilization of these vendors.

5.5 A Vendor shall count towards the goal only expenditures to firms that perform a commercially useful function in the work of the contract.

5.5.1 A firm is considered to perform a commercially useful function when it is responsible for execution of a distinct element of the work of a contract and carries out its responsibilities by actually performing, managing, and supervising the work involved. The BEP certified vendor must also be responsible, with respect to materials or supplies used on the contract, for negotiating price, determining quality and quantity, ordering the materials or supplies, and installing the materials (where applicable) and paying for the material or supplies. To determine whether a firm is performing a commercially useful function, the College shall evaluate the amount of work subcontracted, whether the amount the firm is to be paid under the contract is commensurate with the work it is actually performing and the credit claimed for its performance of the work, industry practices, and other relevant factors.

5.5.2 A BEP certified vendor does not perform a commercially useful function if its role is limited to that of an extra participant in a transaction or contract through which funds are passed through in order to obtain BEP certified vendor participation. In determining whether a BEP certified vendor is such an extra participant, the College shall examine similar transactions, particularly those in which BEP certified vendors do not participate, and industry practices.

5.6 A Vendor shall not count towards the goal expenditures that are not direct, necessary and related to the work of the contract. Only the amount of services or goods that are directly attributable to the performance of the contract shall be counted. Ineligible expenditures include general office overhead or other Vendor support activities.

6. Good Faith Effort Procedures: Vendor must submit Utilization Plans, subcontract documents, and/or Letters of Intent that meet or exceed the published goal. If Vendor cannot meet the stated goal, Vendor must document and explain within the Utilization Plan the good faith efforts it undertook to meet the goal. Utilization Plans are due at the time of and must be enclosed and sealed with the bid

or offer submission. Copies of subcontract documents and/or Letters of Intent shall be due upon request.

7. **Contract Compliance:** Compliance with this section is an essential part of the contract. The following administrative procedures and remedies govern Vendor's compliance with the contractual obligations established by the Utilization Plan. **After approval of the Plan and award of the contract, the Utilization Plan becomes part of the contract.** If Vendor did not succeed in obtaining BEP certified vendor participation to achieve the goal and the Utilization Plan was approved and contract awarded based upon a determination of good faith, the total dollar value of BEP certified vendor work calculated in the approved Utilization Plan as a percentage of the awarded contract value shall become the contract goal.

    7.1. The Utilization Plan may not be amended after contract execution without the College's prior written approval.

    7.2. **Vendor may not make changes to its contractual BEP certified vendor commitments or substitute BEP certified vendors without the prior written approval of the College**. Unauthorized changes or substitutions, including performing the work designated for a BEP certified vendor with Vendor's own forces, shall be a violation of the utilization plan and a breach of the contract, and shall be cause to terminate the contract, and/or seek other contract remedies or sanctions.

    7.3. If it becomes necessary to substitute a BEP certified vendor or otherwise change the Utilization Plan, Vendor must notify the College in writing of the request to substitute a BEP certified vendor or otherwise change the Utilization Plan. The request must state specific reasons for the substitution or change. The College shall notify the Council or its delegate of the request to substitute a BEP certified vendor or change the Utilization Plan. The College reserves the right to approve or deny a request for substitution or other change in the Utilization Plan.

    7.4. Where Vendor has established the basis for the substitution to the College's satisfaction, it must make good faith efforts to meet the contract goal by substituting a BEP certified vendor. Documentation of a replacement BEP certified vendor, or of good faith efforts to replace the BEP certified vendor, must meet the requirements of the initial Utilization Plan. If the goal cannot be reached and good faith efforts have been made, Vendor may substitute with a non- BEP certified vendor or Vendor may perform the work.

    7.5. If a Vendor plans to hire a subcontractor for any scope of work that was not previously disclosed in the Utilization Plan, Vendor must obtain the approval of the College to modify the Utilization Plan and must make good faith efforts to ensure that BEP certified vendors have a fair opportunity to submit a bid or offer on the new scope of work.

    7.6. A new BEP certified vendor agreement must be executed and submitted to the College within five business days of Vendor's receipt of the College's approval for the substitution or other change.

    7.7. Vendor shall maintain a record of all relevant data with respect to the utilization of BEP certified vendors, including but without limitation, payroll records, invoices, canceled checks and books of account for a period of at least three years after the completion of the contract. Full access to these records shall be granted by Vendor upon 48 hours written demand by the College to any duly authorized representative thereof, or to any

municipal, state or federal authorities. The College shall have the right to obtain from Vendor any additional data reasonably related or necessary to verify any representations by Vendor. After the performance of the final item of work or delivery of material by the BEP certified vendor and final payment to the BEP certified vendor by Vendor, but not later than 30 calendar days after such payment, Vendor shall submit a statement confirming the final payment and the total payments made to the BEP certified vendor under the contract.

7.8. The College will periodically review Vendor's compliance with these provisions and the terms of its contract. Without limitation, Vendor's failure to comply with these provisions or its contractual commitments as contained in the Utilization Plan, failure to cooperate in providing information regarding its compliance with these provisions or its Utilization Plan, or provision of false or misleading information or statements concerning compliance, certification status or eligibility of the BEP certified vendor, good faith efforts or any other material fact or representation shall constitute a material breach of this contract and entitle the College to declare a default, terminate the contract, or exercise those remedies provided for in the contract or at law or in equity.

7.9. The College reserves the right to withhold payment to Vendor to enforce these provisions and Vendor's contractual commitments. Final payment shall not be made pursuant to the contract until Vendor submits sufficient documentation demonstrating compliance with its Utilization Plan.

UTILIZATION PLAN

The Utilization Plan and Letter of Intent must be sealed and submitted with Proposal.

_____ (Vendor) submits the following Utilization Plan as part
Respondent Name

of our bid or offer in accordance with the requirements of the BEP Program Status and Participation section of the solicitation for **Student Resource Center Library Media Room Project, Bid Number 2018-B0059**. We understand that all subcontractors must be certified with the CMS BEP Program at the time of submission of all bids and offers. **We understand that compliance with this section is an essential part of this contract and that the Utilization Plan will become a part of the contract, if awarded.**

Vendor submits the following statement:

- ☐ Vendor is a BEP certified firm and plans to fully meet the goal through self-performance.
- ☐ Vendor has identified BEP certified subcontractor(s) to fully meet the established goal and submits the attached executed Letter(s) of Intent; or
- ☐ Vendor has made good faith efforts towards meeting the entire goal as indicated on the attached Utilization Plan, or a portion of the goal, and hereby requests a waiver (complete checklist below).

Vendor's person responsible for compliance with this BEP goal:

Name: _____ Title: _____

Telephone: _____ Email: _____

DEMONSTRATION OF GOOD FAITH EFFORTS TO ACHIEVE GOAL AND REQUEST FOR WAIVER

If the BEP participation goal was not achieved, the vendor must provide documented evidence of good faith efforts to achieve the goal.

Below is a checklist of actions that will be used to evaluate a Vendor's Demonstration of Good Faith Efforts and Request for Waiver. **Please check the actions which you completed.** If any other efforts were made to obtain BEP participation in addition to the items listed below, attach a detailed description of such efforts. The College reserves the right to review and audit the results of the vendor's efforts as described below.

- ☐ Utilize the Sell2Illinois website: www2.illinois.gov/cms/business to identify BEP certified vendors within the respective commodity/service codes denoted above and at a minimum email all listed vendors and solicit quotes from all vendors who express an interest via follow-up emails or telephone calls.

- ☐ Solicit through all reasonable and available means (e.g., attendance at a vendor conference, advertising and/or written notices) the interest of BEP certified vendors that have the capability to perform the work of the contract. Vendor must solicit this interest within sufficient time to allow the BEP certified vendors to respond to the solicitation. Vendor must determine with certainty if the BEP certified vendors are interested by taking appropriate steps to follow up initial solicitations and encourage them to submit a bid or proposal. Vendor must provide interested BEP certified vendors with adequate information about the plans, specifications, and requirements of the contract in a timely manner to assist them in responding promptly to the solicitation.

- ☐ Select portions of the work to be performed by BEP certified vendors in order to increase the likelihood that the goal will be achieved. This includes, where appropriate, breaking out contract work items into economically feasible units to facilitate BEP certified vendor participation, even when Vendor might otherwise prefer to perform these work items with its own forces.

- ☐ Make a portion of the work available to BEP certified vendors and selecting those portions of the work or material needs consistent with their availability, so as to facilitate BEP certified vendor participation.

- ☐ Negotiate in good faith with interested BEP certified vendors. Evidence of such negotiation must include the names, addresses, email addresses, and telephone numbers of BEP certified vendors that were considered and an explanation as to why an agreement could not be reached.

- ☐ Thoroughly investigate the capabilities of BEP certified vendors and not reject them as unqualified without sound reasons.

- ☐ Make efforts to assist interested BEP certified vendors in obtaining lines of credit or insurance as required by the College.

- ☐ Make efforts to assist interested BEP certified vendors in obtaining necessary equipment, supplies, materials, or related assistance or services.

6.0 CERTIFICATIONS **Required**

IMPORTANT: All bidders are required to complete and sign this form. Completed form must be returned with bid no later than the advertised bid deadline. Failure to return this completed form may result in disqualification of bid.

THE UNDERSIGNED IS CAUTIONED TO CAREFULLY READ THESE CERTIFICATIONS PRIOR TO SIGNING THE SIGNATURE PAGE. SIGNING THE SIGNATURE PAGE SHALL CONSTITUTE A WARRANTY BY THE UNDERSIGNED THAT ALL THE STATEMENTS, CERTIFICATIONS AND INFORMATION SET FORTH WITHIN THESE CERTIFICATIONS ARE TRUE, COMPLETE AND CORRECT AS OF THE DATE THE SIGNATURE PAGE IS SIGNED. THE UNDERSIGNED IS NOTIFIED THAT IF THE COLLEGE LEARNS THAT ANY OF THE FOLLOWING CERTIFICATIONS WERE FALSELY MADE, THAT ANY CONTRACT ENTERED INTO WITH THE UNDERSIGNED SHALL BE SUBJECT TO TERMINATION.

A. Prevailing Wage Act. To the extent required by law, Contractor shall not pay less than the prevailing wage as established pursuant to an Act Regulating the Wages of Laborers, Mechanics, and Other Workman employed under Contract for Public Workers 820 ILCS 130/1 *et seq.* Our company certifies that it is eligible for bidding on public contracts and has complied with section 11a of the Prevailing Wage Act, 820 ILCS 130.01-12. **Yes**_____ **No** _____

B. Human Rights Act. To the extent required by law, Contractor shall abide by the Illinois Human Rights Act, 775 ILCS 10/0.01 *et seq.*

C. Drug Free Workplace. To the extent required by law, Contractor shall abide with the requirements of the Drug Free Workplace Act 30 ILCS 580.1 *et seq.*

D. Sexual Harassment Policy. Contractor represents by the signing of this agreement that it has a written sexual harassment policy that is in accordance with 775 ILCS 5/2-105 (A) (4).

E. Non-debarment. By executing this agreement Contractor certifies that it has not been debarred from public contracts in the State of Illinois for violating either 33E-3 or 33E-4 of the Public Contracts Act, 720 ILCS 5/33E-1 *et seq.*

F. Fair Employment Practice: Company is in compliance with all State and Federal laws regarding Fair Employment Practice as well as all rules and regulations**. Yes** _____ **No** _____

G. Our company has an Equal Employment Opportunity and Affirmative Action Program which complies with Executive Order 11246, the Vietnam Era Veterans' Readjustment Assistance Act of 1974, and the Rehabilitation Act of 1973.

Yes _____ **No** _____

H Our company certifies that it is eligible for bidding on public contracts and is not in violation of either paragraph 33E-3 or 33-E-4 of Public Act 86-150, 720ICLS 5 with regards to bid rigging/bid rotating. **Yes**_____ **No** _____

I When required by law, the bidder and all bidder's subcontractors must participate in applicable apprenticeship and training programs approved by and registered with the United States Department of Labor's Bureau of Apprenticeship and Training as required by Illinois Public Act 093-0642.

ADVICE

A. MINORITY/WOMAN-OWNED, DISADVANTAGED BUSINESS? YES_____ NO_____. If yes, please attach copy of certification and advise certification number and expiration date below:

Name of Certifying Entity: _____

Certification #: _____ Expiration Date: _____

B. STATE NEGOTIATED COOPERATIVE AGREEMENT: YES _____ NO _____ Contract No. _____

Signature

Respondent/Company Official: _____Date: _____

7.0 SIGNATURE PAGE **Required**

IMPORTANT: All bidders are required to complete and sign this form. Completed form must be returned with bid no later than the advertised bid deadline. Failure to return this completed form may result in disqualification of bid.

Check One:

☐ **SOLE PROPRIETOR** ☐ **PARTNERSHIP** (and/or JOINT VENTURE) ☐ **LIMITED LIABILITY COMPANY**

☐ **CORPORATION**

The undersigned acknowledges receipt of a full set of Bid Documents and Addenda Numbers _____ (None unless indicated here). **All issued addenda must be signed and returned to the College as per the instructions in the addenda or bid will not be accepted.**

The undersigned makes the foregoing Bid subject to all of the terms and conditions of the Bid Documents. The undersigned certifies that all of the foregoing statements of the Vendor Certifications are true and correct. The undersigned warrants that all of the facts and information submitted by the undersigned in connection with this Bid are true and correct. Upon award and execution of this Contract by the College of DuPage Board of Trustees, the undersigned agrees that execution of this Bid shall stand as the undersigned's execution of this Contract.

BUSINESS NAME:_____

BUSINESS ADDRESS:_____

_____

BUSINESS TELEPHONE:_____ FAX NUMBER:_____

EMAIL ADDRESS:_____

CELLULAR TELEPHONE NUMBER:_____

FEIN/SSN:_____

AUTHORIZED SIGNATURE: _____

PRINT NAME: _____

TITLE: _____

DATE: _____

Subscribed to and sworn before me this

_____ Day of _____, 2018. My commission expires: _____

X_____ _____

Notary Public Signature Notary Seal

*** Attach hereto a partnership resolution or other document authorizing the individual signing this Signature Page to so sign on behalf of the Partnership.**

**** If the LLC is not registered in the State of Illinois, a copy of a current Certificate of Good Standing from the state of incorporation must be submitted with this Signature Page.**

***** Attach either a certified copy of the by-laws, articles, resolution or other authorization demonstrating such persons to sign the Signature Page on behalf of the LLC.**

***** If the corporation is not registered in the State of Illinois, a copy of the Certificate of Good Standing from the state of incorporation must be submitted with this Signature Page.**

******* In the event that this Signature Page is signed by any persons other than the President and Secretary, attach either a certified copy of the corporate by-laws, a resolution or other authorization by the corporation, authorizing such persons to sign the Signature Page on behalf of the corporation.**

8.0 CONFLICT OF INTEREST DISCLOSURE AND NON-COLLUSION FORM **Required**

IMPORTANT: All bidders are required to complete and sign this form. Completed form must be returned with bid no later than the advertised bid deadline. Failure to return this completed form may result in disqualification of bid.

BID #: _____ DATE: _____

CONFLICT OF INTEREST DISCLOSURE

College of DuPage (COD) reserves the right, at its sole discretion, to reject any and all bids, revise the submission timeline as described in the solicitation, and to discontinue at any time the submission process as described in the solicitation. College of DuPage is requiring that any and all relationships with the College, its Administrators, Trustees, Committee members, COD Foundation Trustees, or any other Employee of the College be disclosed in writing as a part of any bid submitted. Contact with any employee of the College of DuPage during the pre-award period, except as noted in the solicitation, is strictly forbidden and is considered sufficient grounds for dismissal from the Bid/RFP process.

VENDOR CONFLICT OF INTEREST DISCLOSURE

Define the relationship with any College of DuPage Administrator, Trustee, Employee, COD Foundation Board member, Committee member, or their immediate family member, with which your company or any of its owners, officers, Trustees, employees, or their immediate family, does business or is likely to do business with, or for which there is an opportunity to influence a related College decision; include the name and relationship to any immediate family member.

_____
_____
_____
_____

☐ Vendor certifies that there is no known conflict of interest with any COD Administrator, Employee, Trustee, Committee member, or COD Foundation Trustee, or their immediate family.

Vendor Printed Name: _____Title: _____

Signature: _____ Date: _____

NON-COLLUSION STATEMENT

The undersigned affirms that he/she is duly authorized to execute this contract and that this company, corporation, firm, partnership or individual has not prepared this bid in collusion with any other bidder, and that the contents of this bid as to prices, terms or conditions of said bid have not been Communicated by the undersigned nor by any employee or agent to any other person engaged in this type of business prior to the official opening of this bid.

Owners/Principal(s)
Company Name: _____ Name(s)/Title(s): _____
_____

Vendor Address: _____ City, State, Zip: _____
Phone Number: _____ Fax Number: _____
Email Address: _____

Signature
Bidder/Company Official: _____Date: _____

EXHIBIT A PROJECT MANUAL

PROJECT MANUAL

Library Media Lab Renovation

for

College of DuPage

425 22nd Street
Glen Ellyn, Illinois 60137

Issued for Bid and Permit
May 7, 2018

PERKINS+WILL

DOCUMENT 00 01 01
PROJECT TITLE PAGE

PROJECT MANUAL

LIBRARY MEDIA LAB RENOVATION

AT

STUDENT RESOURCE CENTER (SRC)
425 22ND ST
GLEN ELLYN, IL 60137

FOR

COLLEGE OF DUPAGE
425 22ND ST
GLEN ELLYN, ILLINOIS 60137

ARCHITECT

PERKINS+WILL
410 NORTH MICHIGAN AVENUE
SUITE 1600
CHICAGO, ILLINOIS 60611
312.755.0770

MECHANICAL AND ELECTRICAL ENGINEER

MECHANICAL SERVICES ASSOCIATES CORPORATION
780 MCARDLE DRIVE
SUITE A
CRYSTAL LAKE, ILLINOIS 60014

DOCUMENT NO. 00 01 10
TABLE OF CONTENTS

The complete Project Manual for this project consists of this entire bound volume which is not to be separated for any reason. The Architect and Owner will not be responsible for any assumptions made by a Contractor or Subcontractor who does not receive a complete bound Project Manual containing all sections and documents listed in the Table of Contents.

The following listed documents comprise the Project Manual for the College of DuPage – Library Media Lab Renovation. Where numerical sequence of Sections or Divisions is interrupted, such interruptions are intentional.

PROJECT MANUAL

DIVISION 07 - THERMAL AND MOISTURE PROTECTION

DIVISION 08 – OPENINGS

DIVISION 09 - FINISHES

DIVISION 21 – FIRE SUPPRESSION

DIVISION 23 – HEATING, VENTILATING AND AIR CONDITIONING

DIVISION 26 – ELECTRICAL

DIVISION 27 – COMMUNICATIONS

DIVISION 28 – ELECTRONIC SAFETY AND SECURITY

NOTE:

Section number and title in **bold** indicates revised document or section.

* Indicates added document or section.

** Indicates replacement section for previously issued document or section of same name and number.

Strike-through of section number and title indicates document or section deleted.

END OF DOCUMENT

DOCUMENT NO. 00 63 73
ELECTRONIC FILE TRANSFER AGREEMENT
(Architect and Contractor Revit®Files)

Name:		Date:	
Address:		Project Name:	**College of DuPage** **Student Resource Center** **Library Media Lab Renovation**
Description of Data:	Architectural BIM File Release	Project No:	**024303.009**

The undersigned is a contractor (the "Contractor") performing services and/or directly or indirectly providing goods and material related to the subject project (the "Project"). The undersigned hereby requests that Perkins+Will and its consultants provide electronic files prepared by Perkins+Will and its consultants for the Project in the form of an electronic model (the "Model Files"). The undersigned acknowledges and agrees that Perkins+Will has no contractual obligation, or any other obligation, to provide the Model Files to the contractor. Perkins+Will agrees to provide the Model Files in consideration for the undertakings of the undersigned. The undersigned agrees that the Contract Documents that Perkins+Will is contractually obligated to prepare and/or deliver are hardcopy drawings and specifications only. The undersigned additionally agrees that the Model Files are not Contract Documents (as that term is defined in or understood to mean in the Owner-Contractor Agreement), do not represent Contract Document modifications, and are not intended to be a substitute for or a supplement to the hardcopy drawings and specifications, or to necessarily represent actual physical conditions on the Project site.

Model Files to be furnished include work prepared by Perkins+Will. The Model Files were prepared by Perkins+Will using the Autodesk® Revit® software platform. Model Files will be furnished in Autodesk® AutoCAD® format for the Contractor's convenience. One set of electronic Model Files will be furnished to the Contractor. The Contractor assumes responsibility for distributing pertinent files to the subcontractors.

The undersigned agrees that the request to provide the Model Files is purely for the convenience of the undersigned and does not constitute the rendering of professional services. Perkins+Will has prepared the Model Files to facilitate the production of the Contract Documents, which are reasonably accurate and complete to the extent of the standard of professional care. The undersigned acknowledges that Perkins+Will does not represent the furnished Model Files as being accurate or complete, as being suitable for the Contractor's purpose, or as identifying or containing any issue, anomaly, omission, or concern with reference to the Project.

The undersigned agrees and understands that the Model Files, except as expressly set forth above, are not fit for any particular purpose, including but not limited to quantity take-offs; pricing; clash detection; ascertainment of construction or installation tolerances and clearances; preparation of shop drawings, coordination drawings, or fabrication drawings; construction sequencing; or the manufacture of any building component or system. As such, the Model Files, and the information contained in them, and the information that may have been omitted from them, shall not be used as a basis for an increase in the Contract Sum or Contract Time.

The undersigned acknowledges that the Model Files have not necessarily been developed with the assistance or specific expertise of the individual subcontractors and installers, and therefore do not account for or incorporate means and methods required by individual subcontractors for their scope of the finished Work. Modifications to the information about the components included in the Model Files may be required and are the responsibility of the Contractor to ascertain, coordinate, and implement. All such modifications are part of the scope of Work of this Project and shall be provided at no additional cost to Owner.

The undersigned further acknowledges that Perkins+Will has made no representations to the undersigned that the Model Files are suitable for any purpose other than as expressly set forth above, or will be usable by the undersigned's systems, infrastructure, or software. The undersigned also understands and agrees that the Model Files may be subject to anomalies, errors, viruses, malware, or other unintended defects, and that Perkins+Will has not reviewed or determined whether such defects may be present in any electronic files. Use of these electronic files is solely at the risk of the undersigned.

The undersigned agrees to release any and all claims that they may have at any time against Perkins+Will or its consultants arising out of the use of the Model Files by the undersigned or by any other individual or entity. The undersigned agrees to hold harmless and indemnify Perkins+Will and its consultants from and against all claims, liabilities, losses, damages, and costs, including but not limited to attorney's fees arising from or in any way connected with the provision of the Model Files by Perkins+Will or the use, modification, misinterpretation, misuse, or reuse by others of the Model Files provided by Perkins+Will. The undersigned shall not use, modify, or reproduce any of the Model Files without first removing identifying information for Perkins+Will and its consultants that may be incorporated in the furnished Model Files.

The undersigned confirms that it will use the Model Files only with reference to the Project and shall not copy or distribute the Model Files, or permit the Model Files to be copied or distributed by others, except for use on this Project. The undersigned shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by the terms and conditions of this Agreement, and to assume toward the Contractor all the obligations and responsibilities that the Contractor, by this Agreement, assumes toward the Owner and Perkins+Will. The undersigned Contractor assumes responsibility for the breach of this Agreement by any Subcontractor to whom the Contractor distributes the Model Files.

Upon return receipt of this signed Agreement, the Model Files will be transmitted to the undersigned through electronic mail, or be posted on the Perkins+Will file transfer protocol site or the Project web site.

This Agreement may be executed in counterpart, and the parties agree that the individual counterparts, taken together, shall constitute a binding agreement.

The undersigned agrees that they are authorized to bind the company indicated below to the obligations of this Agreement, and understands that Perkins+Will is relying upon this representation in agreeing to enter into this Agreement. In addition to any rights that Perkins+Will may have against the company, the undersigned agrees that Perkins+Will shall have rights personally against the undersigned if this apparent authority is questioned or disputed by the company in any way.

The undersigned agrees that any violation of this Agreement by the undersigned or the company, or any of the agents, representatives, officers, or employees of either, will result in irreparable harm to Perkins+Will that cannot be entirely compensated by money damages. Therefore, the undersigned and the company agree that Perkins+Will may seek any and all equitable remedies that may be available to Perkins+Will, including but not limited to a temporary or permanent injunction in the event of any breach or threatened breach of the terms of this Agreement.

The undersigned shall reimburse Perkins+Will for any cost or expense, including attorney's fees and all labor and expenses (including those of in-house counsel), related to the enforcement of the terms of this Agreement.

Contractor:

Printed Name	*Signature of Recipient*
Title	*Company*
Date	

END OF SECTION

SECTION 01 10 00
SUMMARY

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Work covered by the Contract Documents.
2. Work restrictions.
3. Use of premises.
4. Occupancy requirements.
5. Owner-furnished items.
6. Permits and fees.

B. Related Sections:

1. Temporary Facilities and Controls: Section 01 50 00

1.2 WORK COVERED BY CONTRACT DOCUMENTS

A. Project Identification: Library Media Lab Renovation

1. Project Location: Student Resource Center (SRC)
   425 22nd Street
   Glen Ellyn, Illinois 60137

B. Owner: College of DuPage

1. Owner's Representative: Don Inman

C. Architects:

1. Architect: Perkins + Will, 410 North Michigan Avenue, Suite 1600, Chicago, Illinois, 60611.

D. The Work of this Contract: In general the Work includes interior classroom renovations and includes mechanical and electrical work.

1.3 TYPE OF CONTRACT

A. Project will be constructed under a single prime contract.

1.4 WORK RESTRICTIONS

A. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Owner not less than two weeks in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Owner's written permission.

1.5 USE OF PREMISES

A. Use of Site: Limit use of premises to work in areas indicated. Do not disturb portions of site beyond areas in which the Work is indicated.

1. Limits: Confine constructions operations to Contract Limit Lines, Property Lines.
2. Owner Occupancy: Allow for Owner occupancy of site and use by the public.
3. Driveways and Entrances: Keep driveways and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.
   a. Schedule deliveries to minimize use of driveways and entrances.
   b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

B. Use of Existing Building: Maintain existing building in a weathertight condition throughout construction period. Repair damage caused by construction operations. Protect building and its occupants during construction period.

1.6 OCCUPANCY REQUIREMENTS

A. Full Owner Occupancy: Owner will occupy site and existing building during entire construction period. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's operations.

1.7 OWNER-FURNISHED ITEMS

A. Owner will furnish projectors, projector screens, and television screens. The Work includes providing building systems connections for Owner's equipment including but not limited to and plumbing, mechanical, and electrical connections.

1. Owner will arrange for and deliver Shop Drawings, Product Data, and Samples to Contractor.
2. Owner will arrange and pay for delivery of Owner-furnished items according to Contractor's Construction Schedule.
3. After delivery, Owner will inspect delivered items for damage. Contractor shall be present for and assist in Owner's inspection.
4. If Owner-furnished items are damaged, defective, or missing, Owner will arrange for replacement.

5. Owner will arrange for manufacturer's field services and for delivery of manufacturer's warranties to Contractor.
6. Owner will furnish Contractor the earliest possible delivery date for Owner furnished products. Using Owner furnished earliest possible delivery dates, Contractor is to designate delivery dates of Owner furnished items in Contractor's Construction Schedule.
7. Contractor is to review Shop Drawings, Product Data, and Samples and return them to Architect noting discrepancies or anticipated problems in use of product.
8. Owner is responsible for receiving, unloading, and handling Owner furnished items at Project site.
9. Contractor is responsible for protecting Owner-furnished items from damage during storage and handling, including damage from exposure to the elements.
10. If Owner furnished items are damaged as a result of Contractor's operations, Contractor shall repair or replace them.

1.8 PERMITS AND FEES

A. The Architect is to coordinate with the Owner to apply and pay for the building permit.

B. The Contractor is to apply and pay for all other permits, including but not necessarily limited to; environmental and governmental permits and inspection fees. The Architect will assist in the application of permits.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 26 00
CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

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

B. Related Sections:

1. Product Requirements: Section 01 16 00; for administrative procedures for handling requests for substitutions made after Contract award.

1.2 MINOR CHANGES IN THE WORK

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

1.3 PROPOSAL REQUESTS

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

1. Proposal Requests issued by Architect are for information only. Do not consider them instructions either to stop work in progress or to execute the proposed change.
2. Within 10 days after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.

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

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

1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
4. Include costs of labor and supervision directly attributable to the change.
5. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
6. Comply with requirements in Section 01 16 00 - Product Requirements if the proposed change requires substitution of one product or system for product or system specified.

C. Proposal Request Form: Use Architect’s Form for Proposal Requests.

1.4 CHANGE ORDER PROCEDURES

A. On Owner's approval of a Proposal Request, Architect will issue a Change Order for signatures of Owner and Contractor.

1.5 CONSTRUCTION CHANGE DIRECTIVE

A. Construction Change Directive: Architect may issue a Construction Change Directive. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.

1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.

B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.

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

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 29 00
PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

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

B. Related Sections:

1. Contract Modification Procedures: Section 01 26 00; for administrative procedures for handling changes to the Contract.
2. Construction Progress Documentation: Section 01 32 00; for administrative requirements governing preparation and submittal of Contractor's Construction Schedule and Submittals Schedule.

1.2 DEFINITIONS

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

1.3 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the Schedule of Values with preparation of Contractor's Construction Schedule.

1. Correlate line items in the Schedule of Values with other required administrative forms and schedules, including the following:

a. Application for Payment forms with Continuation Sheets.
b. Submittals Schedule.
c. Contractor's Construction Schedule.

2. Submit the Schedule of Values to Architect at earliest possible date but no later than seven (7) days before the date scheduled for submittal of initial Applications for Payment.

B. Format and Content: Use the Project Manual table of contents as a guide to establish line items for the Schedule of Values. Provide at least one line item for each Specification Section.

1. Identification: Include the following Project identification on the Schedule of Values:

a. Project name and location.

b. Name of Architect.
c. Architect's project number.
d. Contractor's name and address.
e. Date of submittal.

2. Submit draft of AIA Document G703 Continuation Sheets.
3. Arrange the Schedule of Values in tabular form with separate columns to indicate the following for each item listed:

a. Related Specification Section or Division.
b. Description of the Work.
c. Name of subcontractor.
d. Name of manufacturer or fabricator.
e. Name of supplier.
f. Change Orders (numbers) that affect value.
g. Dollar value: Percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.

4. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual Table of Contents. Provide several line items for principal subcontract amounts, where appropriate.
5. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
6. Provide a separate line item in the Schedule of Values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.

a. Differentiate between items stored on-site and items stored off-site. If specified, include evidence of insurance or bonded warehousing.

7. Provide separate line items in the Schedule of Values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
8. Each item in the Schedule of Values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.

a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the Schedule of Values or distributed as general overhead expense, at Contractor's option.

9. Schedule Updating: Update and resubmit the Schedule of Values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.4 APPLICATIONS FOR PAYMENT

A. Each Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.

1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.

B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction Work covered by each Application for Payment is the period indicated in the Agreement.

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

D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.

1. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions were made.
2. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.

E. Transmittal: Submit three (3) signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments.

1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.

F. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's liens from subcontractors, sub-subcontractors, and suppliers for construction period covered by the previous application.

1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
2. When an application shows completion of an item, submit final or full waivers.
3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
4. Submit final Application for Payment with or preceded by final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
5. Waiver Forms: Submit waivers of lien on forms, executed in a manner acceptable to Owner.

G. Preparation and Submittal of Draft (Pencil Copy):

1. Prepare draft copy of application for payment, arrange and coordinate a Contractor, Owner and Architect meeting to review the draft copy prior to submittal of the applications for payment.
2. Provide four (4) draft (pencil) copies within two (2) business days before the day of the review meeting with Owner, Architect and Owner’s Lender, if any. Submit substantiating data with each application copy: subcontractor applications for payment, copies of invoices, storage receipts, and data required by Owner and Owner’s Lender.

3. After review of pencil draft copy by Owner, Architect and Contractor, prepare application, use agreed upon data on Owner/Architect reviewed Schedule of Values and Owner/Architect reviewed pencil draft.
4. Include specified information required for application preparation.

H. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:

1. List of subcontractors.
2. Schedule of Values.
3. Contractor's Construction Schedule (preliminary if not final).
4. Products list.
5. Schedule of unit prices.
6. Submittals Schedule (preliminary if not final).
7. List of Contractor's staff assignments.
8. Copies of building permits.
9. Initial progress report.
10. Report of preconstruction conference.
11. Certificates of insurance and insurance policies.
12. Performance and payment bonds.
13. Data needed to acquire Owner's insurance.

I. Application for Payment at Substantial Completion: After issuing the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.

1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
2. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

J. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:

1. Evidence of completion of Project closeout requirements.
2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
3. Updated final statement, accounting for final changes to the Contract Sum.
4. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
5. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
6. AIA Document G707, "Consent of Surety to Final Payment."
7. Evidence that claims have been settled.
8. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 31 00
PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 SUMMARY

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

1. General project coordination procedures
2. Coordination drawings
3. Administrative and supervisory personnel.
4. Project meetings.
5. Requests for Interpretation (RFIs).

B. Each Contractor shall participate in coordination requirements.

C. Related Sections:

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

1.2 DEFINITIONS

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

1.3 COORDINATION

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

1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled or required for later installation.

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

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

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

1. Preparation of Contractor's Construction Schedule.
2. Preparation of the Schedule of Values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Preinstallation conferences.
7. Project closeout activities.
8. Startup and adjustment of systems.
9. Project closeout activities.

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

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

1.4 KEY PERSONNEL

A. Key Personnel Names: Within 10 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including office and cellular telephone numbers. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.

B. Administrative And Supervisory Personnel: In addition to Project superintendent, provide other administrative and supervisory personnel as required for proper performance of the Work.

1. Include special personnel required for coordination of operations with other contractors.

1.5 PROJECT MEETINGS

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

1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
3. Minutes: Record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within three (3) days of the meeting.

B. Preconstruction Conference: Schedule a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 10 days after execution of the Agreement. Hold the conference at Project site or another convenient location. Conduct the meeting to review responsibilities and personnel assignments.

1. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Discuss items of significance that could affect progress, including the following:
    a. Tentative construction schedule.
    b. Critical work sequencing and long-lead items.
    c. Designation of key personnel and their duties.
    d. Procedures for processing field decisions and Change Orders.
    e. Procedures for RFIs.
    f. Procedures for testing and inspecting.
    g. Procedures for processing Applications for Payment.
    h. Distribution of the Contract Documents.
    i. Submittal procedures.
    j. Preparation of Record Documents.
    k. Use of the premises
    l. Work restrictions.
    m. Owner's occupancy requirements.
    n. Responsibility for temporary facilities and controls.
    o. Construction waste management and recycling.
    p. Parking availability.
    q. Office, work, and storage areas.
    r. Equipment deliveries and priorities.
    s. First aid.
    t. Security.
    u. Progress cleaning.
    v. Working hours.

3. Minutes: Record and distribute meeting minutes.

C. Progress Meetings:

1. Conduct progress meetings at weekly intervals. Coordinate dates of meetings with preparation of payment requests. Attendees will be Owner, Architect and Contractor.

2. Conduct separate coordination meetings with subcontractors. Owner and Architect will not be present at such meetings.
3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

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

        1) Review schedule for next period.

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

        1) Interface requirements.
        2) Sequence of operations.
        3) Status of submittals.
        4) Off-site fabrication.
        5) Access.
        6) Temporary facilities and controls.
        7) Quality and work standards.
        8) Status of correction of deficient items.
        9) Field observations.
        10) RFIs.
        11) Status of proposal requests.
        12) Pending changes.
        13) Status of Change Orders.
        14) Pending claims and disputes.
        15) Documentation of information for payment requests.

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

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

D. Project Closeout Conference: The General Contractor will schedule and conduct a Project closeout conference, at a time convenient to Owner, Contractor and Architect, but no later than 90 days prior to the scheduled date of Substantial Completion.

    1. Conduct the conference to review requirements and responsibilities related to Project closeout.

2. Attendees: Authorized representatives of Owner, Construction Manager, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:
   a. Preparation of record documents.
   b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
   c. Submittal of written warranties.
   d. Requirements for preparing sustainable design documentation.
   e. Requirements for preparing operations and maintenance data.
   f. Requirements for demonstration and training.
   g. Preparation of Contractor's punch list.
   h. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
   i. Submittal procedures.
   j. Coordination of separate contracts.
   k. Owner's partial occupancy requirements.
   l. Installation of Owner's furniture, fixtures, and equipment.
   m. Responsibility for removing temporary facilities and controls.

4. Minutes: The General Contractor will record and distribute meeting minutes.

1.6 REQUESTS FOR INTERPRETATION (RFIs)

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

1. RFIs shall originate with Contractor. RFIs submitted by entities other than Contractor will be returned with no response.
2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.

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

1. Project name.
2. Date.
3. Name of Contractor.
4. Name of Architect
5. RFI number, numbered sequentially.
6. Specification Section number and title and related paragraphs, as appropriate.
7. Drawing number and detail references, as appropriate.
8. Field dimensions and conditions, as appropriate.
9. Contractor's suggested solution(s). If Contractor's solution(s) impact the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
10. Contractor's signature.

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

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

C. RFI Forms:

1. AIA Document G716
2. Software-generated form with substantially the same content as indicated above, acceptable to Architect, Owner and Construction Manger.

D. Hard Copy RFIs: Identify each page of attachments with the RFI number and sequential page number.

E. Software Generated RFIs: Software generated form with substantially the same content as indicated above.

1. Provide attachments of electronic files in Adobe Acrobat PDF format.

F. Architect's Action: Architect will review each RFI, determine action required, and return it. Allow seven (7) working days for Architect's response for each RFI. RFIs received after 1:00 p.m. will be considered as received the following work day.

1. The following RFIs will be returned without action:

    a. Requests for approval of submittals.
    b. Requests for approval of substitutions.
    c. Requests for coordination information already indicated in the Contract Documents.
    d. Requests for adjustments in the Contract Time or the Contract Sum.
    e. Requests for information of Architect's actions on submittals.
    f. Incomplete RFIs or RFIs with numerous errors.

2. Architect's action may include a request for additional information, in which case Architect's time for response will start again.
3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Division 01 Section "Contract Modification Procedures."

    a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within ten (10) days of receipt of the RFI response.

G. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within seven (7) working days if Contractor disagrees with response.

H. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly with not less than the following:

1. Project name.
2. Name and address of Contractor.
3. Name and address of Architect
4. RFI number including RFIs that were dropped and not submitted.
5. RFI description.
6. Date the RFI was submitted.
7. Date Architect's response was received.
8. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 32 00
CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 SUMMARY

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

1. Preliminary (Start-up) Construction Schedule.
2. Contractor's Construction Schedule.
3. Daily construction reports.
4. Material location reports.
5. Field condition reports.
6. Special reports.

B. Related Sections:

1. Payment Procedures: Section 01 29 00; for submitting the Schedule of Values.
2. Project Management and Coordination: section 01 31 00; for submitting and distributing meeting and conference minutes.
3. Submittal Procedures: section 01 33 00; for submittal schedule and reports.

1.2 DEFINITIONS

1.3 INFORMATIONAL SUBMITTALS

A. Format for Submittals: Submit required submittals in the following format:

1. PDF electronic file.

B. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.

1. Submit a working electronic copy of schedule, using software indicated, and labeled to comply with requirements for submittals. Include type of schedule (initial or updated) and date on label.

C. Field Condition Reports: Submit at time of discovery of differing conditions.

D. Special Reports: Submit at time of unusual event.

1.4 COORDINATION

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

B. Coordinate Contractor's construction schedule with the schedule of values, list of subcontracts, submittal schedule, progress reports, payment requests, and other required schedules and reports.

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

PART 2 - PRODUCTS

2.1 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

A. Time Frame: Extend schedule from date established for commencement of the Work or the Notice to Proceed, to date of Substantial Completion and final completion.

1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

B. Activities: Treat each story or separate area as a separate numbered activity for each principal element of the Work. Comply with the following:

1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Architect.
2. Procurement Activities: Include procurement process activities for long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
3. Submittal Review Time: Include review and resubmittal times indicated in Section 01 33 00 - Submittal Procedures in schedule. Coordinate submittal review times in Contractor's construction schedule with submittal schedule.
4. Startup and Testing Time: Include not less than 15 days for startup and testing.
5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.
6. Punch List and Final Completion: Include not more than 30 days for punch list and final completion.

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

1. Phasing: Arrange list of activities on schedule by phase.
2. Work under More Than One Contract: Include a separate activity for each contract.
3. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.
4. Products Ordered in Advance: Include a separate activity for each product. Include delivery date indicated in Division 01 Section "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
5. Owner-Furnished Products: Include a separate activity for each product. Include delivery date indicated in Division 01 Section "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
6. Work Restrictions: Show the effect of the following items on the schedule:
   a. Coordination with existing construction.
   b. Limitations of continued occupancies.
   c. Uninterruptible services.
   d. Partial occupancy before Substantial Completion.
   e. Use of premises restrictions.
   f. Provisions for future construction.
   g. Seasonal variations.
   h. Environmental control.

7. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:
   a. Subcontract awards.
   b. Submittals.
   c. Purchases.
   d. Mockups.
   e. Fabrication.
   f. Sample testing.
   g. Deliveries.
   h. Installation.
   i. Tests and inspections.
   j. Adjusting.
   k. Curing.
   l. Startup and placement into final use and operation.

8. Construction Areas: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:

   a. Structural completion.
   b. Permanent space enclosure.
   c. Completion of mechanical installation.
   d. Completion of electrical installation.
   e. Substantial Completion.

D. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and final completion.

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

1. Refer to Section 01 29 00 - Payment Procedures for cost reporting and payment procedures.

F. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:

1. Unresolved issues.
2. Unanswered RFIs.
3. Rejected or unreturned submittals.
4. Notations on returned submittals.

G. Recovery Schedule: When periodic update indicates the Work is 14 or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule. Indicate changes to working hours, working days, crew sizes, and equipment required to achieve compliance, and date by which recovery will be accomplished.

H. Computer Scheduling Software: Prepare schedules using current version of a program that has been developed specifically to manage construction schedules.

2.2 PREMILIMINARY (START-UP) CONSTRUCTION SCHEDULE

A. Bar-Chart Schedule: Submit start-up horizontal bar-chart-type construction schedule within seven (7) days of date established for commencement of the Work or the Notice to Proceed.

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities for first SIXTY (60) days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

2.3 CONTRACTOR'S CONSTRUCTION SCHEDULE (GANTT CHART)

A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal Gantt-chart-type, Contractor's construction schedule within thirty (30) days of date established for commencement of the Work or the Notice to Proceed. Base schedule on the start-up construction schedule and additional information received since the start of Project.

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.

1. For construction activities that require three months or longer to complete, indicate an estimated completion percentage in ten (10) percent increments within time bar.

2.4 REPORTS

A. Field Condition Reports: Immediately on discovery of a difference between field conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

2.5 SPECIAL REPORTS

A. General: Submit special reports directly to Owner within one (1) day of an occurrence. Distribute copies of report to parties affected by the occurrence.

B. Reporting Unusual Events: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, response by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 33 00
SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

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

B. Related Sections:

1. Electronic File Transfer Agreement: Document 00 63 73; for request of CAD files.
2. Payment Procedures: Section 01 29 00; for submitting Applications for Payment and the Schedule of Values.
3. Project Management and Coordination: Section 01 31 00; for submitting and distributing meeting and conference minutes and for submitting Coordination Drawings.
4. Construction Progress Documentation: Section 01 32 00; for submitting schedules and reports, including Contractor's Construction Schedule.
5. Quality Requirements: Section 01 40 00; for submitting test and inspection reports.
6. Section 01 77 00 - Closeout Procedures: for submitting warranties.
7. Project Record Documents: Section 01 78 39: for submitting Record Drawings, Record Specifications, and Record Product Data.
8. Divisions 02 through 49 Sections for specific requirements for submittals in those Sections.

1.2 DEFINITIONS

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

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

1.3 CONTRACTOR'S USE OF ARCHITECT'S ELECTRONIC CAD FILES

A. At Contractor's written request, copies of Architect's CAD files will be provided to Contractor for Contractor's use in connection with Project, subject to the following conditions:

1. Complete and submit Document 00 63 73 - Electronic File Transfer Agreement (Architect and Contractor/Subcontractor) with original signatures by party making request.
2. CAD files will be sent in AutoCAD format to the address of the requesting party electronically via e-mail.

1.4 SUBMITTAL ADMINISTRATRIVE REQUIREMENTS

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

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
    a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

B. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or modifications to submittals noted by the Architect and additional time for handling and reviewing submittals required by those corrections.

1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
2. Initial Submittal: Submit concurrently with start-up construction schedule. Include submittals required during the first 60 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's construction schedule.
    a. Submit revised submittal schedule to reflect changes in current status and timing for submittals.
4. Format: Arrange the following information in a tabular format:
    a. Scheduled date for first submittal.
    b. Specification Section number and title.
    c. Submittal category: Action, informational.
    d. Name of subcontractor.
    e. Description of the Work covered.
    f. Scheduled date for Architect's final release or approval.
    g. Scheduled dates for purchasing.
    h. Scheduled dates for installation.
    i. Activity or event number.

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

1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.

3. Resubmittal Review: Allow 15 days for review of each resubmittal.
4. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow 21 days for initial review of each submittal.
5. Concurrent Consultant Review: Where the Contract Documents indicate that submittals may be transmitted simultaneously to Architect and to Architect's consultants, allow 15 days for review of each submittal. Submittal will be returned to Architect before being returned to Contractor.

D. Identification – Paper: Place a permanent label or title block on each submittal for identification.

1. Indicate name of firm or entity that prepared each submittal on label or title block.
2. Provide a space approximately 6 by 8 inches on label or beside title block to record Contractor's review and approval markings and action taken by Architect.
3. Include the following information on label for processing and recording action taken:
   a. Project name.
   b. Date.
   c. Name and address of Architect.
   d. Name and address of Contractor.
   e. Name and address of subcontractor.
   f. Name and address of supplier.
   g. Name of manufacturer.
   h. Submittal number or other unique identifier, including revision identifier.

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

   i. Number and title of appropriate Specification Section.
   j. Drawing number and detail references, as appropriate.
   k. Location(s) where product is to be installed, as appropriate.
   l. Other necessary identification.

E. Identification – Electronic: Identify and incorporate information in each electronic submittal file as follows:

1. Assemble complete submittal package into a single indexed file with links enabling navigation to each item.
2. Name file with submittal number or other unique identifier, including revision identifier.
   a. Name each file using a project identifier and Specification Section number followed by a decimal point and then a sequential number (e.g., LNHS-061000.01). Name each resubmittal using an alphabetic suffix after another decimal point (e.g., LNHS-061000.01.A).

3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Architect.

4. Transmittal Form for Electronic Submittals: Use software-generated form from electronic project management software acceptable to Owner, containing the following information:
   a. Project name.
   b. Date.
   c. Name and address of Architect.
   d. Name of General Contractor.
   e. Name of Contractor.
   f. Name of firm or entity that prepared submittal.
   g. Name of subcontractor.
   h. Name of supplier.
   i. Name of manufacturer.
   j. Number and title of appropriate Specification Section.
   k. Drawing number and detail references, as appropriate.
   l. Location(s) where product is to be installed, as appropriate.
   m. Related physical samples submitted directly.
   n. Other necessary identification.

5. Include the following information as keywords in the electronic file metadata:
   a. Project name.
   b. Number and title of appropriate Specification Section.
   c. Manufacturer name.
   d. Product name.

F. Options: Identify options requiring selection by the Architect.

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

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

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

I. Transmittal: Package each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect will discard submittals received from sources other than Contractor.

1. Transmittal Form: Provide locations on form for the following information:
   a. Project name.
   b. Date.
   c. Destination (To:).
   d. Source (From:).
   e. Names of subcontractor, manufacturer, and supplier.
   f. Category and type of submittal.
   g. Submittal purpose and description.
   h. Specification Section number and title.
   i. Drawing number and detail references, as appropriate.
   j. Transmittal number**,** numbered consecutively.
   k. Submittal and transmittal distribution record.
   l. Remarks.

m. Signature of transmitter.

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

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

1. Note date and content of previous submittal.
2. Note date and content of revision in label or title block and clearly indicate extent of revision.
3. Resubmit submittals until they are marked "No Exceptions or Exceptions As Noted "

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

L. Use for Construction: Use only final submittals with mark by Architect indicating "No Exceptions Taken" or "Exceptions As Noted".

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

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

1. Submit electronic submittals via email as PDF electronic files.
   a. Architect will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.
2. Action Submittals: Submit three (3) paper copies of each submittal, unless otherwise indicated. Architect will return two (2) copies.
3. Informational Submittals: Submit two (2) paper copies of each submittal, unless otherwise indicated. Architect will not return copies unless it does not comply with specified requirements.
4. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Section 01 77 00 - Closeout Procedures.
5. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Submit certificates and certifications signed by an officer or other individual authorized to sign documents on behalf of that entity.
6. Test and Inspection Reports Submittals: Comply with requirements specified in Section 01 40 00 - Quality Requirements.

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

1. If information must be specially prepared for submittal because standard printed data are not suitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each copy of each submittal to show which products and options are applicable.
3. Include the following information, as applicable:
    a. Manufacturer's catalog cuts.
    b. Manufacturer's product specifications.
    c. Standard color charts.
    d. Statement of compliance with specified referenced standards.
    e. Testing by recognized testing agency.
    f. Application of testing agency labels and seals.
    g. Notation of coordination requirements.
    h. Availability and delivery time information.
4. For equipment, include the following in addition to the above, as applicable:
    a. Wiring diagrams showing factory-installed wiring.
    b. Printed performance curves.
    c. Operational range diagrams.
    d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
5. Submit Product Data before or concurrent with Samples.
6. Submit Product Data as PDF electronic files.

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data**,** unless submittal is based on Architect's electronic CAD drawings that is otherwise permitted.

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
    a. Identification of products.
    b. Schedules.
    c. Compliance with specified standards.
    d. Notation of coordination requirements.
    e. Notation of dimensions established by field measurement.
    f. Relationship and attachment to adjoining construction clearly indicated.
    g. Seal and signature of professional engineer if specified.
2. Submit Shop Drawings in the following format
    a. PDF electronic file.

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

1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
2. Identification: Attach label on unexposed side of Samples that includes the following:
    a. Generic description of Sample.
    b. Product name and name of manufacturer.
    c. Sample source.
    d. Number and title of appropriate Specification Section.

3. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
    a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
    b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
4. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
    a. Number of Samples: Submit three (3) full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return two (2) sets with options selected.
5. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
    a. Number of Samples: Submit three (3) sets of Samples. Architect will return two (2) Sample sets.
        1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
        2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least four (4) sets of paired units that show approximate limits of variations.

E. Product Schedule or List: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:

1. Type of product. Include unique identifier for each product.
2. Number and name of room or space.
3. Location within room or space.
4. Submit product schedule in the following format:
    a. PDF electronic file.
    b. Mark up and retain one returned copy as a Project Record Document.

F. Contractor's Construction Schedule: Comply with requirements specified in Section 01 32 00 - Construction Progress Documentation.

G. Submittals Schedule: Comply with requirements specified in Section 01 32 00 - Construction Progress Documentation.

H. Application for Payment: Comply with requirements specified in Section 01 29 00 - Payment Procedures.

I. Schedule of Values: Comply with requirements specified in Section 01 29 00 - Payment Procedures.

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

1. Name, address, and telephone number of entity performing subcontract or supplying products.
2. Number and title of related Specification Section(s) covered by subcontract.
3. Drawing number and detail references, as appropriate, covered by subcontract.
4. Submit product schedule in the following format:
   a. PDF electronic file.

K. Coordination Drawings: Comply with requirements specified in Section 01 31 00 - Project Management and Coordination.

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

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

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

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

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

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

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

S. Product Test Reports: Prepare written reports indicating current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a

qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

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

1. Name of evaluation organization.
2. Date of evaluation.
3. Time period when report is in effect.
4. Product and manufacturers' names.
5. Description of product.
6. Test procedures and results.
7. Limitations of use.

U. Schedule of Tests and Inspections: Comply with requirements specified in Section 01 14 00 - Quality Requirements.

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

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

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

Y. Maintenance Data: Prepare written and graphic instructions and procedures for operation and normal maintenance of products and equipment. Comply with requirements specified in Section 01 78 23 - Operation and Maintenance Data.

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

2.2 DELEGATED DESIGN

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

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

B. Delegated-Design Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit four (4) copies of a statement, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.

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

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

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

B. Project Closeout and Maintenance/Material Submittals: Refer to requirements in Section 01 77 00 - Closeout Procedures.

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

3.2 ARCHITECT'S ACTION

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

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

1. A – NO EXCEPTIONS: When the Architect marks a submittal "No Exceptions," the Work covered by the submittal may proceed provided it complies with requirements of the Contract Documents. Final payment depends on that compliance.

2. B - EXCEPTIONS AS NOTED: When the Architect marks a submittal "Exceptions As Noted," the Work covered by the submittal may proceed provided it complies with notations or corrections on the submittal and requirements of the Contract Documents. Final payment depends on that compliance.

3. C – REVISE AND RESUBMIT: When the Architect marks a submittal "Revise and Resubmit," do not proceed with Work covered by the submittal, including purchasing, fabrication, delivery, or other activity. Revise or prepare a new submittal according to the notations; resubmit without delay. Repeat if necessary to obtain different action mark.

    a. Do not use, or allow others to use, submittals marked "Revise and Resubmit" at the Project Site or elsewhere where Work is in progress.

4. D - REJECTED: When the Architect marks a submittal "Rejected," do not proceed with Work covered by the submittal, including purchasing, fabrication, delivery, or other activity. The submittal does not conform to the design concept or meet requirements of the Contract Documents.

    a. Do not use, or allow others to use, submittals marked "Rejected" at the Project Site or elsewhere where Work is in progress.

5. E – FOR INFORMATION ONLY: Where a submittal is marked “For Information Only”, the Architect will not return the submittal unless it does not comply with specified requirements.

6. F – NOT REVIEWED: Submittals not required by the Contract Documents will be marked “Not Reviewed”, the Architect will return the submittal without action.

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

D. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.

E. Incomplete submittals are not acceptable, will be considered nonresponsive, and will be returned without review.

END OF SECTION

SECTION 01 42 00
REFERENCES

PART 1 - GENERAL

1.1 DEFINITIONS

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

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

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

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

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

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

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

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

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

J. General Requirements:

1. Drawings and general provisions of the Contract, including General and Supplementary Conditions (if any) and other Division 01 General Requirement Sections, apply to all sections of the work.
2. The provisions or requirements of Division - 1 Sections apply to entire work of the Contract and where so indicated, to other elements which are included in the project.

1.2 INDUSTRY STANDARDS

A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Publication Dates: Comply with standards in effect as of date of the Contract Documents, unless otherwise indicated and except when to comply with standards having different revision dates as referenced in the indicated codes.

C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.

1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

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

ADAAG	Americans with Disabilities Act (ADA) Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities Available from Access Board www.access-board.gov	(800) 872-2253 (202) 272-0080
FED-STD	Federal Standard (See FS)	
FS	Federal Specification Available from Department of Defense Single Stock Point www.dodssp.daps.mil	(215) 697-6257
MILSPEC	Military Specification and Standards Available from Department of Defense Single Stock Point www.dodssp.daps.mil	(215) 697-6257

1.3 ABBREVIATIONS AND ACRONYMS

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

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

AA	Aluminum Association, Inc. (The) www.aluminum.org	(202) 862-5100
AAADM	American Association of Automatic Door Manufacturers www.aaadm.com	(216) 241-7333
AABC	Associated Air Balance Council www.aabchq.com	(202) 737-0202
AAMA	American Architectural Manufacturers Association www.aamanet.org	(847) 303-5664
AASHTO	American Association of State Highway and Transportation Officials www.transportation.org	(202) 624-5800
ACI	ACI International (American Concrete Institute) www.aci-int.org	(248) 848-3700
ACPA	American Concrete Pipe Association www.concrete-pipe.org	(972) 506-7216
AEIC	Association of Edison Illuminating Companies, Inc. (The) www.aeic.org	(205) 257-2530
AF&PA	American Forest & Paper Association www.afandpa.org	(800) 878-8878 (202) 463-2700
AGA	American Gas Association www.aga.org	(202) 824-7000
AGC	Associated General Contractors of America (The) www.agc.org	(703) 548-3118
AI	Asphalt Institute www.asphaltinstitute.org	(859) 288-4960
AIA	American Institute of Architects (The) www.aia.org	(800) 242-3837 (202) 626-7300
AISC	American Institute of Steel Construction www.aisc.org	(800) 644-2400 (312) 670-2400
AISI	American Iron and Steel Institute	(202) 452-7100

	www.steel.org	
ALCA	Associated Landscape Contractors of America www.alca.org	(800) 395-2522 (703) 736-9666
ALSC	American Lumber Standard Committee, Incorporated www.alsc.org	(301) 972-1700
AMCA	Air Movement and Control Association International, Inc. www.amca.org	(847) 394-0150
ANSI	American National Standards Institute www.ansi.org	(202) 293-8020
APA	APA - The Engineered Wood Association www.apawood.org	(253) 565-6600
ARI	Air-Conditioning & Refrigeration Institute www.ari.org	(703) 524-8800
ASCE	American Society of Civil Engineers www.asce.org	(800) 548-2723 (703) 295-6300
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers www.ashrae.org	(800) 527-4723 (404) 636-8400
ASME	ASME International (The American Society of Mechanical Engineers International) www.asme.org	(800) 843-2763 (212) 591-7722
ASSE	American Society of Sanitary Engineering www.asse-plumbing.org	(440) 835-3040
ASTM	ASTM International (American Society for Testing and Materials International) www.astm.org	(610) 832-9585
AWI	Architectural Woodwork Institute www.awinet.org	(800) 449-8811 (703) 733-0600
AWPA	American Wood-Preservers' Association www.awpa.com	(334) 874-9800
AWS	American Welding Society www.aws.org	(800) 443-9353 (305) 443-9353
AWWA	American Water Works Association www.awwa.org	(800) 926-7337 (303) 794-7711
BHMA	Builders Hardware Manufacturers Association www.buildershardware.com	(212) 297-2122

CSI	Cast Stone Institute www.caststone.org	(770) 972-3011
CISCA	Ceilings & Interior Systems Construction Association www.cisca.org	(630) 584-1919
CISPI	Cast Iron Soil Pipe Institute www.cispi.org	(423) 892-0137
CLFMI	Chain Link Fence Manufacturers Institute www.chainlinkinfo.org	(301) 596-2583
CRI	Carpet & Rug Institute (The) www.carpet-rug.com	(800) 882-8846 (706) 278-3176
CRSI	Concrete Reinforcing Steel Institute www.crsi.org	(847) 517-1200
CSI	Construction Specifications Institute (The) www.csinet.org	(800) 689-2900 (703) 684-0300
DHI	Door and Hardware Institute www.dhi.org	(703) 222-2010
FSC	Forest Stewardship Council www.fsc.org	52 951 5146905
GA	Gypsum Association www.gypsum.org	(202) 289-5440
GANA	Glass Association of North America www.glasswebsite.com	(785) 271-0208
GS	Green Seal www.greenseal.org	(202) 872-6400
HMMA	Hollow Metal Manufacturers Association (Part of NAAMM)	
HPVA	Hardwood Plywood & Veneer Association www.hpva.org	(703) 435-2900
IESNA	Illuminating Engineering Society of North America www.iesna.org	(212) 248-5000
IGCC	Insulating Glass Certification Council www.igcc.org	(315) 646-2234
IGMA	Insulating Glass Manufacturers Alliance (The) www.igmaonline.org	(613) 233-1510

ISSFA	International Solid Surface Fabricators Association www.issfa.net	(702) 567-8150
LPI	Lightning Protection Institute www.lightning.org	(800) 488-6864 (847) 577-7200
MFMA	Metal Framing Manufacturers Association www.metalframingmfg.org	(312) 644-6610
MIA	Marble Institute of America www.marble-institute.com	(440) 250-9222
NAAMM	National Association of Architectural Metal Manufacturers www.naamm.org	(312) 332-0405
NACE	NACE International (National Association of Corrosion Engineers International) www.nace.org	(281) 228-6200
NAIMA	North American Insulation Manufacturers Association (The) www.naima.org	(703) 684-0084
NBGQA	National Building Granite Quarries Association, Inc. www.nbgqa.com	(800) 557-2848
NCMA	National Concrete Masonry Association www.ncma.org	(703) 713-1900
NCPI	National Clay Pipe Institute www.ncpi.org	(262) 248-9094
NCTA	National Cable & Telecommunications Association www.ncta.com	(202) 775-3550
NECA	National Electrical Contractors Association www.necanet.org	(301) 657-3110
NEMA	National Electrical Manufacturers Association www.nema.org	(703) 841-3200
NFPA	NFPA (National Fire Protection Association) www.nfpa.org	(800) 344-3555 (617) 770-3000
NFRC	National Fenestration Rating Council www.nfrc.org	(301) 589-1776
NGA	National Glass Association www.glass.org	(703) 442-4890
NLGA	National Lumber Grades Authority	(604) 524-2393

	www.nlga.org	
NRCA	National Roofing Contractors Association www.nrca.net	(800) 323-9545 (847) 299-9070
NRMCA	National Ready Mixed Concrete Association www.nrmca.org	(888) 846-7622 (301) 587-1400
NTMA	National Terrazzo & Mosaic Association, Inc. www.ntma.com	(800) 323-9736 (540) 751-0930
PCI	Precast/Prestressed Concrete Institute www.pci.org	(312) 786-0300
PDCA	Painting & Decorating Contractors of America www.pdca.com	(800) 332-7322 (314) 514-7322
PTI	Post-Tensioning Institute www.post-tensioning.org	(602) 870-7540
RCSC	Research Council on Structural Connections www.boltcouncil.org	(800) 644-2400 (312) 670-2400
RFCI	Resilient Floor Covering Institute www.rfci.com	(301) 340-8580
SAE	SAE International www.sae.org	(724) 776-4841
SDI	Steel Deck Institute www.sdi.org	(847) 462-1930
SDI	Steel Door Institute www.steeldoor.org	(440) 899-0010
SEI	Structural Engineering Institute www.seinstitute.com	(800) 548-2723 (703) 295-6195
SGCC	Safety Glazing Certification Council www.sgcc.org	(315) 646-2234
SIA	Security Industry Association www.siaonline.org	(703) 683-2075
SIGMA	Sealed Insulating Glass Manufacturers Association (Now IGMA)	
SJI	Steel Joist Institute www.steeljoist.org	(843) 626-1995
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association www.smacna.org	(703) 803-2980

SPIB	Southern Pine Inspection Bureau (The) www.spib.org	(850) 434-2611
SSINA	Specialty Steel Industry of North America www.ssina.com	(800) 982-0355 (202) 342-8630
SSPC	SSPC: The Society for Protective Coatings www.sspc.org	(877) 281-7772 (412) 281-2331
TCA	Tile Council of America, Inc. www.tileusa.com	(864) 646-8453
UL	Underwriters Laboratories Inc. www.ul.com	(800) 285-4476 (847) 272-8800
USGBC	U.S. Green Building Council www.usgbc.org	(202) 828-7422
WCLIB	West Coast Lumber Inspection Bureau www.wclib.org	(800) 283-1486 (503) 639-0651
WCMA	Window Covering Manufacturers Association (Now WCSC)	
WDMA	Window & Door Manufacturers Association (Formerly: NWWDA - National Wood Window and Door Association) www.wdma.com	(800) 223-2301 (847) 299-5200
WWPA	Western Wood Products Association www.wwpa.org	(503) 224-3930

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

ICBO	International Conference of Building Officials (See ICC)	
ICBO ES	ICBO Evaluation Service, Inc. (See ICC-ES)	
ICC	International Code Council (Formerly: CABO - Council of American Building Officials) www.iccsafe.org	(703) 931-4533
SBCCI	Southern Building Code Congress International, Inc. (See ICC)	

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

CPSC	Consumer Product Safety Commission www.cpsc.gov	(800) 638-2772 (301) 504-6816
EPA	Environmental Protection Agency www.epa.gov	(202) 272-0167
FAA	Federal Aviation Administration www.faa.gov	(202) 366-4000
FCC	Federal Communications Commission www.fcc.gov	(888) 225-5322
	(See TRB)	
NIST	National Institute of Standards and Technology www.nist.gov	(301) 975-6478
OSHA	Occupational Safety & Health Administration www.osha.gov	(800) 321-6742 (202) 693-1999
USPS	Postal Service www.usps.com	(202) 268-2000

E. Project Referenced Codes And Compliance Acts: Project Work is to conform with, but is not necessarily be limited to the following codes and regulations:

1. International Building Code, 2009 edition
2. National Electric Code, 2008 edition
3. Illinois Plumbing Code, 2004 edition
4. International Mechanical Code, 2009 edition
5. Americans With Disabilities Act (ADA), Current Edition
6. Fair Housing Act
7. The Illinois Accessibility Code, 71 ILL. Adm. Code 400

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 50 00
TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

A. Requirements for temporary utilities, support facilities, and security and protection facilities.

B. Related Sections include the following:

1. Submittal Procedures: Section 01 33 00; for procedures for submitting copies of implementation and termination schedule and utility reports.
2. Execution: Section 01 73 00; for progress cleaning requirements.
3. Divisions 03 through 32 Sections for temporary heat, ventilation, and humidity requirements for products in those Sections.

1.2 USE CHARGES

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

B. Water Service: The Owner will make available to the Contractor the use of existing water service at the site at no cost to the Contractor. Pay water service use charges for water beyond that available at the site used by all entities for construction operations.

C. Electric Power Service: The Owner will make available to the Contractor the use of existing electric power at the site at no cost to the Contractor. Pay electric power service use charges for electricity beyond that available at the site used by all entities for construction operations.

1.3 QUALITY ASSURANCE

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

PART 2 - PRODUCTS

2.1 EQUIPMENT

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

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

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

1. Locate facilities to limit site disturbance as specified in Section 01 10 00 - Summary.

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

3.2 TEMPORARY UTILITIES - EXISTING BUILDINGS

A. Water Service: Water service will be available from existing sources at no charge to the contractor.

B. Sanitary Facilities: The Owner will designate existing toilets, wash facilities, and drinking water for use of construction personnel.

C. Heating: The existing heating system will be utilized for temporary heating required by construction activities.

D. Ventilation: The existing HVAC system will be utilized for temporary ventilation.

E. Electric Power Service: Electric power service will be available from existing sources at no charge to the contractor.

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

1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.
2. Electric power to operate temporary lighting will be available from existing sources at no charge to the contractor.

3.3 SUPPORT FACILITIES INSTALLATION

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

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

B. Parking: The Owner will designate temporary parking areas for construction personnel.

C. Waste Disposal Facilities: Provide waste collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with Section 01 73 00 - Execution Requirements for progress cleaning requirements.

D. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.

1. Truck cranes and similar devices used for hoisting materials are considered tools and equipment and not temporary facilities.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

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

1. Construct dustproof partitions with gypsum wallboard with joints taped on occupied side, and fire retardant plywood on construction operations side.
2. Insulate partitions to provide noise protection to occupied areas.
3. Seal joints and perimeter. Equip partitions with dustproof doors and security locks.
4. Protect air handling equipment.
5. Weather strip openings.

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

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

3.5 OPERATION, TERMINATION, AND REMOVAL

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

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

1. At Substantial Completion, clean and renovate permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 01 77 00 - Closeout Procedures.

END OF SECTION

SECTION 01 60 00
PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

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

B. Related Sections include the following:

1. References: Section 01 42 00; for applicable industry standards for products specified.
2. Closeout Procedures: Section 01 77 00; for submitting warranties for Contract closeout.
3. Divisions 03 through 33 Sections for specific requirements for warranties on products and installations specified to be warranted.

1.2 DEFINITIONS

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

1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.
2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
3. Comparable Product: Product that is demonstrated and approved through submittal process, or where indicated as a product substitution, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

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

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

other characteristics for purposes of evaluating comparable products of other named manufacturers.

1.3 SUBMITTALS

A. Product List: Submit a list, in tabular from, showing specified products. Include generic names of products required. Include manufacturer's name and proprietary product names for each product.

1. Coordinate product list with Contractor's Construction Schedule and the Submittals Schedule.
2. Form: Tabulate information for each product under the following column headings:
   a. Specification Section number and title.
   b. Generic name used in the Contract Documents.
   c. Proprietary name, model number, and similar designations.
   d. Manufacturer's name and address.
   e. Supplier's name and address.
   f. Installer's name and address.
   g. Projected delivery date or time span of delivery period.
   h. Identification of items that require early submittal approval for scheduled delivery date.
3. Initial Submittal: Within fifteen (15) days after date of commencement of the Work, submit three (3) copies of initial product list. Include a written explanation for omissions of data and for variations from Contract requirements.
   a. At Contractor's option, initial submittal may be limited to product selections and designations that must be established early in Contract period.
4. Completed List: Within thirty (30) days after date of commencement of the Work, submit three (3) copies of completed product list. Include a written explanation for omissions of data and for variations from Contract requirements.
5. Architect's Action: Architect will respond in writing to Contractor within five (5) days of receipt of completed product list. Architect's response will include a list of unacceptable product selections and a brief explanation of reasons for this action. Architect's response, or lack of response, does not constitute a waiver of requirement to comply with the Contract Documents.

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

1. Substitution Request Form: Use facsimile of form provided at end of Section.
2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
   a. Statement indicating why specified material or product cannot be provided.
   b. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by

Owner and separate contractors that will be necessary to accommodate proposed substitution.

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

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

e. Samples, where applicable or requested.

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

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

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

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

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

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

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

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

a. Form of Acceptance: Change Order.

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

C. Basis-of-Design Product Specification Submittal: Comply with requirements in Section 01 33 00 - Submittal Procedures. Show compliance with requirements.

1.4 QUALITY ASSURANCE

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

1. Each contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors.
2. If a dispute arises between contractors over concurrently selectable but incompatible products, Architect will determine which products shall be used.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

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

B. Delivery and Handling:

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

C. Storage:

1. Store products to allow for inspection and measurement of quantity or counting of units.
2. Store materials in a manner that will not endanger Project structure.
3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
4. Store cementitious products and materials on elevated platforms.
5. Store foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
6. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather protection requirements for storage.
7. Protect stored products from damage and liquids from freezing.
8. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

1.6 PRODUCT WARRANTIES

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

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

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

1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
2. Specified Form: When specified forms are included with the Specifications, prepare a written document using appropriate form properly executed.
3. Refer to Divisions 03 through 32 Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Division 01 Section "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, that are new at time of installation.

1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
4. Where products are accompanied by the term "as selected," Architect will make selection.
5. Where products are accompanied by the term "match sample," sample to be matched is Architect's.
6. Descriptive, performance, and reference standard requirements in the Specifications establish "salient characteristics" of products.

B. Product Selection Procedures:

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

3. Products: Where Specifications include a list of names of both products and manufacturers, provide one of the products listed that complies with requirements.
4. Manufacturers: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements.
5. Product Options: Where Specifications indicate that sizes, profiles, and dimensional requirements on Drawings are based on a specific product or system, provide the specified product or system. Comply with provisions in Part 2 "Product Substitutions" Article for consideration of an unnamed product or system.
6. Basis-of-Design Product: Where Specifications name a product and include a list of manufacturers, provide the specified product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with provisions in Part 2 "Comparable Products" Article for consideration of an unnamed product by the other named manufacturers.
7. Where products are specified by name and accompanied by the term "or equal", "or approved equal", or "or other as approved by Architect, comply with provisions for Product Substitutions. The Architect is the sole determiner of what is equal, equivalent or acceptable for such products and substitutions.
8. Visual Matching Specification: Where Specifications require matching an established Sample, select a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.
    a. If no product available within specified category matches and complies with other specified requirements, comply with provisions in Part 2 "Product Substitutions" Article for proposal of product.
9. Visual Selection Specification: Where Specifications include the phrase "as selected from manufacturer's colors, patterns, textures" or a similar phrase, select a product that complies with other specified requirements.
    a. Standard Range: Where Specifications include the phrase "standard range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, density, or texture from manufacturer's product line that does not include premium items.
    b. Full Range: Where Specifications include the phrase "full range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 PRODUCT SUBSTITUTIONS - DURIING BIDDING & PRIOR TO BID DUE DATE

A. Timing: Architect will consider requests for substitution if received within seven (7) days prior to receipt of Bids. Requests received after that time may be considered or rejected at discretion of Architect.

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

C. Indicate one or more of following reasons for request:

1. Substitution is required for compliance with final Code interpretation requirements, or insurance regulations.
2. Specified product is unavailable through no fault of Contractor/Subcontractor.
3. Subsequent information discloses specified product unable to perform properly or fit designated space.
4. Manufacturer or fabricator refuses to certify or guarantee performance of specified product, as required.
5. Substitution saves substantial cost, time or other considerations. (Show accurate cost data on proposed substitution in comparison with product or method specified.)
6. Request is directly related to an “or other as approved by the Architect” or "or equal" clause or similar language in the Contract Documents.

D. Product substitutions will not be accepted unless the originally specified product is no longer available or there is significant value or cost savings. Contractor shall demonstrate value or savings to the owner prior to substitution submittal, and obtain owner and architect acceptance of this savings or value.

E. General Contractor to secure schedule delivery for specified materials as part of scheduling and coordination of the project. Submit line by line comparison of substituted material beside specified material for architect review. Substitution is valid only if critical path is compromised by specified material and is indicated as such on project schedule to owner and architect with reasonable time for decision to substitute. Comparison shall clearly demonstrate similarities and differences between the two products.

F. Substitutions during initial pricing phase shall be included as a line item addition/deduction from the base pricing submitted with the proposal. Base pricing shall be based on the products specified herein.

2.3 PRODUCT SUBSTITUTIONS - AFTER AWARD OF CONTRACT

A. Timing: Architect will consider requests for substitution if received within thirty (30) days after the Award of Contract and/or Notice to Proceed. Requests received after that time may be considered or rejected at discretion of Architect.

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

1. Request for Substitution form and required substantiating documentation is submitted to the Architect for review prior to submittals. Substitution requests are not to be sent as part of a submittal of shop drawings, product data and/or samples.
2. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may

include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.

3. Requested substitution does not require extensive revisions to the Contract Documents.
4. Requested substitution is consistent with the Contract Documents and will produce indicated results.
5. Request is directly related to an “or other as approved by the Architect” or "or equal" clause or similar language in the Contract Documents.
6. Substitution request is fully documented and properly submitted.
7. Requested substitution will not adversely affect Contractor's Construction Schedule.
8. Requested substitution has received necessary approvals of authorities having jurisdiction.
9. Requested substitution is compatible with other portions of the Work.
10. Requested substitution has been coordinated with other portions of the Work.
11. Requested substitution provides specified warranty.
12. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

PART 3 - EXECUTION (Not Used)

REQUEST FOR SUBSTITUTION

TO: Perkins + Will
330 North Wabash Avenue
Suite 3600
Chicago, Illinois 60611

FROM: _____
Name of manufacturer

_____
Street address

_____
City and state

_____
Phone number and name of person to contact

PROJECT: Name:
City, State:
Architect's Job Number:

1. Specification Section and Paragraph numbers of product specified _____.

2. Proposed Substitute

   A. Name and Model No.:

   B. Description:

   C. Attach applicable Submittals as required by the referenced Specification Section, i.e. Product Data, Materials List, Shop Drawings, Samples, Design Data, Test Reports, and Certificates. Attach Shop Drawings to the effect of the proposed substitution on adjacent components of the Work.

   D. Insert Numbers of applicable reference standards:

   E. Attach a color chart, if applicable.

   F. Attach installation instructions.

3. Manufacturer's Reputation: Attach the following:

   A. Evidence of reputation for prompt delivery.

   B. Evidence of reputation for efficiency in servicing products.

4. Comparison: Attach an itemized comparison of the proposed substitution with product specified. Significant qualities may include elements such as size, weight, durability, performance, and visual effects.

5. Changes in Work: Attach data relating to changes required in other work to permit use of proposed substitution and changes required in construction schedule and overall contract time. Coordinate changes or modifications needed to other parts of the Work and to construction performed by the Owner and separate Contractors that will be necessary to accommodate the proposed substitution.

6. Cost Data: Attach accurate cost data on proposed substitution in comparison with product specified.

7. Previous Installation: Provide the following information on similar projects on which proposed substitution was used, list projects in the locale of the project primarily and then in other areas that best represent its application on this project:

Name and Address of Project	Date of Installation	Name, Address, and Phone # of Architect
A.		
B.		
C.		
D.		

8. In making a request for substitution, the Manufacturer represents that:

   A. He has examined the Drawings and Specifications and has determined that, to the best of his knowledge, the proposed substitution is appropriate for the use intended in the Drawings and Specifications.

   B. He will provide the same or better warranty for substitution as for product or method specified.

   C. The product is equal or better in quality and serviceability to the specified item.

9. In making a request for substitution, the Manufacturer represents that:

   A. He has examined the Drawings and Specifications and has determined that, to the best of his knowledge, the proposed substitution is appropriate for the use intended in the Drawings and Specifications.

   B. He will provide the same or better warranty for substitution as for product or method specified.

   C. The product is equal or better in quality and serviceability to the specified item.

_____
Name of Manufacturer and signature of Manufacturer's Rep. Date

_____
Name of Contractor and signature Date

END OF SECTION

SECTION 01 73 00
EXECUTION REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

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

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

B. Related Sections include the following:

1. Project Management and Coordination: Section 01 31 00; for procedures for coordinating field engineering with other construction activities.
2. Submittal Procedures: section 01 33 00; for submitting surveys.
3. Cutting and Patching: section 01 73 29; for procedural requirements for cutting and patching necessary for the installation or performance of other components of the Work.
4. Closeout Procedures: Section 01 77 00; for submitting final property survey with Project Record Documents, recording of Owner accepted deviations from indicated lines and levels, and final cleaning.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

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

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

B. Acceptance of Conditions: Examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for

installation tolerances and other conditions affecting performance. Record observations.

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

    a. Description of the Work.
    b. List of detrimental conditions, including substrates.
    c. List of unacceptable installation tolerances.
    d. Recommended corrections.

2. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
3. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
4. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
5. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

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

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

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

3.3 INSTALLATION

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

1. Make vertical work plumb and make horizontal work level.
2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.
4. Maintain minimum headroom clearance of 8 feet in spaces without a suspended ceiling.

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

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

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

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

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

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

1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
2. Allow for building movement, including thermal expansion and contraction.
3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

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

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

3.4 OWNER INSTALLED PRODUCTS

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

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

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

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

3.5 PROGRESS CLEANING

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

1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
2. Do not hold materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 degF.
3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

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

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

1. Remove liquid spills promptly.
2. Where dust would impair proper execution of the Work, broom clean or vacuum the entire work area, as appropriate.

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

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

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

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

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

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

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

3.6 STARTING AND ADJUSTING

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

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

C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Manufacturer's Field Service: If a factory authorized service representative is required to inspect field assembled components and equipment installation, comply with qualification requirements in Section 01 40 00 - Quality Requirements.

3.7 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Comply with manufacturer's written instructions for temperature and relative humidity.

3.8 CORRECTION OF THE WORK

A. Repair or remove and replace defective construction. Restore damaged substrates and finishes. Comply with requirements in Section 01 73 29 - Cutting and Patching.

1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.

B. Restore permanent facilities used during construction to their specified condition.

C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.

D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.

E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION

SECTION 01 73 29
CUTTING AND PATCHING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes procedural requirements for cutting and patching.

B. Related Sections include the following:

1. Divisions 03 through 32 Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.
2. Penetration Firestopping: Section 07 84 13; for patching fire-rated construction.

1.2 DEFINITIONS

A. Cutting: Removal of in-place construction necessary to permit installation or performance of other Work.

B. Patching: Fitting and repair work required to restore surfaces to original conditions after installation of other Work.

1.3 SUBMITTALS

A. Cutting and Patching Proposal: Submit a proposal describing procedures at least ten (10) days before the time cutting and patching will be performed, requesting approval to proceed. Include the following information:

1. Extent: Describe cutting and patching, show how they will be performed, and indicate why they cannot be avoided.
2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building's appearance and other significant visual elements.
3. Products: List products to be used and firms or entities that will perform the Work.
4. Dates: Indicate when cutting and patching will be performed.
5. Utility Services and Mechanical/Electrical Systems: List services/systems that cutting and patching procedures will disturb or affect. List services/systems that will be relocated and those that will be temporarily out of service. Indicate how long services/systems will be disrupted.
6. Structural Elements: Where cutting and patching involve adding reinforcement to structural elements, submit details and engineering calculations showing integration of reinforcement with original structure.
7. Architect's Approval: Obtain approval of cutting and patching proposal before cutting and patching. Approval does not waive right to later require removal and replacement of unsatisfactory work.

1.4 QUALITY ASSURANCE

A. Structural Elements: Do not cut and patch structural elements in a manner that could change their load carrying capacity or load deflection ratio.

B. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Operating elements include the following:

1. Primary operational systems and equipment.
2. Air or smoke barriers.
3. Fire suppression systems.
4. Mechanical systems piping and ducts.
5. Control systems.
6. Communication systems.
7. Conveying systems.
8. Electrical wiring systems.
9. Operating systems of special construction in Division 13 Sections.

C. Miscellaneous Elements: Do not cut and patch miscellaneous elements or related components in a manner that could change their load carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety. Miscellaneous elements include but are not limited to the following:]

1. Water, moisture, or vapor barriers.
2. Membranes and flashings.
3. Exterior curtain wall construction.
4. Equipment supports.
5. Piping, ductwork, vessels, and equipment.
6. Noise and vibration control elements and systems.

D. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

E. Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

1.5 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during cutting and patching operations, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections.

B. In-Place Materials: Use materials identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

1. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.

1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with in-place finishes or primers.
2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Temporary Support: Provide temporary support of Work to be cut.

B. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

3.3 PERFORMANCE

A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
4. Excavating and Backfilling: Comply with requirements in applicable Division 31 Sections where required by cutting and patching operations.
5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
6. Proceed with patching after construction operations requiring cutting are complete.

C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.

    a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
    b. Restore damaged pipe covering to its original condition.

3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.

    a. Where patching occurs in a painted surface, apply primer and intermediate paint coats over the patch and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.

4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.

5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.

D. Cleaning: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.

END OF SECTION

SECTION 01 77 00
CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:

1. Inspection procedures.
2. Warranties.
3. Final cleaning.

B. Related Sections include the following:

1. Payment Procedures: Section 01 29 00; for requirements for Applications for Payment for Substantial and Final Completion.
2. Execution: Section 01 73 00; for progress cleaning of Project site.
3. Project Record Documents: section 01 78 39; for submitting Record Drawings, Record Specifications, and Record Product Data.
4. Operation and Maintenance Data: section 01 78 23; for operation and maintenance manual requirements.
5. Demonstration and Training: Section 01 79 00; for requirements for instructing Owner's personnel.
6. Divisions 03 through 32 Sections for specific closeout and special cleaning requirements for the Work in those Sections.

1.2 SUBSTANTIAL COMPLETION

A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete in request.

1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
2. Advise Owner of pending insurance changeover requirements.
3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
4. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
5. Prepare and submit Project Record Documents, operation and maintenance manuals, Final Completion construction photographs, damage or settlement surveys, property surveys, and similar final record information.
6. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.

7. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
8. Complete startup testing of systems.
9. Submit test/adjust/balance records.
10. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
11. Advise Owner of changeover in heat and other utilities.
12. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
13. Complete final cleaning requirements, including touchup painting.
14. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

B. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis of requirements for Final Completion.

1.3 FINAL COMPLETION

A. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:

1. Submit a final Application for Payment according to Section 01 29 00 - Payment Procedures.
2. Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
4. Submit pest control final inspection report and warranty.
5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.

B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.4 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Preparation: Submit three (3) copies of list. Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor.
2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
3. Include the following information at the top of each page:
   a. Project name.
   b. Date.
   c. Name of Architect.
   d. Name of Contractor.
   e. Page number.
4. Submit list of incomplete items in one of the following formats:
   a. MS Excel electronic file. Architect will return annotated file.
   b. PDF electronic file. Architect will return annotated file.
   c. Three (3) paper copies. Architect will return two (2) copies.

1.5 WARRANTIES

A. Submittal Time: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.

B. Partial Occupancy: Submit properly executed warranties within ten days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.

C. Organize warranty documents into an orderly sequence based on the Table of Contents of the Project Manual.

1. Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
2. Provide heavy paper dividers with plastic covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.

D. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 FINAL CLEANING

A. General: Provide final cleaning. Conduct cleaning and waste removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:

    a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
    b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
    c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
    d. Remove tools, construction equipment, machinery, and surplus material from Project site.
    e. Remove snow and ice to provide safe access to building.
    f. Clean exposed exterior and interior hard surfaced finishes to a dirt free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
    g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
    h. Sweep concrete floors broom clean in unoccupied spaces.
    i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
    j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision obscuring materials. Replace chipped or broken glass and other

damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.

k. Remove labels that are not permanent.

l. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.

1) Do not paint over UL and similar labels, including mechanical and electrical nameplates.

m. Wipe surfaces of mechanical and electrical equipment, elevator equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.

n. Replace parts subject to unusual operating conditions.

o. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.

p. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.

q. Clean ducts, blowers, and coils if units were operated without filters during construction.

r. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

s. Leave Project clean and ready for occupancy.

C. Pest Control: Engage an experienced, licensed exterminator to make a final inspection and rid Project of rodents, insects, and other pests. Prepare a report.

D. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.

END OF SECTION

SECTION 01 78 23
OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:

1. Operation and maintenance documentation directory.
2. Emergency manuals.
3. Operation manuals for systems, subsystems, and equipment.
4. Maintenance manuals for the care and maintenance of products, materials, finishes, systems and equipment.

B. Related Sections include the following:

1. Submittal Procedures: S4ction 01 33 00; for submitting copies of submittals for operation and maintenance manuals.
2. Closeout Procedures: section 01 77 00; for submitting operation and maintenance manuals.
3. Project Record Documents: Section 01 78 39; for preparing Record Drawings for operation and maintenance manuals.
4. Divisions 03 through 32 Sections for specific operation and maintenance manual requirements for the Work in those Sections.

1.2 DEFINITIONS

A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.

B. Subsystem: A portion of a system with characteristics similar to a system.

1.3 SUBMITTALS

A. Initial Submittal: Submit two 2) draft copies of each manual at least ten (10) days before requesting inspection for Substantial Completion. Include a complete operation and maintenance directory. Architect will return one (1) copy of draft and mark whether general scope and content of manual are acceptable.

B. Final Submittal: Submit one (1) copy of each manual in final form at least ten (10) days before final inspection. Architect will return copy with comments within fifteen (15) days after final inspection.

1. Correct or modify each manual to comply with Architect's comments. Submit three (3) copies of each corrected manual within ten (10) days of receipt of Architect's comments.

1.4 COORDINATION

A. Where operation and maintenance documentation includes information on installations by more than one factory authorized service representative, assemble and coordinate information furnished by representatives and prepare manuals.

PART 2 - PRODUCTS

2.1 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

A. Organization: Include a section in the directory for each of the following:

1. List of documents.
2. List of systems.
3. List of equipment.
4. Table of Contents.

B. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.

C. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.

D. Tables of Contents: Include a Table of Contents for each emergency, operation, and maintenance manual.

E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

2.2 MANUALS - GENERAL

A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:

1. Title page.
2. Table of Contents.
3. Manual contents.

B. Title Page: Enclose title page in transparent plastic sleeve. Include the following information:

1. Subject matter included in manual.
2. Name and address of Project.

3. Name and address of Owner.
4. Date of submittal.
5. Name, address, and telephone number of Contractor.
6. Name and address of Architect.
7. Cross reference to related systems in other operation and maintenance manuals.

C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross referenced to Specification Section number in Project Manual.

1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive Table of Contents for all volumes in each volume of the set.

D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.

1. Binders: Heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.

    a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
    b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents. Indicate volume number for multiple volume sets.

2. Dividers: Heavy-paper dividers with plastic covered tabs for each section. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the Section on each divider, cross referenced to Specification Section number and title of Project Manual.
3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software diskettes for computerized electronic equipment.
4. Supplementary Text: Prepared on 8-1/2-by-11-inch white bond paper.
5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.

    a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
    b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

2.3 EMERGENCY MANUALS

A. Content: Organize manual into a separate section for each of the following:

1. Type of emergency.
2. Emergency instructions.
3. Emergency procedures.

B. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:

1. Fire.
2. Flood.
3. Gas leak.
4. Water leak.
5. Power failure.
6. Water outage.
7. System, subsystem, or equipment failure.
8. Chemical release or spill.

C. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.

D. Emergency Procedures: Include the following, as applicable:

1. Instructions on stopping.
2. Shutdown instructions for each type of emergency.
3. Operating instructions for conditions outside normal operating limits.
4. Required sequences for electric or electronic systems.
5. Special operating instructions and procedures.

2.4 OPERATION MANUALS

A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:

1. System, subsystem, and equipment descriptions.
2. Performance and design criteria if Contractor is delegated design responsibility.
3. Operating standards.
4. Operating procedures.
5. Operating logs.
6. Wiring diagrams.
7. Control diagrams.
8. Piped system diagrams.
9. Precautions against improper use.
10. License requirements including inspection and renewal dates.

B. Descriptions: Include the following:

1. Product name and model number.
2. Manufacturer's name.
3. Equipment identification with serial number of each component.
4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.
7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

C. Operating Procedures: Include the following, as applicable:

1. Startup procedures.
2. Equipment or system break-in procedures.
3. Routine and normal operating instructions.
4. Regulation and control procedures.
5. Instructions on stopping.
6. Normal shutdown instructions.
7. Seasonal and weekend operating instructions.
8. Required sequences for electric or electronic systems.
9. Special operating instructions and procedures.

D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

E. Piped Systems: Diagram piping as installed, and identify color coding where required for identification.

2.5 PRODUCT MAINTENANCE MANUAL

A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

B. Source Information: List each product included in manual, identified by product name and arranged to match manual's Table of Contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.

C. Product Information: Include the following, as applicable:

1. Product name and model number.
2. Manufacturer's name.
3. Color, pattern, and texture.
4. Material and chemical composition.
5. Reordering information for specially manufactured products.

D. Maintenance Procedures: Include manufacturer's written recommendations and the following:

1. Inspection procedures.
2. Types of cleaning agents to be used and methods of cleaning.
3. List of cleaning agents and methods of cleaning detrimental to product.
4. Schedule for routine cleaning and maintenance.
5. Repair instructions.

E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

2.6 SYSTEMS AND EQUIPMENT MAINTENANCE MANUAL

A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.

B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's Table of Contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.

C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:

1. Standard printed maintenance instructions and bulletins.
2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
3. Identification and nomenclature of parts and components.
4. List of items recommended to be stocked as spare parts.

D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:

1. Test and inspection instructions.
2. Troubleshooting guide.
3. Precautions against improper maintenance.
4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
5. Aligning, adjusting, and checking instructions.
6. Demonstration and training videotape, if available.

E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.

1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.

F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.

G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.

H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

PART 3 - EXECUTION

3.1 MANUAL PREPARATION

A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals.

B. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.

C. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

D. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.

1. Engage a factory authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.

E. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data

include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.

1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.

F. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in Record Drawings to ensure correct illustration of completed installation.

1. Do not use original Project Record Documents as part of operation and maintenance manuals.
2. Comply with requirements of newly prepared Record Drawings in Division 01 Section "Project Record Documents."

G. Comply with Section 01 77 00 - Closeout Procedures for schedule for submitting operation and maintenance documentation.

END OF SECTION

SECTION 01 78 39
PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for Project Record Documents, including the following:

1. Record Drawings.
2. Record Specifications.
3. Record Product Data.

B. Related Sections:

1. Electronic File Transfer Agreement: Document 00 63 73; for request of CAD files.
2. Closeout Procedures: Section 01 77 00; for general closeout procedures.
3. Operation and Maintenance Data: Section 01 78 23; for operation and maintenance manual requirements.
4. Divisions 03 through 32 Sections for specific requirements for Project Record Documents of the Work in those Sections.

1.2 SUBMITTALS

A. Record Drawings: Comply with the following:

1. Number of Copies: Submit copies of Record Drawings as follows:

a. Submit one (1) set of marked-up Record Prints, two (2) sets of Record CAD Drawing files, and three (3) copies printed from record plots. Plot and print each Drawing, whether or not changes and additional information were recorded.

1) Electronic Media: CD-R.

B. Record Specifications: Submit two copies of Project's Specifications, including addenda and contract modifications.

C. Record Product Data: Submit two copies of each Product Data submittal.

1. Where Record Product Data is required as part of operation and maintenance manuals, submit marked-up Product Data as an insert in manual instead of submittal as Record Product Data.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

A. Record Prints: Maintain one set of blue- or black-line white prints of the Contract Drawings and Shop Drawings.

1. Preparation: Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the marked up Record Prints.

    a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
    b. Accurately record information in an understandable drawing technique.
    c. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.

2. Content: Types of items requiring marking include, but are not limited to, the following:

    a. Dimensional changes to Drawings.
    b. Revisions to details shown on Drawings.
    c. Depths of foundations below first floor.
    d. Locations and depths of underground utilities.
    e. Revisions to routing of piping and conduits.
    f. Revisions to electrical circuitry.
    g. Actual equipment locations.
    h. Duct size and routing.
    i. Locations of concealed internal utilities.
    j. Changes made by Change Order or Construction Change Directive.
    k. Changes made following Architect's written orders.
    l. Details not on the original Contract Drawings.
    m. Field records for variable and concealed conditions.
    n. Record information on the Work that is shown only schematically.

3. Mark the Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. If Shop Drawings are marked, show cross-reference on the Contract Drawings.
4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
5. Mark important additional information that was either shown schematically or omitted from original Drawings.
6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

B. Record CAD Drawings: Immediately before inspection for Certificate of Substantial Completion, review marked-up Record Prints with Architect. When authorized, prepare a full set of corrected CAD Drawings of the Contract Drawings, as follows:

1. Format: Same CAD program, version, and operating system as the original Contract Drawings.
2. Incorporate changes and additional information previously marked on Record Prints. Delete, redraw, and add details and notations where applicable.
3. Refer instances of uncertainty to Architect for resolution.
4. Complete and submit Document 00 63 73 - Electronic File Transfer Agreement (Architect and Contractor/Subcontractor) with original signatures by party making request.
5. Architect will furnish Contractor one set of CAD Drawings of the Contract Drawings for use in recording information.

    a. Architect makes no representations as to the accuracy or completeness of CAD Drawings as they relate to the Contract Drawings.
    b. CAD Software Program: The Contract Drawings are available in Autocad.

C. Newly Prepared Record Drawings: Prepare new Drawings instead of preparing Record Drawings where Architect determines that neither the original Contract Drawings nor Shop Drawings are suitable to show actual installation.

1. New Drawings may be required when a Change Order is issued as a result of accepting an alternate, substitution, or other modification.
2. Consult Architect for proper scale and scope of detailing and notations required to record the actual physical installation and its relation to other construction. Integrate newly prepared Record Drawings into Record Drawing sets; comply with procedures for formatting, organizing, copying, binding, and submitting.

D. Format: Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.

1. Record Prints: Organize Record Prints and newly prepared Record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
2. Record Transparencies: Organize into unbound sets matching Record Prints. Place transparencies in durable tube type drawing containers with end caps. Mark end cap of each container with identification. If container does not include a complete set, identify Drawings included.
3. Record CAD Drawings: Organize CAD information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each CAD file.
4. Identification: As follows:

    a. Project name.
    b. Date.
    c. Designation "PROJECT RECORD DRAWINGS."
    d. Name of Architect.
    e. Name of Contractor.

2.2 RECORD SPECIFICATIONS

A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
4. For each principal product, indicate whether Record Product Data has been submitted in operation and maintenance manuals instead of submitted as Record Product Data.
5. Note related Change Orders, Record Product Data, and Record Drawings where applicable.

2.3 RECORD PRODUCT DATA

A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
3. Note related Change Orders, Record Specifications, and Record Drawings where applicable.

2.4 MISCELLANEOUS RECORD SUBMITTALS

A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and modifications to Project Record Documents as they occur; do not wait until the end of Project.

B. Maintenance of Record Documents and Samples: Store Record Documents and Samples in the field office apart from the Contract Documents used for

construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Architect's reference during normal working hours.

END OF SECTION

SECTION 01 79 00
DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:

1. Demonstration of operation of systems, subsystems, and equipment.
2. Training in operation and maintenance of systems, subsystems, and equipment.
3. Demonstration and training videotapes.

B. Related Sections include the following:

1. Project Management and Coordination: Section 01 31 00; for requirements for pre-instruction conferences.
2. Divisions 03 through 32 Sections for specific requirements for demonstration and training for products in those Sections.

1.2 SUBMITTALS

A. Instruction Program: Submit two (2) copies of outline of instructional program for demonstration and training, including a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.

1. At completion of training, submit thee (3) complete training manuals for Owner's use.

B. Qualification Data: For instructor.

C. Attendance Record: For each training module, submit list of participants and length of instruction time.

D. Evaluations: For each participant and for each training module, submit results and documentation of performance based test.

E. Demonstration and Training Videotapes: Submit two (2) copies within seven (7) days of end of each training module.

1. Identification: On each copy, provide an applied label with the following information:

a. Name of Project.
b. Name and address of photographer.
c. Name of Architect.

d. Name of Contractor.
e. Date videotape was recorded.
f. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.

2. Transcript: Prepared on 8-1/2-by-11-inch paper, punched and bound in heavy-duty, 3-ring, vinyl-covered binders. Mark appropriate identification on front and spine of each binder. Include a cover sheet with same label information as the corresponding videotape. Include name of Project and date of videotape on each page.

1.3 QUALITY ASSURANCE

A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.

B. Instructor Qualifications: A factory authorized service representative, complying with requirements in Division 01 Section "Quality Requirements," experienced in operation and maintenance procedures and training.

C. Photographer Qualifications: A professional photographer who is experienced in video photography for construction projects.

D. Preinstruction Conference: Conduct conference at Project site to comply with requirements in Section 01 31 00- Project Management and Coordination. Review methods and procedures related to demonstration and training including, but not limited to, the following:

1. Inspect and discuss locations and other facilities required for instruction.
2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.
3. Review required content of instruction.
4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

1.4 COORDINATION

A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations.

B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.

C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Architect.

PART 2 - PRODUCTS

2.1 INSTRUCTION PROGRAM

A. Program Structure: Develop an instruction program that includes individual training modules for each system and equipment not part of a system, as required by individual Specification Sections, and as follows:

1. HVAC systems, including air handling equipment, air distribution systems and terminal equipment and devices.
2. HVAC instrumentation and controls.
3. Electrical service and distribution, including transformers, panelboards, switchboards and motor controls.
4. Lighting equipment and controls.
5. Communication systems, including intercommunication, voice and data and television equipment.

B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following:

1. Basis of System Design, Operational Requirements, and Criteria: Include the following:

   a. System, subsystem, and equipment descriptions.
   b. Performance and design criteria if Contractor is delegated design responsibility.
   c. Operating standards.
   d. Regulatory requirements.
   e. Equipment function.
   f. Operating characteristics.
   g. Limiting conditions.
   h. Performance curves.

2. Documentation: Review the following items in detail:

   a. Emergency manuals.
   b. Operations manuals.
   c. Maintenance manuals.
   d. Project Record Documents.
   e. Identification systems.
   f. Warranties and bonds.
   g. Maintenance service agreements and similar continuing commitments.

3. Emergencies: Include the following, as applicable:

   a. Instructions on meaning of warnings, trouble indications, and error messages.
   b. Instructions on stopping.
   c. Shutdown instructions for each type of emergency.
   d. Operating instructions for conditions outside of normal operating limits.

e. Sequences for electric or electronic systems.
f. Special operating instructions and procedures.

4. Operations: Include the following, as applicable:

a. Startup procedures.
b. Equipment or system break-in procedures.
c. Routine and normal operating instructions.
d. Regulation and control procedures.
e. Control sequences.
f. Safety procedures.
g. Instructions on stopping.
h. Normal shutdown instructions.
i. Operating procedures for emergencies.
j. Operating procedures for system, subsystem, or equipment failure.
k. Seasonal and weekend operating instructions.
l. Required sequences for electric or electronic systems.
m. Special operating instructions and procedures.

5. Adjustments: Include the following:

a. Alignments.
b. Checking adjustments.
c. Noise and vibration adjustments.
d. Economy and efficiency adjustments.

6. Troubleshooting: Include the following:

a. Diagnostic instructions.
b. Test and inspection procedures.

7. Maintenance: Include the following:

a. Inspection procedures.
b. Types of cleaning agents to be used and methods of cleaning.
c. List of cleaning agents and methods of cleaning detrimental to product.
d. Procedures for routine cleaning
e. Procedures for preventive maintenance.
f. Procedures for routine maintenance.
g. Instruction on use of special tools.

8. Repairs: Include the following:

a. Diagnosis instructions.
b. Repair instructions.
c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
d. Instructions for identifying parts and components.
e. Review of spare parts needed for operation and maintenance.

PART 3 - EXECUTION

3.1 PREPARATION

A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a combined training manual.

B. Set up instructional equipment at instruction location.

3.2 INSTRUCTION

A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Owner for number of participants, instruction times, and location.

B. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.

1. Architect will furnish an instructor to describe basis of system design, operational requirements, criteria, and regulatory requirements.
2. Owner will furnish an instructor to describe Owner's operational philosophy.
3. Owner will furnish Contractor with names and positions of participants.

C. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.

1. Schedule training with Owner, through Architect, with at least ten (10) days' advance notice.

D. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of a demonstration performance based test.

E. Cleanup: Collect used and leftover educational materials and remove from Project site. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

3.3 DEMONSTRATION AND TRAINING VIDEOTAPES

A. General: Engage a qualified commercial photographer to record demonstration and training videotapes. Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice.

1. At beginning of each training module, record each chart containing learning objective and lesson outline.

B. Videotape Format: Provide high-quality VHS color videotape in full-size cassettes.

C. Recording: Mount camera on tripod before starting recording, unless otherwise necessary to show area of demonstration and training. Display continuous running time.

D. Narration: Describe scenes on videotape by dubbing audio narration off-site after videotape is recorded. Include description of items being viewed. Describe vantage point, indicating location, direction (by compass point), and elevation or story of construction.

E. Transcript: Provide a typewritten transcript of the narration. Display images and running time captured from videotape opposite the corresponding narration segment.

END OF SECTION

SECTION 02 41 19
SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

A. Selective demolition work required to remove indicated portions of the existing building construction for installation or construction of the work of other sections.

B. Related Sections:

1. Cutting and Patching: Section 01 73 29.

1.2 SUBMITTALS

A. Inventory: After selective demolition is complete, submit a list of items that have been removed and salvaged.

B. Predemolition Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including finish surfaces that might be misconstrued as damage caused by selective demolition operations. Submit before Work begins.

1.3 QUALITY ASSURANCE

A. Demolition Firm Qualifications: Engage an experienced firm that has successfully completed selective demolition Work similar to that indicated for this Project.

B. Regulatory Requirements: Comply with all laws, ordinances, rules and regulations of governmental authorities having jurisdiction over the demolition work.

1. Comply with governing EPA notification regulations before starting selective demolition.
2. Comply with hauling and disposal regulations of authorities having jurisdiction.
3. Provide protection of persons and property in accordance with ANSI/NFPA 241.

C. In the event that unforeseen conditions or conflicts become known, notify the Architect of such conditions before proceeding with demolition work.

D. Definitions:

1. Remove: Remove and legally dispose of items and construction except those indicated to remain the Owner's property.
2. Existing to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by the Architect,

items may be removed to a suitable, protected storage location during selective demolition and then cleaned and reinstalled in their original locations.

3. Remove and Salvage: Items indicated to be removed and salvaged remain the Owner's property. Remove, clean, and pack or crate items to protect against damage. Identify contents of containers and deliver to Owner's designated storage area.
4. Remove and Reinstall: Remove items indicated; clean, service, and otherwise prepare them for reuse; store and protect against damage. Reinstall items in the same locations or in locations indicated.

1.4 PROTECTION

A. Provide all temporary barricades, railings, platforms, lights, etc., required to protect the workmen, Owner's personnel and others from injury due to the selective demolition work. Provide free and safe passage of persons to and from building areas which are to remain.

B. Repair any damage to the condition existing before damage to property of the Owner which is to remain in use, or that of any person, or persons on or off the site caused by the selective demolition work without additional expense to the Owner.

C. Maintain regular traffic flow around the building areas unless otherwise directed.

D. During the demolition work, if any structure or portion thereof, at any time, is considered by governing authorities or Contractor to be unstable and presents a hazard, Contractor is to immediately notify the Owner. Take such precautions as necessary to protect and stabilize the construction until permanent conditions are established. If such unstable construction is to be removed, it has to be given priority and be immediately removed at no additional cost to the Owner.

1.5 FIRE PREVENTION

A. Perform the demolition work in such a manner as to prevent fires. Remove debris promptly. Do not burn materials on the site.

B. Protect combustible materials against ignition during acetylene cutting operations. Keep stairways and fire escapes unobstructed and available for use at all times.

C. Instruct employees in the following:

1. The location of the fire alarm box and telephone; also as to the manner of summoning the fire department without delay in the event of fire.
2. The use of hand pumps, hose, water buckets and other fire extinguishing equipment.
3. Maintenance of fire protection equipment in serviceable condition properly located and identified so that it will be available for immediate use.

1.6 PROJECT/SITE CONDITIONS

A. The Drawings indicate existing construction diagrammatically. Verify at the project site exact locations, sizes, extent, quantities and conditions of the existing construction to be removed or to remain.

B. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted. Provide not less than 72 hours' notice to Owner of activities that will affect Owner's operations.

C. Maintain access to existing walkways, corridors, paths of egress, exit ways and other adjacent occupied or used facilities.

1. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from authorities having jurisdiction.

D. Owner assumes no responsibility for condition of areas to be selectively demolished.

1. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
2. Before selective demolition, Owner will remove the following items:
   a. Furniture

E. Except as specified below, no liability is to be attached to the Owner or to Architect through bidder or Contractor for reliance on information indicated on Drawings of existing construction.

1. Exception: Conditions not indicated in the Contract Documents nor on Drawings of existing construction, which are not observable or otherwise determinable without the use of uncommon equipment and procedures and which subsequently affect the scope or time of the work, may be considered to represent a change in the work. Refer to Section 01 26 00 - Contract Modification Procedures.

F. 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 Owner. Hazardous materials will be removed by Owner under a separate contract.

1.7 MATERIALS OWNERSHIP

A. Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain the Owner's property, demolished materials become the Contractor's property and are to be removed from the site with further disposition at the Contractor's option.

B. Storage or sale of removed items or materials on-site will not be permitted.

1.8 USE OF EXISTING ELEVATORS

A. The existing service and freight elevators will be available for use during selective demolition work. Provide operators for such. Do not overload.

B. The existing passenger elevators will not available for use during selective demolition work.

C. The Owner will provide maintenance of service elevators during selective demolition work.

PART 2 - PRODUCTS

2.1 REPAIR MATERIALS

A. Use repair materials identical to existing materials.

1. If identical materials are unavailable or cannot be used for exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.
2. Use materials whose installed performance equals or surpasses that of existing materials.

B. Comply with material and installation requirements specified in individual Specification Sections.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped.

B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

C. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.

D. When unanticipated mechanical, electrical, or structural elements that conflict with the intended function or design are encountered, investigate and measure the nature and extent of the conflict. Promptly submit a written report to the Architect.

E. Survey the condition of the building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of the structure or adjacent structures during selective demolition.

3.2 PREPARATION AND PROTECTION

A. Conduct demolition operations and remove debris to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.

B. Erect temporary protection, such as dust partitions.

1. Protect walls, ceilings, floors, and other existing finish work that are to remain and are exposed during selective demolition operations.
2. Cover and protect furniture, furnishings, and equipment that have not been removed.

C. Protection of Areas In Use: Erect and maintain dustproof partitions and temporary enclosures to limit dust and dirt migration and to separate areas from fumes and noise.

1. Provide dust-tight partitions between areas where demolition work is being performed and areas which are finished, not in use, or other building and tenant areas.
2. Provide not less than 2 inches x 4 inches wood stud partitions with 1/4 inch plywood sheeting. Seal joints of sheeting airtight. Seal perimeter joints of partitions to the adjoining existing construction.
3. Provide hinged lockable doors of same construction as partitions. Provide doors of adequate size to allow for access and passage of workmen, equipment and materials.

3.3 UTILITY SERVICES

A. Protect and maintain existing and temporary utility lines which are to remain in service in such a manner as to avoid interruption of these lines. Cap all utility lines terminated by the selective demolition work.

B. Coordinate locations of existing utility and building services located in walls, floors and ceilings prior to the start of work. Record all such utilities and services on as-built record drawings.

3.4 REMOVAL OF MATERIALS

A. In addition to what is specifically shown on the Drawings, remove items as necessary to provide access or to allow alterations and new work to proceed. Including such items as:

1. Removal of abandoned items and items serving no useful purpose, such as framing, blocking, abandoned piping, conduit, ductwork, wiring, switches, junction boxes, fittings, anchors, fasteners and appurtenances associated with

the removed or abandoned items or construction for a make ready condition for new construction or patching.
2. Removal of unsuitable or extraneous materials not marked for salvage.
3. Cleaning of surfaces and removal of surface finishes as needed to install new work and finishes.

B. Cutting and Drilling:

1. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. To minimize disturbance of adjacent surfaces, use hand or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.
2. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
3. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame cutting operations. Maintain portable fire suppression devices during flame cutting operations.
4. Maintain adequate ventilation when using cutting torches.

C. Remove decayed, vermin infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.

D. Equipment and Material Loading Requirements: Locate selective demolition equipment throughout the structure and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing. Verify exiting load capacity before the start of demolition work.

E. Do not cause or impose impact loads or excessive vibration on the existing floor construction during selective demolition. Do not stack, pile or allow to accumulate demolition materials that would exceed the safe floor loading of 50 pounds per square foot, except as noted on the structural demolition Drawings.

F. Remove resilient floor coverings and adhesive according to recommendations of the Resilient Floor Covering Institute's (RFCI), Recommended Work Practices for the Removal of Resilient Floor Coverings and Addendum.

1. Remove residual adhesive and prepare substrate for new floor coverings by one of the methods recommended by RFCI.

G. Wet down all piled materials and materials being discharged into vehicles. Do not flood areas or materials, or allow water to accumulate on the site.

H. Remove all materials resulting from the selective demolition work from the site in such a manner as to avoid creating a nuisance as required by building management. Dispose of all materials from the site in a legal manner on a daily basis at no additional cost to the Owner. Coordinate routes of removed materials through the building or buildings with the Owner's representative.

1. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level.

I. Leave each area of the building broom clean upon completion of the demolition work.

J. Removed and Salvaged Items: Comply with the following:

1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers.
3. Store items in a secure area until delivery to Owner.
4. Transport items to Owner's storage area designated by Owner.
5. Protect items from damage during transport and storage.

K. Removed and Reinstalled Items: Comply with the following:

1. Clean and repair items to functional condition adequate for intended reuse. Paint equipment to match new equipment.
2. Pack or crate items after cleaning and repairing. Identify contents of containers.
3. Protect items from damage during transport and storage.
4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

L. Removal and Storage of Existing Doors and Door Frames for Reuse:

1. Carefully remove existing doors and door frames indicated for salvage on the Drawings.
2. Leave all hardware on doors and frames.
3. Provide covering and padding to protect finish surfaces and hardware from damage.
4. Provide plastic banding at top, center and bottom of doors and door frames to maintain doors in frames.
5. If doors are removed from frames, provide temporary spreader bars at the bottom of each frame.
6. Transport doors and frames to Owner’s storage area.
7. Store doors and door frames in upright position with protective padding between units.

M. Removal and Storage of Existing Door Hardware for Reuse:

1. Remove existing door hardware items taking not do damage each item and the existing door and door frame.
2. Place each hardware set from a door into an individual box marked with a description of the contents.
3. Transport hardware sets to Owner’s secure storage area designated by Owner.

3.5 PATCHING AND REPAIRS

A. General: Promptly repair damage to adjacent construction caused by selective demolition operations.

B. Repairs: Where repairs to existing surfaces are required, patch to produce surfaces suitable for new materials.

1. Completely fill holes and depressions in existing masonry walls that are to remain with a compatible masonry patching material as approved by the Architect, applied according to manufacturer's written recommendations.

C. Finishes: Restore exposed finishes of patched areas and extend restoration into adjoining construction in a manner that eliminates evidence of patching and refinishing.

D. Floors and Walls: Where walls or partitions that are demolished extend one finished area into another, patch and repair floor and wall surfaces in the existing and new space. Provide an even surface of uniform finish color, texture, and appearance. Remove existing floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.

1. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other specification sections.
2. Where patching occurs in a painted surface, apply primer and intermediate paint coats over patch and apply final paint coat over entire unbroken surface containing patch. Provide additional coats until patch blends with adjacent surfaces.
3. Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.

E. Ceilings: Patch, repair, or rehang existing ceilings as necessary to provide an even plane surface of uniform appearance.

3.6 POLLUTION CONTROLS

A. Do not use water inside the building to control dust. Use temporary enclosures, and other suitable methods to limit the spread of dust and dirt. Comply with governing environmental protection regulations.

B. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

3.7 CLEANING

A. Clean exterior adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before start of selective demolition.

B. Clean building interior areas of selective demolition of dust, dirt, and debris as a result of selective demolition, leave areas broom clean.

C. Remove containers, equipment, temporary construction and protection used for selective demolition.

3.8 SCHEDULE OF SLAVAGED ITEMS

A. Existing Items to Be Removed, Salvaged and Store for Reinstallation: Locations and quantities of the following are indicated on the Drawings:

1. Doors
2. Door frames
3. Door hardware
4. Light fixtures
5. Cover plates for light switches, electrical outlets, data outlets
6. Fire extinguisher cabinets
7. Fire extinguishers

END OF SECTION

SECTION 06 10 00
ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. Rough carpentry and framing, including the following:

1. Wood blocking and nailers for the anchor or support of other items or construction of every description including items reasonably implied but not specifically mentioned on the Drawings or specified herein to render the work secure and complete.
2. Miscellaneous plywood panels and backing.
3. Wood fire retardant treatment for lumber and plywood.
4. Anchors, fasteners and hardware for the above.

B. Related Sections:

1. Gypsum board: Section 09 29 00.

1.2 SUBMITTALS

A. Product data: For each type of process and factory fabricated product. Indicate component materials and dimensions and include construction and application details.

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 based on testing by a qualified independent testing agency.
2. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to project site.

1.3 QUALITY ASSURANCE

A. Grading Rules:

1. Provide lumber conforming to the grading rules and wood species of the DOC Voluntary Product Standard PS-20. Grading rules of the following associations also apply to materials produced under their supervision:
   a. Northeastern Lumber Manufacturer's Association, Inc. (NELMA).
   b. Southern Pine Inspection Bureau (SPIB).
   c. West Coast Lumber Inspection Bureau (WCLIB).
   d. Western Wood Products Association (WWPA).
2. Provide plywood conforming to the following:

a. Softwood Plywood - Construction and Industrial: DOC Product Standard PS-1.

B. Grading Marks: Identify all lumber and plywood by official grade mark.

1. Lumber: Grade stamp to contain symbol of grading agency, mill number or name, grade of lumber, species or species grouping or combination designation, rules under which graded, where applicable and condition of seasoning at time of manufacture.
   a. S-Dry: Maximum 19 percent moisture content.
   b. MC-5 or KD: Maximum 15 percent moisture content.
   c. Dense.
2. Softwood Plywood: Maximum grade trademark of the APA The Engineered Wood Association.
   a. Type, grade, class and identification index.
   b. Inspection, testing or grading agency.

C. Testing: ASTM E 84, maximum 25 flame spread rating.

D. Requirements of Regulatory Agencies:

1. Fire Hazard Classification: Underwriters' Laboratories, Inc., for treated lumber and plywood.
2. Span Tables: American Forest & Paper Association (AFPA) American Wood Council (AWC).
3. Working Stresses: Softwood Lumber, National Design Specification, American Forest & Paper Association (AFPA) American Wood Council (AWC).

E. Framing Standard: Comply with AFPA, Manual for Wood Frame Construction, unless otherwise indicated herein or required by governing codes.

F. Nailing:

1. Recommended Nailing Schedule of referenced framing standard and with AFPA, National Design Specifications for Wood Construction.

1.4 DELIVERY, STORAGE AND HANDLING

A. Stack lumber flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Lumber:

1. Dimension:
   a. Specified lumber dimensions are nominal.

b. Actual dimensions conform to industry standards established by the American Lumber Standards Committee and the rules writing agencies.

2. Moisture Content: 19 percent maximum at time of permanent closing in of building or structure for lumber 2 inches or less nominal thickness.
3. Surfacing: Surface four sides (S4S), unless otherwise shown on the Drawings or specified.
4. Blocking and Nailers lumber, No. 2 Grade, 2 inch to 4 inch thick, 2 inch to 4 inch wide, any commercial softwood species, unless otherwise shown or specified.

B. Plywood:

1. Telephone, Electrical and Miscellaneous Equipment Backing Panels: Interior Graded Plywood, C-D INT-APA, with exterior glue in areas where moisture is present, touch sanded, fire retardant treated, square edged, 3/4 inch thick unless noted otherwise on the Drawings.

C. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.

1. Treatment shall not promote corrosion of metal fasteners.
2. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D 3201 at 92 percent relative humidity. Use where exterior type is not indicated.

2.2 METAL FRAMING ANCHORS AND HARDWARE

A. General: Provide galvanized steel framing anchors of structural capacity, type, and size indicated and as follows:

1. Research or Evaluation Reports: Provide products for which model code research or evaluation reports exist that are acceptable to authorities having jurisdiction and that evidence compliance of metal framing anchors for application indicated with building code in effect for project.
2. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer that meet or exceed those indicated. Manufacturer's published values are to be determined from empirical data or by rational engineering analysis, and demonstrated by comprehensive testing performed by a qualified independent testing agency.

B. Rough Hardware: Zinc coated steel, unless otherwise shown on the Drawings or specified:

1. Bolts: FS FF-B-575C.
2. Nuts: FS FF-N-836C.
3. Expansion Shields: FS FF-B-561C.
4. Lag Screws and Bolts: FS FF-B-561C.
5. Toggles Bolts: FS FF-B-588C.

6. Wood Screws: FS FF-S-111D.
7. Nails and Staples: FS FF-N-105B.
8. Joist Hangers: Minimum 18 gage.
9. Metal Cross Bridging: 16 gage.
10. Bar and Strap Anchors: ASTM A 525, minimum 18 gage, hot-dip galvanized.
11. Plyclips: Extruded aluminum alloy, ASTM B 221, 6063-T6.

C. Acceptable Metal Framing Anchor Manufacturers:

1. Heckman Building Products, Chicago, IL 60624.
2. KC Metal Products, Inc., San Jose, CA 95131.
3. Simpson Strong-Tie Company, Inc., Pleasanton, CA 94588.
4. Southeastern Metal Manufacturing Company, Jacksonville, FL 32218.

PART 3 - EXECUTION

3.1 PREPARATION

A. Examine all surfaces to receive the parts of the work specified herein. Verify all dimensions of in-place and subsequent construction. Application or installation of materials constitutes acceptance of existing conditions.

3.2 INSTALLATION

A. General: Frame wood members to a close fit, set accurately to required lines and levels and secure rigidly in place in accordance with the Drawings. Cut to fit framing, blocking, etc. to accommodate other work.

B. Blocking and Nailers:

1. Provide where shown on the Drawings and required for attachment of other items of construction. Space framing members as shown on the Drawings. If not shown space at 16 inches on center maximum. Form to shapes as shown and cut as required for true, level lines of other work to be attached.
2. Attach to substrates as required to support applied loading. Countersink bolts, nuts and anchors flush with surface, unless otherwise shown on the Drawings.
3. Coordinate locations of blocking and nailers with other work requiring support or solid substrate for anchoring in place.

C. Plywood Panels and Backing:

1. Provide miscellaneous plywood panels and backing (sheathing) for attachment of other items of construction.
2. Attach to substrates as required to support applied loading and in conformance with the applicable recommendations of the current edition of the APA Design/ Construction Guide - Residential and Commercial.
3. Coordinate locations of plywood panels and backing with other work requiring prior installation for support or anchoring.

D. Plywood Wall Sheathing:

1. Install with face grain horizontal.
2. Allow minimum 1/16 inch space at end joints and 1/8 inch at edge joints; double these spacings under wet or humid conditions.
3. Nail 6 inches o.c. along panel edges and 12 inches o.c. at intermediate supports with 6d common nails for panels 1/2 inch thickness and less and 8d nails for greater thicknesses.

E. Fire Retardant Treated Wood Products:

1. Provide fire retardant treated wood for all framing, blocking, furring, nailing strips, and plywood where shown on the Drawings and required by local codes.
2. Apply two brush coats of same treatment used in original treatment to all sawn or cut surfaces of fire treated lumber and plywood.

END OF SECTION

SECTION 07 84 13
THROUGH-PENETRATION FIRESTOP SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Through-penetration firestop systems, including but not limited to the following:

1. Penetrations through fire-resistance-rated floor including both empty openings and openings containing cables, pipes, ducts, conduits, and other penetrating items.
2. Penetrations through fire-resistance-rated walls and partitions including both empty openings and openings containing cables, pipes, ducts, conduits, and other penetrating items.
3. Penetrations through smoke barriers and construction enclosing compartmentalized areas involving both empty openings and openings containing penetrating items.
4. Accessories and materials required for installation.

B. Related Sections:

1. Fire resistive joint systems: Section 07 84 43
2. Gypsum board: Section 09 29 00
3. Division 21 Sections
4. Division 22 Sections
5. Division 23 Sections
6. Division 26 Sections
7. Division 27 Sections

1.2 PERFORMANCE REQUIREMENTS

A. General: Provide tested through-penetration firestop systems produced and installed to retain integrity of fire rated construction by maintaining an effective barrier against the spread of flame, smoke, water and hot gases through penetrations in fire rated wall, partition, floor and roof assemblies, according to requirements indicated.

B. F-Rated Through-Penetration Firestop Systems: Provide through-penetration firestop systems with F ratings indicated, as determined per ASTM E 814, but not less than that equaling or exceeding the fire-resistance rating of the constructions penetrated.

C. T-Rated Through-Penetration Firestop Systems: Provide through-penetration firestop systems with T ratings, in addition to F ratings, as determined per ASTM E 814, where indicated and where systems protect penetrating items exposed to contact with adjacent materials in occupiable floor areas. T-rated assemblies are required where the following conditions exist:

1. Where through-penetration firestop systems protect penetrations located outside of wall cavities.
2. Where through-penetration firestop systems protect penetrations located outside fire-resistive shaft enclosures.
3. Where through-penetration firestop systems protect penetrations located in construction containing doors required to have a temperature-rise rating.
4. Where through-penetration firestop systems protect penetrating items larger than a 4-inch-diameter nominal pipe or 16 sq. in. in overall cross-sectional area.

D. For through-penetration firestop systems exposed to view, traffic, moisture, and physical damage, provide products that do not deteriorate when exposed to these conditions.

1. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration firestop systems.
2. For floor penetrations with annular spaces exceeding 4 inches or more in width and exposed to possible loading and traffic, provide through-penetration firestop systems capable of supporting the floor loads involved either by installing floor plates or by other means.
3. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.

E. For through-penetration firestop systems exposed to view, provide products with flame-spread values of less than 25 and smoke-developed values of less than 450, as determined per ASTM E 84.

F. Systems and Product Selection:

1. When not shown on the Drawings, it is the Installing Contractor's undivided responsibility to select proposed systems and products which are appropriate for the types of penetrations, construction systems and the required fire resistance ratings shown on the Drawings and which comply with the requirements of this specification, subject to review by the Architect.
2. Proprietary products and UL designs when indicated on the Drawings are not intended to imply that products and UL designs of the manufacturer are required to the exclusion of equivalent products of other named acceptable manufacturers.

1.3 SUBMITTALS

A. Manufacturer's Literature: Materials description and installation instructions/ specifications for all materials used in the system.

B. Certification by through-penetration firestop system manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOCs) and are nontoxic to building occupants.

C. Shop Drawings:

1. Submit floor plans indicating the locations of each type of item or group of items to receive a through-penetration system, indicate the proposed penetration system at each location.
2. For each type of penetration and construction show materials, installation methods, and relationships to adjoining construction. Include firestop design designation of qualified testing and inspecting agency evidencing compliance with requirements for each condition indicated.

    a. Submit documentation, including illustrations, from a qualified testing and inspecting agency that is applicable to each through-penetration firestop configuration for construction and penetrating items.
    b. Where Project conditions require modification of qualified testing and inspecting agency's illustration to suit a particular through-penetration firestop condition, submit illustration approved by through-penetration firestop system manufacturer's fire protection engineer with modifications marked.

D. Schedule: For each type of penetration and construction submit a schedule indicating the following:

1. Indicate each type of item or group of items to receive through-penetration firestoping. Include description of item or items; description of the floor, wall or roof construction; proposed through-penetration firestoping system.
2. Indicate the UL Fire Resistance Directory (Vol. 2) alpha-numeric identification system cross-referenced to the scheduled systems at the end of this section and the submitted shop drawings and product literature.

E. Samples: Submit manufacturer's standard color samples for selection by Architect for exposed to view through-penetration firestop systems.

F. Product Certificates: Signed by manufacturers of through-penetration firestop system products certifying that their products comply with specified requirements.

G. Product Test Reports: From a qualified testing and inspecting agency indicating compliance through-penetration firestop system complies with requirements based on comprehensive testing of current products.

H. Installer Qualifications:

1. Submit written evidence in accordance with the "Quality Assurance" article to demonstrate capabilities and experience. Include list of completed projects with project names, addresses, names of Architect and Owners, and other information specified.
2. Installer's written certification from the Manufacturer stating that the Installer is approved and is a Certified or Licensed Installer of the proposed through-penetration firestop systems.

1.4 QUALITY ASSURANCE

A. Comply with all laws, ordinances, rules, regulations and orders of public authorities having jurisdiction over this part of the work.

B. Fire-Test-Response Characteristics: Provide through-penetration firestop systems that complies with the following requirements and those specified under the "Performance Requirements" Article:

1. Through-penetration firestop systems tests are to be performed by a qualified testing and inspecting agency. A qualified testing and inspecting agency is UL, ITS, Warnock Hersey, or other agency approved by the Architect, performing testing and follow-up inspection services for through-penetration firestop systems and is acceptable to authorities having jurisdiction.
2. Through-penetration firestop systems are identical to those tested per ASTM E 814 under conditions where positive furnace pressure differential of at least 0.01 inch of water is maintained at a distance of 0.78 inch below the fill materials surrounding the penetrating items in the test assembly. Provide rated systems complying with the following requirements:
   a. Through-penetration firestop system products bear classification marking of qualified testing and inspecting agency.
   b. Through-penetration firestop systems correspond to those indicated by reference to through-penetration firestop system designations listed by UL in their "Fire Resistance Directory," by ITS, Warnock Hersey, or by another qualified testing and inspecting agency.

C. Information on the Drawings referring to specific design designations of through-penetration firestop systems is intended to establish requirements for performance based on conditions that are expected to exist during installation. Any changes in conditions and designated systems require the Architect's prior approval. Submit documentation in accordance with Section 01 60 00 showing that the performance of proposed substitutions proposed to replace those shown or specified subject to acceptable to authorities having jurisdiction.

D. Installer Qualifications:

1. The Installer is to be a firm regularly experienced in the installation of through-penetration firestop systems who has completed through-penetration firestop systems installations similar in material, design, and extent to that indicated for Project and whose work has resulted in construction with a record of successful in-service performance for period of not less than five (5) consecutive years.
2. The Installer is also to be acceptable to the Through-Penetration Firestop System Manufacturer and is to also be certified by the manufacture to install the proposed through-penetration firestop systems and is to provide written evidence as part of the required submittals.
3. Qualifications include having the necessary experience, staff, and training to install manufacturer's products per specified requirements. Manufacturer's willingness to sell its penetration firestopping products to Contractor or to Installer engaged by Contractor does not in itself confer qualification on buyer.

E. Single-Source Responsibility: Obtain through-penetration firestop systems for each type of penetration and construction condition indicated from a single manufacturer.

F. Provide through-penetration firestop systems products containing no detectable asbestos as determined by the method specified in 40 CFR Part 763, Subpart F, Appendix A, Section 1, "Polarized Light Microscopy."

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver through-penetration firestop system products to Project site in original, unopened containers or packages with intact and legible manufacturers' labels identifying product and manufacturer; date of manufacture; lot number; shelf life, if applicable; qualified testing and inspecting agency's classification marking applicable to Project; curing time; and mixing instructions for multi component materials.

B. Store and handle through-penetration firestop system materials to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

1. Store materials, between 60 degrees F. and 80 degrees F. If exposed to lower temperature, restore to proper temperature before using.
2. Store materials, in dry area and protect. Replace damaged materials at Contractor's expense.

1.6 PROJECT/SITE CONDITIONS

A. Pre-installation Meeting: Meet with Installer, Architect, Sealant manufacturer's technical representative, if so requested, and other trades involved in coordination with sealant work at the Project Site. Review procedures and time schedule proposed for installation of through-penetration firestop systems in coordination with other work. Review each major through-penetration firestop systems application required on the Project.

B. Environmental Conditions:

1. Do not proceed with installation of through-penetration firestop systems under adverse environmental conditions or when temperatures are below or above manufacturer's recommended limitations for installation.
2. Proceed with the Work only when forecasted environmental conditions are favorable for proper cure and development by ambient temperature variations, install elastomeric sealants only when temperatures are in the lower third of manufacturer's recommended installation temperature range, so that sealant will not be subjected to excessive elongation and bond stress at subsequent low temperatures.

C. Ventilation: Ventilate through-penetration firestop system installation area per through-penetration firestop system manufacturers' instructions by natural means or, where this is inadequate, forced air circulation.

1.7 COORDINATION

A. Coordinate construction of openings and penetrating items to ensure that through-penetration firestop systems are installed according to specified requirements.

B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate through-penetration firestop systems.

C. Do not cover up through-penetration firestop system installations that will become concealed behind other construction until Owner's inspecting agency and building inspector, if required by authorities having jurisdiction, have examined each installation.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with the specified requirements, provide systems products by one of the following:

1. 3M Fire Protection Products, St. Paul, MN 55144
2. Dap Inc., Dayton, Oh 45401
3. Hilti Construction Chemicals, Inc., Tulsa, OK 74146
4. Flamesafe - W.R. Grace & Co., Hatfield, PA 19440
5. The RectorSeal Corporation, Houston, TX 77023
6. Nelson Firestop Products, Tulsa, OK 74145
7. United States Gypsum Co., Chicago. IL 60680
8. Specified Technologies Co., Sommerville, Nj 08876
9. Isolatek International, Stanhope, NJ 07874
10. Instant Firestop Mfg.m, Inc., Niagara Falls, NY 14305
11. NUCO Industries, Lake Forest, IL 60045
12. Tremco; Cleveland, OH 44104

2.2 THROUGH-PENETRATION FIRESTOP SYSTEMS - GENERAL

A. Compatibility: Provide through-penetration firestop systems that are compatible with one another, with the substrates forming openings, and with the items, if any, penetrating through-penetration firestop systems, under conditions of service and application, as demonstrated by through-penetration firestop system manufacturer based on testing and field experience.

B. Accessories: Provide components for each through-penetration firestop system that is needed to install fill materials and to comply with "System Performance Requirements" Article. Use only components specified by the through-penetration firestop system manufacturer and approved by the qualified testing and inspecting agency for the designated fire-resistance-rated systems. Provide accessories which include but are not limited to the following items:

1. Permanent forming/damming/backing materials including the following:
   a. Semirefractory fiber (slag/rock or mineral wool) insulation.

b. Ceramic fiber.
c. Sealants used in combination with other forming/damming materials to prevent leakage of fill materials in liquid state.
d. Fire-rated formboard.
e. Joint fillers for joint sealants.

2. Temporary forming materials.
3. Substrate primers.
4. Collars.
5. Steel sleeves.

2.3 FILL MATERIALS

A. General: Provide through-penetration firestop systems containing the types of fill materials indicated in the Through-Penetration Firestop System Schedule at the end of Part 3 by reference to the types of materials described in this Article. Fill materials are those referred to in directories of the referenced testing and inspecting agencies as fill, void, or cavity materials.

B. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer metallic sleeve lined with an intumescent strip, a radial extended flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.

C. Latex Sealants: Single-component latex formulations that after cure do not re-emulsify during exposure to moisture.

D. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.

E. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced elastomeric sheet bonded to galvanized steel sheet.

F. Intumescent Putties: Non-hardening dielectric, water-resistant putties containing no solvents, inorganic fibers, or silicone compounds.

G. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.

H. Mortars: Prepackaged, dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a non-shrinking, homogeneous mortar.

I. Pillows/Bags: Reusable, heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents and fire-retardant additives.

J. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, non-shrinking foam.

K. Silicone Sealants: Moisture-curing, single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below:

1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces and nonsag formulation for openings in vertical and other surfaces requiring a non-slumping, gunnable sealant, unless indicated firestop system limits use to nonsag grade for both opening conditions.
2. Grade for Horizontal Surfaces: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces.
3. Grade for Vertical Surfaces: Nonsag formulation for openings in vertical and other surfaces.

2.4 MIXING

A. For those products requiring mixing before application, comply with through-penetration firestop system manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of through-penetration firestop system. Do not proceed with installation until unsatisfactory conditions have been corrected.

B. Application or installation of material constitutes acceptance of the substrate.

3.2 PREPARATION

A. Surface Cleaning: Clean out openings and joints immediately prior to installing through-penetration firestop system to comply with recommendations of through-penetration firestop system manufacturer and the following requirements:

1. Remove all foreign materials from surfaces of opening and joint substrates and from penetrating items that could interfere with adhesion of through-penetration firestop system materials.
2. Clean opening and joint substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with through-penetration firestop system materials. Remove loose particles remaining from cleaning operation.
3. Remove laitance and form release agents from concrete.

B. Priming: Prime substrates where recommended by through-penetration firestop system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

C. Masking Tape: Use masking tape to prevent through-penetration firestop system materials from contacting adjoining surfaces that will remain exposed upon completion of Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from through-penetration firestop system materials. Remove tape as soon as it is possible to do so without disturbing through-penetration firestop system's seal with substrates.

3.3 INSTALLING THROUGH-PENETRATION FIRESTOP SYSTEMS

A. General: Comply with the "System Performance Requirements" article in Part 1 and the through-penetration firestop system manufacturer's installation instructions and drawings pertaining to products and applications indicated.

B. Install forming/damming/backing materials and other accessories of types required to support fill materials during their application and in the position needed to produce the cross-sectional shapes and depths required to achieve fire ratings of designated through-penetration firestop systems.

1. After installing fill materials, remove combustible forming materials and other accessories not indicated as permanent components of firestop systems.

C. Install fill materials for through-penetration firestop systems by proven techniques to produce the following results:

1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items.
2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

A. Identify through-penetration firestop systems with pressure-sensitive, self-adhesive, preprinted vinyl labels. Attach labels permanently to surfaces of penetrated construction on both sides of each firestop system installation where labels will be visible to anyone seeking to remove penetrating items or firestop systems. Include the following information on labels:

1. The words: "Warning--Through-Penetration Firestop System--Do Not Disturb. Notify Building Management of Any Damage."
2. Contractor's name, address, and phone number.
3. Through-penetration firestop system designation of applicable testing and inspecting agency.
4. Date of installation.
5. Through-penetration firestop system manufacturer's name.
6. Installer's name.

3.5 CLEANING AND PROTECTION

A. Clean off excess fill materials adjacent to openings as Work progresses by methods and with cleaning materials that are approved in writing by through-penetration firestop system manufacturers and that do not damage materials in which openings occur.

B. Provide final protection and maintain conditions during and after installation that ensure through-penetration firestop systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated through-penetration firestop systems immediately and install new materials to produce through-penetration firestop systems complying with specified requirements.

3.6 THROUGH-PENETRATION FIRESTOP SYSTEM SCHEDULE

A. Where UL-classified systems are indicated, they refer to the alpha-alpha-numeric designations listed in UL's "Fire Resistance Directory" under product Category XHEZ.

B. FS-1 Firestop Systems for No Penetrating Items: Comply with the following:

1. Available UL-Classified Systems: C-AJ- 0001-0999.

C. FS-2 Firestop Systems for Metallic Pipes, Conduit, or Tubing: Comply with the following:

1. Available UL-Classified Systems: C-AJ- 1001-1999.

D. FS-3 Firestop Systems for Metallic Pipes, Conduit, or Tubing: Comply with the following:

1. Available UL-Classified Systems: W-L-AJ- 1001-1999.

E. FS-4 Firestop Systems for Nonmetallic Pipe, Conduit, or Tubing: Comply with the following:

1. Available UL-Classified Systems: C-AJ-2001-2999.

F. FS-5 Firestop Systems for Electrical Cables : Comply with the following:

1. Available UL-Classified Systems: C-AJ- 3001-3999.

G. FS-6 Firestop Systems for Cable Trays: Comply with the following:

1. Available]UL-Classified Systems: C-AJ-4001-4999.

H. FS-7 Firestop Systems for Insulated Pipes: Comply with the following:

1. Available UL-Classified Systems: C-AJ-5001-5999.

I. FS-8 Firestop Systems for Insulated Pipes: Comply with the following:

1. Available UL-Classified Systems: W-L-5001-5999.

J. FS-9 Firestop Systems for Miscellaneous Electrical Penetrants: Comply with the following:

1. Available UL-Classified Systems: C-AJ-6001-6999.

K. FS-10 Firestop Systems for Miscellaneous Electrical Penetrants: Comply with the following:

1. Available UL-Classified Systems: W-L-6001-6999.

L. FS-11 Firestop Systems for Miscellaneous Mechanical Penetrations: Comply with the following:

1. Available UL-Classified Systems: C-AJ- 7001-7999.

M. FS-12 Firestop Systems for Miscellaneous Mechanical Penetrations: Comply with the following:

1. Available UL-Classified Systems: W-L- 7001-7999.

N. FS-13 Firestop Systems for Groupings of Penetrations: Comply with the following:

1. Available UL-Classified Systems: C-AJ-8001-8999.

O. FS-14 Firestop Systems for Groupings of Penetrations: Comply with the following:

1. Available UL-Classified Systems: W-L-8001-8999.

END OF SECTION

SECTION 07 84 43
FIRE RESISTIVE JOINT SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Fire resistive joint systems, including but not limited to the following:

1. Floor-to-wall joints.
2. Head-of-wall joints.
3. Wall-to-wall joints.

B. Related Sections:

1. Through-penetration firestop systems: Section 07 84 13
2. Non fire-rated sealants: Section 07 92 00
3. Gypsum board: Section 09 29 00

1.2 PERFORMANCE REQUIREMENTS

A. General: For joints in the following constructions, provide fire-resistive joint systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of assembly in which fire-resistive joint systems are installed:

1. Fire-resistance-rated non-load-bearing walls, including partitions, with fire-protection-rated openings.
2. Fire Resistance of Joint Systems: Assembly ratings indicated, but with assembly ratings not less than that equaling or exceeding fire-resistance rating of constructions in which joints are located, as determined by UL 2079.

B. System and Product Selection: When not shown on the Drawings, it is the Installing Contractor's undivided responsibility to select proposed systems and products which are appropriate for the types of penetrations, construction systems and the required fire ratings as shown on the Drawings, complying with the requirements of this specification, subject to review by the Architect.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For each fire-resistive joint system, show each kind of construction condition in which joints are installed and relationships to adjoining construction. Include fire-resistive joint system design designation of testing and inspecting agency acceptable to authorities having jurisdiction that demonstrates compliance with requirements for each condition indicated.

1. Submit documentation, including illustrations, from a qualified testing and inspecting agency that is applicable to each fire-resistive joint system configuration for construction and penetrating items.

C. Evaluation Reports: Evidence of fire-resistive joint systems' compliance with ICBO ES AC30, from the ICBO Evaluation Service.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain fire-resistive joint systems for each kind of joint and construction condition indicated through one source from a single manufacturer.

B. Fire-Test-Response Characteristics: Provide fire-resistive joint systems that comply with the following requirements and those specified in Performance Requirements Article 1.2:

1. Fire-resistive joint systems are identical to those tested per UL 2079 and ICBO ES AC30 and are qualified for joint movement capabilities indicated in a current ICBO Evaluation Report by the ICBO Evaluation Service.
2. Provide rated systems complying with the following requirements:
   a. Fire-resistive joint system products bearing classification marking of qualified testing and inspecting agency
   b. Fire-resistive joint systems correspond to those indicated in the UL Fire Resistance Directory.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver fire-resistive joint system products to Project site in original, unopened containers or packages with qualified testing and inspecting agency's classification marking applicable to Project and with intact and legible manufacturers' labels identifying product and manufacturer, date of manufacture, lot number, shelf life, curing time, and mixing instructions for multicomponent materials.

B. Store and handle materials for fire-resistive joint systems to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not install fire-resistive joint systems when ambient or substrate temperatures are outside limits permitted by fire-resistive joint system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.

B. Ventilate fire-resistive joint systems per manufacturer's written instructions by natural means or, if this is inadequate, forced-air circulation.

1.7 COORDINATION

A. Coordinate construction of joints to ensure that fire-resistive joint systems are installed according to specified requirements.

B. Coordinate sizing of joints to accommodate fire-resistive joint systems.

C. Do not cover up fire-resistive joint system installations that will become concealed behind other construction until Owner's inspecting agency and building inspector, if required by authorities having jurisdiction, have examined each installation.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with the specified requirements, provide system products by one of the following:

1. Fire-resistive Joint Systems:
   a. 3M Fire Protection Products, St. Paul, MN 55144
   b. Dap Inc., Dayton, Oh 45401
   c. Hilti Construction Chemicals, Inc., Tulsa, OK 74146
   d. Flamesafe - W.R. Grace & Co.(IPC), Hatfield, PA 19440
   e. The RectorSeal Corporation, Houston, TX 77023
   f. Nelson Firestop Products, Tulsa, OK 74145
   g. Specified Technologies Co., Sommerville, NJ 08876
   h. Isolatek International, Stanhope, NJ 07874
   i. NUCO Industries, Lake Forest, IL 60045
   j. Tremco; Cleveland, OH 44104

2.2 FIRE-RESISTIVE JOINT SYSTEMS - GENERAL

A. Compatibility: Provide fire-resistive joint systems that are compatible with joint substrates, under conditions of service and application, as demonstrated by fire-resistive joint system manufacturer based on testing and field experience.

B. Accessories: Provide components of fire-resistive joint systems, including forming materials, that are needed to install fill materials and to comply with Part 1 "Performance Requirements" Article. Use only components specified by fire-resistive joint system manufacturer and approved by the qualified testing and inspecting agency for systems indicated.

2.3 FIRE-RESISTIVE JOINT SYSTEMS

A. Where UL-classified fire-resistive joint systems are indicated, they refer to alphanumeric designations listed in UL's "Fire Resistance Directory" under product Category XHBN.

B. Floor-to-Wall, Fire-Resistive Joint System FRJS-2:

1. UL-Classified Products:
   a. Movement: FF-D-0999
   b. No Movement: FF-S-0999
2. Assembly Rating: 1 hour / 2 hours
3. Nominal Joint Width: As indicated on the Drawings, if not indicated, provide joint width not more than 1/2 inch.
4. Movement Capabilities: Class II

C. Head-of-Wall, Fire-Resistive Joint System FRJS-3:

1. UL-Classified Products:
   a. Movement: FF-D-0999
   b. No Movement: FF-S-0999
2. Assembly Rating: 1 hour / 2 hours
3. Nominal Joint Width: As indicated on the Drawings, if not indicated, provide joint width not more than 1 inch.
4. Movement Capabilities: Class II

D. Wall-to-Wall, Fire-Resistive Joint System FRJS-4:

1. UL-Classified Products:
   a. Movement: FF-D-0999
   b. No Movement: FF-S-0999
2. Assembly Rating: 1 hour / 2 hours
3. Nominal Joint Width: As indicated on the Drawings, if not indicated, provide joint width not more than 1/2 inch.
4. Movement Capabilities: Class II

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for joint configurations, substrates, and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

C. Application or installation of material constitutes acceptance of the substrate.

3.2 PREPARATION

A. Surface Cleaning: Clean joints immediately before installing fire-resistive joint systems to comply with fire-resistive joint system manufacturer's written instructions and the following requirements:

1. Remove from surfaces of joint substrates foreign materials that could interfere with adhesion of fill materials.
2. Clean joint substrates to produce clean, sound surfaces capable of developing optimum bond with fill materials. Remove loose particles remaining from cleaning operation.
3. Remove laitance and form-release agents from concrete.

B. Priming: Prime substrates where recommended in writing by fire-resistive joint system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

C. Masking Tape: Use masking tape to prevent fill materials of fire-resistive joint system from contacting adjoining surfaces that will remain exposed on completion of Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from fire-resistive joint system materials. Remove tape as soon as possible without disturbing fire-resistive joint system's seal with substrates.

3.3 INSTALLATION

A. General: Install fire-resistive joint systems to comply with Part 1 Article 1.2 Performance Requirements and fire-resistive joint system manufacturer's written installation instructions for products and applications indicated.

B. Install forming/packing/backing materials and other accessories of types required to support fill materials during their application and in position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.

C. Install fill materials for fire-resistive joint systems by proven techniques to produce the following results:

1. Fill voids and cavities formed by openings and forming/packing/backing materials as required to achieve fire-resistance ratings indicated.
2. Apply fill materials so they contact and adhere to substrates formed by joints.
3. For fill materials that will remain exposed after completing Work, tool sealants to form smooth, uniform beads, of flush configuration unless otherwise indicated on the Drawings, to eliminate air pockets and ensure contact and adhesion of the sealant with the side of the joint. Remove excess sealants from surfaces adjacent to the joint. Do not use tooling agents which discolor sealants or adjacent surfaces or are not approved by the sealant manufacturer.

3.4 CLEANING AND PROTECTION

A. Clean off excess fill materials adjacent to joints as Work progresses by methods and with cleaning materials that are approved in writing by fire-resistive joint system manufacturers and that do not damage materials in which openings occur.

B. Provide final protection and maintain conditions during and after installation that ensure fire-resistive joint systems are without damage or deterioration at time of Substantial Completion. If damage or deterioration occurs despite such protection, cut out and remove damaged or deteriorated fire-resistive joint systems immediately and install new materials to produce fire-resistive joint systems complying with specified requirements.

END OF SECTION

SECTION 07 92 00
JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

A. Joint sealants and installation accessories, including the following:

1. Silicone joint sealants.
2. Urethane joint sealants.
3. Latex joint sealants.
4. Acoustical joint sealants.
5. Installation accessories and materials for the above.

B. Related Sections:

1. Penetration firestopping: Section 07 84 13.
2. Fire resistive joint systems: Section 07 84 46.
3. Hollow metal doors and frames: Section 08 11 13.
4. Glazing: Section 08 80 00.
5. Gypsum board: Section 09 29 00.
6. Acoustical ceiling panels: Section 09 51 13.

1.2 SUBMITTALS

A. Product Data: For each joint-sealant product indicated.

B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

C. Samples for Verification: For each kind and color of joint sealant required, provide Samples with joint sealants in 1/2 inch wide joints formed between two 6 inch long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

D. Warranties: Sample of special warranties.

1.3 QUALITY ASSURANCE

A. Comply with the applicable portions of ASTM C 1193 - Standard Guide for Use of Joint Sealants for use of joint sealants as applicable to materials, applications, and conditions indicated.

B. Installer Qualifications: An experienced installer who has specialized in installing joint sealants similar in material, design, and extent to those indicated for this

Project and whose work has resulted in joint sealant installations with a record of successful in-service performance.

C. Source Limitations: Obtain each kind of joint sealant from single source from single manufacturer.

1.4 PROJECT CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer.
2. When joint substrates are wet.
3. Where joint widths are less than those allowed by joint sealant manufacturer for applications indicated.
4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.5 WARRANTY

A. Special Installer's Warranty: Manufacturer's standard form in which Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Five (5) years from date of Substantial Completion.

B. Special Manufacturer's Warranty: Manufacturer's standard form in which joint sealant manufacturer agrees to furnish joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Five (5) years from date of Substantial Completion.

C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:

1. Movement of the structure caused by structural settlement or errors attributable to design or construction resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
2. Disintegration of joint substrates from natural causes exceeding design specifications.
3. Mechanical damage caused by individuals, tools, or other outside agents.
4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

D. This warranty is in addition to, and not a limitation of, other rights the Owner may have under the Contract Documents.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

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

B. VOC Content of Interior Sealants: Provide sealants and sealant primers for use inside the weatherproofing system that comply with the following limits for VOC content when calculated according to 40CFR59, Part 59, Subpart D (EPA Method 24):

1. Architectural Sealants: 250 g/L.
2. Sealant Primers for Nonporous Substrates: 250 g/L.
3. Sealant Primers for Porous Substrates: 775 g/L.

C. Stain Test Response Characteristics: Where sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C1248 and have not stained porous joint substrates indicated for Project.

D. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.2 JOINT SEALANTS

A. S-1: Acrylic Latex or Siliconized Acrylic Latex Joint Sealant: ASTM C 834, Type OP, Grade NF. Subject to compliance with requirements, provide one of the following:

1. Pecora Corporation; AC-20+.
2. Tremco Incorporated; Tremflex 834.
3. Sonneborn, Sonolac.

B. S-2: Acoustical Joint Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E90. Subject to compliance with requirements, provide one of the following:

1. Pecora Corporation; AC-20 FTR or AIS-919.
2. USG Corporation; SHEETROCK Acoustical Sealant.
3. Tremco, Acoustical Sealant.

C. S-3: Acoustical Sealant for Fire Rated Partitions:

1. CP 25 by 3M Corporation, St. Paul, MN
   a. CP 25N/S for penetrations of vertical partitions and CP 25S/L for penetrations of horizontal partitions.

2. Acoustical Sealant by Specified Technologies, Somerville, NJ
3. FS 1900 Series Sealant Intumescent Elastomeric Firestop by International Protective Coatings, Oakhurst, NJ

2.3 JOINT SEALANT BACKING

A. General: Provide sealant backings of material that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C1330, type and material as recommended and approved in writing by joint sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

C. Bond Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.4 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint sealant substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint sealant performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint sealant manufacturer's written instructions and the following requirements:

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
2. Remove laitance and form release agents from concrete.
3. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:

a. Metal.
b. Glass.

B. Joint Priming: Prime joint substrates where recommended by joint sealant manufacturer or as indicated by preconstruction joint sealant substrate tests or prior experience. Apply primer to comply with joint sealant manufacturer's written instructions. Confine primers to areas of joint sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations of ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of sealant backings.
2. Do not stretch, twist, puncture, or tear sealant backings.
3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.

D. Install bond breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:

1. Place sealants so they directly contact and fully wet joint substrates.
2. Completely fill recesses in each joint configuration.
3. Produce uniform, cross sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

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

1. Remove excess sealant from surfaces adjacent to joints.
2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
3. Provide concave joint profile complying with ASTM C 1193, Figure 8A, unless otherwise indicated.
4. Provide flush joint profile complying with ASTM C 1193, Figure 8B.
5. Provide recessed joint configuration of recess depth and at locations complying with ASTM C 1193, Figure 8C.

a. Use masking tape to protect surfaces adjacent to recessed tooled joints.

G. Acoustical Sealant Installation: At sound rated assemblies and elsewhere as indicated, seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations.

3.4 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.6 JOINT SEALANT SCHEDULE

A. S-1: Non-moving interior joints in non-traffic surfaces and surfaces not subject to running or standing water, including the joint between dissimilar materials (around door frames, etc.).

B. S-2: Gypsum wall board construction and other locations shown or noted on the Drawings to seal joints and openings against the passage of sound and as required by partition material manufacturer to meet the manufacturer published acoustical sound ratings for assemblies shown on the Drawings.

C. S-3: Fire rated gypsum wall board construction and other locations shown or noted on the Drawings to seal joints and openings against the passage of sound and as required by partition material manufacturer to meet the manufacturer published acoustical sound ratings for assemblies shown on the Drawings.

END OF SECTION

SECTION 08 11 13
HOLLOW STEEL FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Hollow steel door frames (welded), including fabrication and installation accessories.

B. Related Sections:

1. Flush wood doors: Section 08 14 16
2. Finish door hardware: Section 08 71 00
3. Glazing: Section 08 80 00; for glass
4. Non-Load Bearing Metal Framing: Section 09 22 16; for wall framing
5. Gypsum board: Section 09 29 00
6. Painting: Section 09 91 00

1.2 SUBMITTALS

A. Product Data: Copies of manufacturer's data for fabrication and installation instructions.

B. Shop Drawings:

1. Submit shop drawings for the fabrication and installation. Include details of each frame type, elevations of door design types, conditions at openings, details of anchorage to construction, location and installation requirements of finish hardware and reinforcements, and details of joints and connections.
2. Provide a schedule of doors and frames using same reference numbers for details and openings as those on the Contract Document Drawings. Indicate all fire-rated doors and frames, welded and knockdown frames.

C. Certification: When door assemblies required to be fire-rated that exceed manufacturer's capabilities or UL design maximum sizes, submit copies of Door and Frame Manufacturer's Label Certification that each door and frame assembly has been constructed to conform to design, materials and construction equivalent to the requirements for labeled assemblies or products or units tested in accordance with ASTM E 2074.

1.3 QUALITY ASSURANCE

A. Products: Provide standard welded hollow steel doors and frames by a single firm specializing in the production of custom hollow steel work as evidenced by a minimum of ten (10) consecutive years production experience.

B. Provide standard hollow steel frames conforming to the applicable recommended practices contained in the following:

1. Standard: Steel Door Institute (SDI), Standard Steel Doors and Frames, SDI 100/ANSI A250.8, Recommended Specifications, current edition, except as herein modified.

1.4 DELIVERY, STORAGE AND HANDLING

A. Inspection: Inspect hollow metal work upon delivery for damage. Minor damages may be repaired provided the finish items are equal in all respects to new work; otherwise, remove and replace damaged items as directed.

B. Storage: Store at the building site under cover. Place units on at least 4 inch high wood sills or on floors in a manner that will prevent rust and damage. Avoid the use of non-vented plastic or canvas shelters, which could create a humidity chamber. If the cardboard wrapper on the door becomes wet, remove the carton immediately. Provide a 1/4 inch space between stacked doors to promote air circulation.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with requirements, provide products by one of the following:

1. Ceco Door Products; an Assa Abloy Group company.
2. Curries Company; an Assa Abloy Group company.
3. Steelcraft; an Ingersoll-Rand company.
4. Republic Doors and Frames.

2.2 MATERIALS

A. Hot-Rolled Steel Sheets and Strips: Commercial quality carbon steel, pickled and oiled, complying with ASTM A 1011 and ASTM A 568.

B. Cold-Rolled Steel Sheets: Commercial quality carbon steel, complying with ASTM A 1008 and ASTM A 568.

C. Electrolytic Zinc Coated Steel Sheet: ASTM A 591, Commercial Steel (CS), Class B coating; mill phosphatized; suitable for unexposed applications; stretcher leveled standard of flatness where used for face sheets.

D. Structural Steel Shapes: ASTM A 36.

E. Steel Bars: ASTM A 108.

F. Steel Plate: ASTM A 283.

G. Supports and Anchors: Fabricate of not less than 0.053 inch thick sheet metal. Galvanized after fabrication for units to be built into exterior walls, complying with ASTM A 1008 or ASTM A 1011, hot-dip galvanized according to ASTM A 153, Class B.

H. Shop Primer: Modified alkyd rust inhibiting primer paint as standard with door and frame fabricator.

2.3 FABRICATION – GENERAL

A. Fabricate hollow metal units to be rigid, neat in appearance and free from defects, warp, buckle and shadows or surface deformations from welds. Accurately form metal to required sizes and profiles. Wherever practicable, fit and assemble units in the manufacturer's plant. Clearly identify work that cannot be permanently factory assembled before shipment, to assure proper assembly at the project site. Weld exposed joints continuously, grind, dress and make smooth, flush and invisible.

B. Prepare hollow metal units to receive finish hardware, including cutouts, reinforcing, drilling and tapping in accordance with final Finish Hardware Schedule and templates provided by hardware supplier. Comply with applicable requirements of ANSI A115 Specifications for Door and Frame Preparation for Hardware, current edition.

C. Locate finish hardware as shown on final shop drawings or, if not shown, in accordance with National Builders' Hardware Association “Recommended Locations for Builder's Hardware”, current edition.

2.4 FRAME FABRICATION

A. General:

1. Fabricate frames unless noted otherwise of full welded unit construction, with corners full mitered, reinforced, continuously welded inside the full depth and width of frame miter, including returns, soffits and stops.
2. Knockdown frames will not be acceptable as alternates for welded frames.
3. Form frames of either cold or hot-rolled sheet steel.
4. Interior Frames: Provide not less than 0.053 inch thick steel for interior openings, including 4 feet wide.
5. For openings over 4 feet wide, increase thickness by at least 2 standard thickness.

B. Welded Frame Corner Joints (Full Profile Welded) :

1. Fabricate frame members stamped in the flats to a predetermined pattern, designed to provide mitered faces or trims and mitered stops.
2. After fabricating head and jamb members, fit frames together engaging projecting tabs into corresponding slots in the head.
3. Tightly close contact edges so that trim and faces are aligned straight, level and true.

a. Secure interlocking tabs where they pass thru head slots by welding.
b. Continuously weld all back bends, soffits and returns together.
c. Continuously weld mitered trim joints on each side inside the frame section. Dress and finish exposed joints to produce invisible connections.
d. Weld head and jamb together along their intersecting depth and width inside the frame.
e. Weld jambs to head overhang along the length of each rabbet, inside the frame completely welding the full joint perimeter.
f. Grind all welds on exposed surfaces smooth and flush with adjoining surfaces.

C. Window Frames, Borrowed Lites, Mullions and Transom Bars:

1. Provide closed or tubular mullions and transom bars. Fasten mullions and transom bars at crossings and to jambs by butt welding. Reinforce joints between frame members with concealed clip angles or sleeves same metal and thickness as frame.
2. Provide steel channel stiffeners on interior of closed mullion sections.
3. Provide anchors for window and side lites frames same as for doors.
4. Provide concealed sleeves for frames to be shipped in one piece. Weld and grind smooth all field connections.

D. Welded Frame Jamb Anchors: Furnish jamb anchors as required to secure frames to adjacent construction and as required by fire-rated assemblies, formed of not less than 0.042 inch thick galvanized steel unless noted otherwise.

1. Metal Stud Partitions: Insert type with notched clip to engage metal stud, welded to back of frames. Provide at least four anchors for each jamb for frames up to 7 feet-6 inches in height; five anchors up to 8 feet jamb height; one additional anchor for each 24 inches or fraction thereof over 8 feet height.

E. Floor Anchors: Provide floor anchors for each jamb and mullion which extends to floor, formed of not less than 0.067 inch thick galvanized steel sheet; clip type anchors, with two holes to receive fasteners, welded to bottom of jambs.

F. Structural Reinforcing Members: Provide structural reinforcing members as a part of frame assembly, where indicated at mullions, transoms or other locations which are to be built into frame.

G. Finish Hardware Reinforcement: Unless otherwise indicated herein, reinforce frames for scheduled finish hardware, as follows:

1. Butt Hinges and Pivots: Steel plate not less than 0.187 inch thick x 1-1/2 inches wide x 6 inches longer than hinge, secured by not less than six spot welds.
2. Continuous Hinges: Steel plate not less than 0.187 inch thick x 1-1/2 inches wide x continuous, secured by spot welds 8 inches o.c.
3. Strike Plate Clips: Steel plate not less than 0.187 inch thick x 1-1/2 inches wide x 3 inch long.

4. Surface Applied Closers: Not less than 0.093 inch thick steel sheet, secured with not less than six spot welds.
5. Concealed Closers: Removable steel access plate, not less than 0.093 inch thick internal reinforcement of size and shape required, and enclosing housing to keep closer pocket free of mortar or other materials.

H. Spreader Bars: Provide removable spreader bar across bottom of frames, tack welded to jambs and mullions.

I. Rubber Door Silencers: Drill stop to receive three silencers on single door frames and four silencers on double door frames. Install plastic lugs to keep holes clear during construction.

2.5 STOPS AND MOLDINGS

A. Provide stops and moldings around openings in hollow metal door and window units and for frames to receive lights where indicated.

B. Form fixed stops and moldings integral with door or frame. Provide fixed stops on outside of hollow metal units exposed to exterior and on corridor side of interior units, unless otherwise indicated.

C. Provide removal stops and molds at other locations, formed of not less than 0.032 inch thick steel sheets. Secure with countersunk machine screws spaced uniformly not more than 1/2 inch o.c. form corners with butted hairline joints.

D. Coordinate width of rabbet between fixed and removable stops with type of glass or panel and type of installation indicated.

2.6 SHOP PAINTING

A. Clean surfaces of fabricated units of mill scale, rust, oil, grease, dirt and other foreign matter.

B. After fabrication, dress, fill and sand tool marks and surface imperfections as required to make all faces and vertical edges smooth, level and free of all irregularities.

C. Pretreat cleaned surface in accordance with SSPC-PT-2, SSPC-PT3 or SSPC-PT4. Verify compatibility of primer with galvanized surfaces. Provide primer on galvanized surfaces that will not affect finish paint materials.

D. Shop Applied Paint:

1. Plain Steel: For steel surfaces, use rust inhibitive enamel or paint, either air drying or baking, suitable as a base for finish paints, complying with ANSI/SDI A250.10 Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces.
2. Galvanized Steel: Clean welds, mechanical connections, and abraded areas, and apply galvanizing repair paint specified to comply with ASTM A 780. After

applying repair paint, clean surfaces and apply galvanized metal primer compatible coatings to be applied over it.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install hollow metal units and accessories in accordance with the final reviewed shop drawings, manufacturer's data, and as herein specified.

B. Floor Anchors: Floor anchors are to be set with masonry anchorage devices and machine screws. Do not use powder actuated fasteners.

C. Placing Frames:

1. Set frames accurately in position, plumbed, aligned and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces and spreaders leaving surfaces smooth and undamaged.
2. Install fire-rated frames according to NFPA 80.
3. Make field splices in frames as detailed on final shop drawing, welded and finished to match factory work.
4. Remove spreader bars only after frames or bucks have been properly set and secured.
5. Installation Tolerances: Adjust hollow metal door frames for squareness, alignment, twist, and plumb to the following tolerances:
    a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
    b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
    c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
    d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.

3.2 ADJUST AND CLEAN

A. Final Adjustment: Check and readjust operating finish hardware items in hollow metal work just prior to final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including doors or frames which are warped, bowed or otherwise unacceptable at no additional cost to the Owner.

END OF SECTION

SECTION 08 14 16
FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Interior flush wood doors, including factory fitting and machining for hardware and factory applied transparent finishing.

B. Related Sections:

1. Hollow metal frames: Section 08 11 13
2. Finish door hardware: Section 08 71 00
3. Glazing: Section 08 80 00
4. Painting: Section 09 91 00

1.2 SUBMITTALS

A. Manufacturer's Literature:

1. Verification indicating that AWI Quality Certification Labels will be used for Project indicating that doors comply with requirements of grades specified.

B. Shop Drawings:

1. Show elevations, dimensions, construction details for each type of door.
2. Provide door schedule of doors using same reference numbers for openings as those on the Contract Drawings.

C. Samples:

1. 12 inch x 12 inch corner section of each type door.
2. 12 inch x 12 inch x 1/4 inch to 3/4 inch thick samples with each veneer specified, without stain or finish.
3. Finish Samples:
   a. 12 inch x 12 inch x 3/4 inch thick pieces of plywood with each veneer specified with a range of stains for selection by the Architect.
   b. A maximum of four (4) separate sample sets of 3 may be required to obtain the desired stain color and finish appearance for each finish specified.
   c. Finish samples as specified and numbered for reference of stain and finish. Include on the back of each sample a complete description of the finish and each coat applied.

D. Warranty: Signed copies of warranty specified herein.

1.3 QUALITY ASSURANCE

A. Except as otherwise specified herein, provide wood doors conforming with Architectural Woodwork Institute AWI, AWMAC, WI Architectural Woodwork Standards, current edition.

1. Flush Wood Doors: ANSI/WDMA I.S-1A
2. Stile and Rail Doors: ANSI/WDMA I.S-6A

B. Fire Rated Doors: Where shown as fire doors, provide doors conforming with UL 10(b) for label indicated on Drawings or specified herein, based on testing at positive pressure, according to UBC Standard 7-2 or UL 10C. Face veneer to conform to Section 3.11. Fabricate doors to permit installation in accordance with NFPA 80.

1. Oversized, Fire-Rated Wood Doors: For door assemblies exceeding sizes of tested assemblies, provide manufacturer's certificate stating that doors conform to all standard construction requirements of tested and labeled fire-door assemblies except for size.

1.4 DELIVERY, HANDLING AND STORAGE

A. Individually package doors in corrugated cartons and/or poly bags by the manufacturer with identifying marks.

B. Store doors flat with spacers between each door, a minimum of 3 inches off the floor. Do not remove doors from cartons or poly bags until all painting and other interior finishing work has been completed. Immediately remove from the project site, damaged or otherwise unsuitable doors, when so ascertained.

1.5 PROJECT SITE CONDITIONS

A. Environmental Requirements: Do not accept delivery of doors until storage areas have been closed in and are thoroughly dry. Do not install wood doors until the required temperature and relative humidity have been stabilized in installation areas per the door manufacturer’s requirements.

1.6 WARRANTY

A. Provide door manufacturer's or fabricator’s written warranty stating that the wood doors will be free of faults and defects in accordance with the General Conditions, except that the warranty is to be for the life of the installation for solid core doors, instead of one (1) year from the date of final acceptance by the Owner.

B. Provide warranty signed by the door manufacturer or fabricator. Warp in excess of that permitted by the WDMA or any defect which affects the operation or appearance of the door is considered a defect under the provisions of the warranty.

C. Provide warranty which includes the cost of defective door replacement and the cost of rehanging defective doors.

D. The door manufacturer or fabricator or his representative is responsible for inspecting the installation of the doors before issuance of the warranty and is to note on the warranty that the doors have been hung in accordance with the manufacturer's recommendations.

E. This warranty is in addition to, and not a limitation of, other rights the Owner may have against the Contractor under the Contract Documents.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Solid Core Doors:

1. Algoma Hardwoods, Inc., Algoma, WI 54201.
2. Eggers Hardwood Products Corporation, Two Rivers, WI 54241.
3. Graham Manufacturing Corporation, Mason City, IA 50401.
4. Marshfield Door Systems, Inc., Marshfield, WI 54449.
5. Mohawk Flush Doors, Inc., Northumberland, PA 17857.
6. VT Industries, Inc., Holstein, IA 51025.

2.2 DOOR CONSTRUCTION – GENERAL

A. Flush Solid Core Non-Fire Rated Doors: Flush, solid core, hardwood and/or MDO veneered, AWI Quality Standards, Premium Grade, Section 1300, Symbol PC-5, 5-ply construction, Performance Duty Level; Extra Heavy Duty.

1. Cores: Five ply hot press structural composite lumber (SCL) core construction complying with AWI SLC-5.
2. Face Veneers:
   a. Transparent Finish: (1/40th inch thick before sanding):
      1) Red Oak, plain sliced, for transparent finish, Grade A, (random, slip, book) veneer leaves match, book matched leaves and balanced door faces.
   b. Opaque Finish: Medium Density Overlay (MDO), minimum 0.050 inch thick, for paint finish.
3. Crossbands: Hardwood, 1/16 inch thick, extending the full width and height of the door.
4. Adhesives: Type I.
5. Stiles:
   a. Vertical: Minimum 1-3/8 inch thick.
   b. Midrail: Minimum 4-1/2 inch wide.
   c. Top and Bottom: Minimum 4-1/2 inches wide.
6. Edge Bands: Same species as face veneer.
7. Inner Blocking (all doors):

a. Top and Bottom: Continuous, minimum 5 inches wide solid wood blocking solid, or wider to assure no through bolting of surface hardware.
b. Both Sides of Door: 5 inch wide x 10 inch long solid wood lock blocking.

8. Light Opening Moldings: Flush with door face or as shown on the Drawings, if not shown provide square shaped stops hardwood veneered or veneer wrapped, same species as face veneer or match color of hardwood for transparent finish veneer.
9. Thickness: 1-3/4 inches.

2.3 FABRICATION – GENERAL

A. Factory fit doors to suit frame opening sizes indicated, with the following uniform clearances and bevels, unless otherwise indicated:

1. Comply with clearance requirements of referenced quality standard for fitting. Comply with requirements in NFPA 80 for fire-rated doors and UL10c Positive Pressure Fire Door Test Method for hardware requirements.

B. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI WDHS 3. Comply with final hardware schedules, door frame shop drawings, DHI A115 W series standards, and hardware templates.

C. Coordinate measurements of hardware mortises in metal frames to verify dimensions and alignment before factory machining.

D. Metal Astragals: Premachine astragals and formed steel edges for hardware for pairs of fire-rated doors.

E. Transom Panels:

1. Fabricate matching panels with same construction, exposed surfaces, and finish as specified for associated doors. Finish bottom edges of transoms and top edges of rabbeted doors same as door stiles.
2. Fabricate door panels with full width, solid lumber rabbeted, meeting rails. Provide factory installed spring bolts for concealed attachment into jambs of metal door frames.

F. Openings: Cut and trim openings through doors to comply with applicable requirements of referenced standards for kind(s) of door(s) required.

1. Light Openings: Trim openings with moldings of material and profile indicated.
2. Louvers: Factory install louvers in prepared openings.

2.4 TRANSPARENT FINISHING

A. Completely factory finish all hardwood veneer doors specified under this Section and scheduled or noted on the Drawings to receive transparent finishing.

B. Preparation for finishing and finishing is to conform with AWI Section 5, Premium Grade, closed grain. Provide the following finish matching existing flush wood door stain and finish as verified by submitted samples:

1. System - 11, Polyurethane, Catalyzed, satin sheen

C. Seal tops and bottoms of wood door with a heavy coat of varnish or equivalent sealer prior to delivery to the job. Seal vertical edges of doors to receive opaque finishes (paint).

PART 3 - EXECUTION

3.1 PREPARATION

A. Verify all measurements at the building. Provide other trades with information necessary for proper completion of related work.

B. Examine each area of installation and report in writing to the Architect any conditions which would adversely affect the doors and their installation. Corrective measures, if required will be performed by others. Starting of work constitutes acceptance of the existing conditions.

C. Inspect each area of installation and allow doors to acclimate to the area temperature and humidity.

3.2 INSTALLATION

A. Install flush wood doors in accordance with the manufacturer's printed instructions, referenced standards, the final reviewed shop drawings and this Section.

B. Carry doors upright. Do not drag doors. Protect door bottoms with scruff strips. Do not slide across one another. Condition doors to average humidity of spaces before hanging.

C. Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted with fire-rated doors. Machine doors for hardware. Seal cut surfaces after fitting and machining including areas routed for concealed closers and all other hardware cutouts. Hand doors with hardware specified.

1. Provide uniform clearances at jambs and heads not to exceed 1/8 inch and at bottoms not less than 1/4 inch nor greater than 3/4 inch and not greater than 3/8 inch from floor finish or top of threshold, except where indicated otherwise on the Drawings to be under cut or where required to clear thresholds, floor finishes or for passage of air. Coordinate undercut requirements with various floor materials and trades installing such and provide undercuts to accommodate all conditions for installation of doors at no additional cost to the Owner.

2. Fitting Clearances for Fire-Rated Doors: Comply with NFPA 80.

D. Bevels:

1. Bevel non-rated doors 1/8 inch in 2 inches at lock and hinge edges.
2. Bevel fire-rated doors 1/8 inch in 2 inches (3-1/2 degrees) on lock edge; trim stiles and rails only to extent permitted by labeling agency.

E. Install fire-rated doors in corresponding fire-rated frames according to requirements of NFPA 80.

F. If any trimming of a door occurs, then the trimmed edge will need to be resealed in accordance with the factory specs and Section 08 14 16/2.4 Transparent Finishing.

3.3 CLEANING AND PROTECTION

A. Repair or remove and replace defective doors as directed upon completion of installation. Remove and replace doors which can not be successfully repaired at no additional cost to the Owner.

B. Protection: Advise Contractor of procedures and precautions for protection of wood by the work or other trades until acceptance of the Work by the Owner. Advise Contractor of the required temperature and humidity conditions which must be maintained during the remainder of the construction period in areas of wood door installation.

C. Clean all door surfaces in accordance with the manufacturer's recommendations. Touch-up factory finished doors in accordance with the manufacturer's printed instructions. Remove and return to the factory for complete refinishing, any door which can not be successfully touched-up in the field.

END OF SECTION

SECTION 08 71 00
FINISH DOOR HARDWARE

PART 1 - GENERAL

1.1 SUMMARY

A. Finish door hardware for swing, sliding and folding doors.

B. Related Sections:

1. Hollow metal doors and frames: Section 08 11 13
2. Flush wood doors: Section 08 14 16
3. Painting: Section 09 91 00

1.2 SUBMITTALS

A. Manufacturer's Literature: Materials description, specifications, installation and maintenance instructions and catalog cut sheets for all items scheduled.

B. Samples:

1. Samples for Verification: Submit minimum 2-by-4-inch plate samples of each type of finish required, except primed finish.
2. Lockset Lever and Rose: One (1) lockset with rose, if any, of each design and finish scheduled in the reviewed hardware schedule. Samples will be returned at the completion of the Work.

C. Hardware Schedule:

1. Provide hardware schedule containing a complete listing of all finish hardware items required for the project, whether or not specifically named in the Specifications or indicated on the Drawings. The Architect's review of the schedule is not to be construed to relieve the Contractor of responsibility for errors or omissions in the schedule, nor of the responsibility to completely equip the project with finish hardware.
2. Include in the schedule each door location, hand of door, complete list of each hardware set item per set, finish, manufacturer of each item and keying information. Use same reference numbers and letters for doors and sets as those on the Contract Documents.

D. Keying Schedule: Submit separate detailed keying schedule for approval indicating clearly how the Owner’s final instructions on keying of locks have been fulfilled.

E. Template Notification: Written notification that required templates and a copy of the final reviewed hardware schedule have been sent to the hollow metal door and frame, manufacturers for use in fabrication.

F. Warranties: Copies of warranty for each item requiring a warranty.

G. Operation and Maintenance Manuals: Upon completion, furnish two (2) complete maintenance manuals to the Owner. Include the following items:

1. Approved hardware schedule, catalog cuts and keying schedule.
2. Hardware installation and adjustment instructions.
3. Manufacturer's written warranty information.
4. Wiring diagrams and operational descriptions for all electronic openings.

1.3 QUALITY ASSURANCE

A. Supplier Qualifications:

1. The hardware supplier is to be an industry recognized company who has maintained and has been furnishing hardware in the project's vicinity for a period of not less than two (2) years.
2. The supplier of the finish hardware is to be a firm with not less than five (5) years of consecutive experience in supplying finish hardware of the quantity and quantity specified for projects similar in size and complexity.
3. The supplier of the finish hardware is to be a firm technically qualified and experienced in supplying building structures with finish hardware.
4. The supplier is to employ a experienced certified Architectural Hardware Consultant (AHC) who is to be available, at reasonable times during the course of the hardware submittals, supply and installation, for consultation about the project hardware requirements to the Owner, Architect and Contractor.
5. Refinements such as butt knuckle, clearance, strike lip lengths and adjustments, beveling of lock faces, handing of doors and centering of backsets will be expected and is to be indicated in the submitted hardware schedule.

B. Supplier Responsibilities: The supplier is responsible for thoroughly detailing the entire project to assure that the items specified will properly function in the indicated locations. Should the items specified not work properly, it is the responsibility of the supplier to furnish suitable items of comparable quality as approved by the Architect to those being furnished throughout the project at no additional cost to the Owner.

C. Installer Qualifications: An experienced installer who has completed 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. Source Limitations: Obtain each type and variety of door hardware from a single manufacturer, unless otherwise indicated.

E. Hardware Sets: 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 are to be brought to the attention of the Architect with corrections made prior to the end of the bidding process. Omitted items not included in a hardware sets are

to be scheduled with the appropriate additional hardware required for proper application and functionality.

F. Underwriters' Laboratory Requirements:

1. Furnish hardware in accordance with NFPA Standard No. 80 and 101 for openings specified, shown or scheduled to receive fire-rated UL labels. In case of conflict between type of hardware specified and type required for fire protection, furnish type required by NFPA and UL at no additional cost to the Owner.
2. Furnish hardware of type approved by UL for usage with the types and sizes of fire doors and frames required. Unless otherwise shown on the Drawings or specified, arrange fire doors to remain in the normally closed position by furnishing each unit with an automatic closing device. Furnish active latch bolts of UL approved throw.
3. Provide exit hardware for fire-rated openings bearing UL markings.

G. Electrified Door Hardware: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

H. Regulatory Requirements: Comply with provisions of the following:

1. Where indicated to comply with accessibility requirements, comply with Americans with Disabilities Act (ADA), "Accessibility Guidelines for Buildings and Facilities".
2. NFPA 101: Comply with the following for means of egress doors:
   a. Latches, Locks, and Exit Devices: Not more than 15 lbf to release the latch. Locks are not to require the use of a key, tool, or special knowledge for operation.
   b. Door Closers: Not more than 30 lbf to set door in motion and not more than 15 lbf to open door to minimum required width.
   c. Thresholds: Not more than 1/2 inch high.

I. Reference Standards:

1. ANSI/BHMA A156

1.4 COORDINATION

A. Coordinate layout and installation of recessed pivots and or closers with floor construction and finishes. Cast anchoring inserts into concrete.

B. Templates: Distribute door hardware templates for doors, frames, and other work specified to be factory prepared for installing door hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

C. Keying Meeting: Conduct meeting with the Owner or Owner's representative prior to submitting the Key schedule for Owner's review. Incorporate keying meeting decisions into final keying schedule including, but not limited to, the following:

1. Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
2. Final key system schematic diagram.
3. Requirements for key control system.
4. Address for delivery of keys.

1.5 DELIVERY, STORAGE AND HANDLING

A. Handle finish hardware in such a manner as to prevent damage. Store in a clean, dry, secure place.

B. Package each set of hardware items together in sets, identified with set numbers in accordance with the final reviewed hardware schedule.

1. Package each item of hardware separately and labeled separately.
2. Include in each package appropriate fastening installation instructions and templates.
3. Deliver a complete schedule with shipped hardware.

C. Should marking of any item become separated from the item, return the item to the supplier for marking.

D. Immediately remove from the job site all damaged or otherwise unsuitable items when so ascertained and replace with an identical item at no additional cost to the Owner.

1.6 WARRANTY

A. Provide Hardware Manufacturer's standard written form in which the hardware item manufacturer agrees to repair or replace door hardware components that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including excessive deflection, cracking, or breakage.
b. Faulty operation of operators and door hardware.
c. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.

2. Warranty Period: Three (3) years from date of Substantial Completion, except as follows:

a. Mortise Locksets: Five (5) years from date of Substantial Completion.
b. Cylindrical Locksets (Grade 1): Five (5) years from date of Substantial Completion.
c. Manual Closers: Ten (10) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS & FINISHES

A. Materials and equipment are contained in the Hardware Schedule.

B. Unless otherwise specified, provide various items of hardware with color and finish matching the finish specified for locksets and latchsets.

C. Provide finishes of the same designation, that come from two or more sources, which match when the items are viewed at arms length and approximately 2 feet apart.

D. Provide hue of color of each finish matching whether or not the base metal is cast, forged or stamped, or when plating is applied over steel, brass or bronze.

E. Provide manufacturer's standard painted finish over bonderized and prime coated metal surfaces where required; the lacquer or enamel matching the finish of the locksets and latchsets unless otherwise specified.

F. Hardware Finishes:

1. Provide finishes as indicated in the herein hardware sets. Provide all other hardware with matching finish unless noted otherwise.
2. The designations used in schedules and elsewhere to indicate hardware finishes are those listed in ANSI/BHMA A156.18 including coordination with traditional U.S. finishes shown by certain manufacturers for their products
3. 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.

2.2 TEMPLATES

A. Fabricate locks, hinges, closers and other hardware, to be mounted on hollow metal doors and frames to templates; furnish with machine screws. Furnish templates to hollow metal door and frame manufacturers and other manufacturers requiring such templates.

2.3 FASTENINGS

A. Furnish hardware with screws and other fastenings suitable to assure permanent anchorage. Where exposed, provide fastenings of countersunk oval head type, (except use flat head for hinges), and matching finish of hardware being attached. Provide concealed fastenings. Exposed through and sex bolts are not acceptable. Do not attach hardware with self-tapping or sheet metal screws. Fasten floor type stops and holders to the floor with machine screws into expansion shields.

2.4 ACCEPTABLE MANUFACTURERS

A. Proprietary names used to designate hardware in the schedule are not intended to imply that products of the manufacturer are required to the exclusion of equivalent products of other herein named or listed manufacturers. The Architect is to be informed in writing in accordance with Section 01 60 00 “Product Requirements” for approval of hardware items and manufacturers not specified on the project prior to submitting the hardware schedule.

1. The manufacturer for each specified hardware item is noted in each hardware set of the Hardware Schedule by abbreviations i.e. (MC) noted below for each hardware item.

B. Manufacturer’s Abbreviations:

1. HA – Hager
2. ME – Medco
3. MK – McKinney
4. LC – LCN
5. GL – Glynn-Johnson
6. NG – National Guard
7. PE – Pemko
8. RO – Rockwood
9. SC – Schlage
10. ST – Stanley
11. IV – Ives
12. OT – By Others

2.5 HARDWARE ITEMS

A. Hanging Devices:

1. Butt Hinges:
   a. Complying with ANSI/BHMA A156.1 Grade 1.
   b. Provide one (1) hinge for every 30 inches of door height.
   c. Provide non-removable pins on all lockable reverse bevel doors.
   d. Provide butt hinges as manufactured by one of the following:
      1) Hager (HA)
      2) McKinney (MC)
      3) Stanley (ST)

B. Flush Bolts And Accessories:

1. Provide manual and automatic flush bolts, dust-proof strikes and related accessories as indicated in the hardware schedule sets.
2. Complying with BHMA A156.16, Grade 1.
3. Provide items as manufactured by one of the following:
   a. Ives (IV)
   b. Trimco (TR)
   c. Rockwood (RO)

C. Cylinders And Keying:

1. Initiate and conduct meeting(s) with Owner to determine system keyway(s) and structure. Furnish Owner's written approval of the system.
   a. Existing factory registered master key system.
   b. Construction keying: Furnish temporary keyed-alike cylinders/cores. Remove at substantial completion and install permanent cylinders/cores in Owner's presence. Demonstrate that construction key no longer operates.
   c. Temporary cylinders/cores remain Supplier's property.
   d. Furnish 10 construction keys.
   e. Furnish 2 construction control keys.
   f. Re-combinate entire project at no extra expense to Owner if missing any keys.
2. Cylinders:
   a. Provide manufacture's standard cylinders and keys of same manufacturer as locksets provided.
   b. Complying with BHMA A156.5, Grade 1.
   c. Provide cylinders as manufactured by the following:
      1) Medeco KeyMark 7-pin S.F.I.C.
   d. All cylinder cores to be face stamped by Medeco as directed by Owner's Lock shop.
3. Keying:
   a. Complying with BHMA A156.28.
   b. Provide locks and cylinders construction master-keyed or temporary cylinders in quantities as directed by General Contractor. Provide all locks and cylinders to be master-keyed or grandmaster-keyed into new key system as directed by the Owner. Provide factory keyed all locks and cylinders. Furnish the following key amounts:
      1) Two (2) cut keys per lock
      2) Two (2) key blanks for each KeyMark core
   c. Send master keys, key blanks, cores and bitting list directly from the factory to the Owner in sealed boxes. Submit signed receipt indicating such quantities received and person receiving to the following address:
      1) College of DuPage
         Facilities Operations & Maintenance – Lock shop
         425 Fawell Blvd.
         Glen Ellyn, IL 60137-6599
   d. All keys to be stamped with "Do Not Duplicate" and appropriate key set.

D. Locking Devices:

1. Mortise Locksets:
   a. Complying with ANSI/BHMA 156.13 Series 1000, Grade 1 Certified.
   b. Provide mortise locksets as manufactured by the following:
      1) Schlage (SC) L9000BD Series x 06N lever/rose design
      2) No substitutions

E. Door Closers - Surface Mounted Door Closers – Heavy Duty:

1. Complying with ANSI/BHMA 156.4, Grade 1 Certified.
2. Do not install closers on exterior or corridor side of doors where possible.

3. Provide surface mounted door closers as manufactured by one of the following:
   a. LCN (LC) 4041 Series
   b. No substitutions

F. Door Trim and Protective Plates:

1. Complying with BHMA A156.6.
2. Provide kick, mop and armor plates fabricated from .050 gauge stainless steel with beveled edges all four sides. Provide heights and widths indicated in the hardware sets.
3. Push plates, pull plates, door pulls and other miscellaneous door trim to be furnished as specified.
4. Provide items as manufactured by one of the following:
   a. Rockwood (RO)
   b. Hiawatha (HI) J102
   c. Trimco (TR) K0050

G. Push Bar:
1. Complying with BHMA A156.6
2. Provide items as manufactured by one of the following:
   a. Rockwood (RO) 47
   b. No substitutions

H. Wall Mounted Door Stops:

1. Complying with BHMA A156.16, Grade 1.
2. Provide wall stops for all doors unless otherwise indicated.
3. Provide wall stops as manufactured by one of the following:
   a. Ives (IV) WS406CVX
   b. Hiawatha (HI) W1326R
   c. Trimco (TR) 1270WX

I. Overhead Stops and Holders:

1. Complying with BHMA A156.8, Grade 1
2. Templating of both surface and concealed overhead stops and holders allows for 85 to 115 degree stop/hold open position.
3. Provide overhead holders as manufactured by one of the following:
   a. Surface mounted: Glynn-Johnson 90 Series
   b. Concealed: Glynn-Johnson 100 Series
   c. No substitutions

J. Weather –Stripping, Gasketing and Thresholds:

1. Provide items as indicated in the hardware sets.
2. Complying with the following:
   a. Weather-Stripping & Gasketing: BHMA A156.22.
   b. Thresholds: BHMA A156.21.
3. Provide threshold units comply with the Americans with Disabilities Act (ADA.)
4. Fire-rated openings, 90min or less duration: use thresholds to interrupt floor covering material under the door where that material has a critical radiant

flux value less than 0.22 watts per square centimeter, per NFPA 253. Use threshold unit as scheduled. If none scheduled, request direction from Architect.

5. Sound control openings: Threshold set in bed of mastic sealant.
6. Provide items as manufactured by one of the following:
   a. Gasketing: National Guard Products 5050B
   b. Threashold: National Guard Products 513, 896S
   c. Pemko (PE)
   d. Reese (RS)

K. Silencers: Furnish rubber door silencers at all hollow metal and/or wood frames; two (2) per pair and three (3) per single door frame.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine and verify all conditions of hardware installations. Installation of finish hardware and related items constitute acceptance of the existing conditions.

3.2 PRE-INSTALLATION ORIENTATION

A. After delivery of hardware and prior to its installation, meet with the installer and manufacturers. Compare approved samples with actual hardware delivered to assure acceptability. Review catalogs, brochures, installation instructions and the final hardware schedule. Rehearse installation procedures and workmanship, with special techniques of installation.

3.3 INSTALLATION

A. 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.

B. Install finish hardware plumb, level and true to line. Install each hardware item in compliance with the manufacturer's printed instructions and recommendations.

C. Install finish hardware using supplied templates for each item. Cut and fit substrate to avoid substrate damage and weakening. Cover cut-outs with hardware item. Mortise work in correct locations and size, without gouging, splintering or causing irregularities in the finished work.

D. Where cutting and fitting is required on substrates to be painted or stained, install, fit and adjust hardware prior to finishing work. Remove finish hardware and place in original packaging. Reinstall hardware after finishing.

E. Attach thresholds to concrete surfaces using drilled-in lead expansion shields and countersunk flat-head bronze or stainless steel screws. Set thresholds in a continuous bed of polyurethane sealant.

3.4 MOUNTING HEIGHTS OF HARDWARE

A. 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. Custom Steel Doors and Frames: DHI's "Recommended Locations for Builders' Hardware for Custom Steel Doors and Frames.
3. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."

B. Where standards or specified heights conflict, consult the Architect for interpretation prior to mounting hardware.

3.5 FIELD QUALITY CONTROL

A. The Architect and hardware supplier will do a final inspection prior to building completion to ensure that all hardware was correctly installed and is in proper working order.

B. Prior to the installation of hardware, manufacturer's representatives for locksets, closers, and exit devices is to arrange and hold a jobsite meeting to instruct the hardware installer's personnel on the proper installation of their respective products. Send a letter of compliance to the Architect indicating when this meeting is to be held and who will be in attendance.

3.6 CLEANING, TRAINING AND FINAL ADJUSTMENT

A. Adjust and check each operating item of hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate freely and smoothly or as intended for the application made.

B. Immediately prior to acceptance of the building by the Owner, lubricate hardware with graphite or special oil, test and adjust moving parts. Clean hardware to remove dust and stains.

C. Instruct Owner's designated personnel in adjustment and maintenance of hardware and finishes during hardware adjustment. Furnish special tools to the Owner's Representative as required to adjust and maintain hardware.

D. Where door hardware is installed more than one month prior to Final Completion or partial occupancy of a space or area, return to the installation during the week prior to Final Completion or partial occupancy and make final check and adjustment of all hardware items in such space or area. Clean operating items as necessary to

restore to proper function and finish of hardware and doors. Adjust door control devices to compensate for final operation of heating and ventilating equipment and air movement so that all items operate properly.

3.7 PROTECTION

A. Protect exposed hardware installed on doors during the construction phase. Install hardware at the latest possible time frame to avoid damage from construction activities. Replace all such damaged hardware at no additional cost to the Owner.

3.8 HARDWARE SCHEDULE

		BHMA Finish No.	MFR.

A. Set 1 (CLIENT REQUESTS TO DISABLE ELECTRIFIED HARDWARE AND CARD READER ACCESS):

3 Hinges	Reuse Existing		
1 Classroom Lock	Reuse Existing		
1 Cylinder Core	Reuse Existing		
1 Floor Stop	Reuse Existing		

B. Set 2:

3 Hinges	BB1279 4.5 X 4.5	26D	HA
1 Storeroom Lock	L9080BD 06N	626	SC
1 Cylinder Core	As Required	626	ME
1 Wall Stop	WS406CVX	630	IV

C. Set 3:

3 Hinges	BB1279 4.5 X 4.5 NRP	26D	HA
1 Classroom Lock	L9070BD 06N	626	SC
1 Cylinder Core	As Required	626	MD
1 Set Acoustic Gasketing	5050C		NG
1 Threshold	896S	613	NG
1 Floor Stop	IVES FS439	630	IV

D. Set 4:

3 Hinges	BB1279 4.5 X 4.5 NRP	26D	HA
1 Classroom Lock	L9070BD 06N	626	SC
1 Cylinder Core	As Required	626	MD
1 Set Acoustic Gasketing	5050C		NG
1 Threshold	896S	613	NG
1 Wall Stop	WS406CVX	630	IV

E. Set 5:

3 Hinges	BB1279 4.5 X 4.5 NRP	26D	HA
1 Classroom Lock	L9070BD 06N	626	SC
1 Cylinder Core	As Required	626	MD
1 Wall Stop	WS406CVX	630	IV

END OF SECTION

SECTION 08 80 00
GLAZING

PART 1 - GENERAL

1.1 SUMMARY

A. Glass and glazing.

B. Related Sections:

1. Rough carpentry: Section 06 10 00; for polycarbonate mirror backing
2. Joint Sealants: Section 07 92 00; for non-glazing sealants
3. Hollow steel frames: Section 08 11 13
4. Flush wood doors: Section 08 14 16

1.2 PERFORMANCE REQUIREMENTS

A. General: Provide glazing systems capable of withstanding normal thermal movement, wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

B. Manufacturer's Engineering Analysis: For all glass for exterior openings, the glass manufacturer is to perform wind load and thermal stress analyses and is to demonstrate compliance of glass with performance requirements.

C. Glass Design: Glass thicknesses indicated are minimums and are for detailing only. Confirm glass thicknesses by analyzing project loads and in-service conditions. Provide glass lites for various size openings in nominal thicknesses indicated, but not less than thicknesses and in strengths (annealed or heat treated) required to meet or exceed the following criteria:

1. Glass Thicknesses: Select minimum glass thicknesses to comply with ASTM E 1300, according to the following requirements:
   a. Impact Loads For Interior Installations: Per applicable code or herein referenced industry standard.
2. Maximum Lateral Deflection: For the following types of glass supported on all four edges, provide thickness required that limits center deflection at design wind pressure to 1/50 times the short side length or 1 inch, whichever is less.
   a. For monolithic glass lites heat treated to resist wind loads.
   b. For insulating glass.
   c. For laminated glass lites.

D. Thermal Movements: Provide glazing that allows for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures acting on glass framing members and glazing components. Base engineering calculation on surface temperatures of materials due to both solar heat gain and

nighttime sky heat loss and a temperature change (range) of 120 deg F ambient; 180 deg F, material surfaces.

1.3 SUBMITTALS

A. Manufacturer's Literature: Materials description and installation instructions for glazing materials.

B. Samples for Initial Selection:

1. Sets of laminated glass interlayer color and pattern selection samples.
2. Sets of spandrel glass, standard color selection samples.
3. Sets of color samples of glazing sealant for each type of sealant used.

C. Samples for Verification:

1. 12 inch x 12 inch samples of each type glass.

D. Design Calculations: Provide design calculations showing conformance with the specified performance requirements prepared and certified by the glass manufacturer.

E. Wind Load and Thermal Stress Analyses: Copies of manufacturer's wind load and thermal stress analyses.

F. Warranties: Signed copies of insulating glass units, coated and laminated glass and unframed mirror warranties.

1.4 QUALITY ASSURANCE

A. Comply with the following:

1. GANA Publications: GANA's - Glazing Manual.
2. Glazing Material: FS DD-G-451D, ANSI Z97.1, and ASTM C 1036.
3. Glass Coating: ASTM C 1376 Standard Specification for Pyrolitic and Vacuum Deposition Coatings on Glass.
4. Safety Glazing: ASTM C 1048, ASTM C 1172, ANSI Z97.1, ANSI Z97.1a, U.S. Consumer Product Safety Commission Standard 16 CFR 1201 CI and CII, and GANA'S - Glazing Manual and Laminated Glass Design Guide.
5. Insulating Glass:
   a. Manufacturing: ASTM E 2190, Class CBA.
   b. Testing: ASTM E 2190.
   c. Installation: SIGMA TM-3000, Vertical Glazing Guidelines, and SIGMA TB-3001, Sloped Glazing Guidelines.

B. Unless otherwise shown or governed by other referenced standards specified, conform with details and procedures of GANA, (Glass Association of North America) Glazing Manual, current edition.

C. Installer Qualifications: An experienced installer, as evidenced by a minimum of five (5) consecutive years experience, and who has completed glazing similar in material, design, and extent to that indicated for project and whose work has resulted in construction with a record of successful in-service performance.

D. Source Limitations:

1. Coated Glass: Obtain coated glass from one manufacturer for each type of coating and each type and class of float glass indicated.
2. Insulating Glass: Obtain insulating glass units from one manufacturer using the same type of glass and other components for each type of unit indicated.
3. Tempered Glass: Obtain tempered glass units from one manufacturer using the same type of glass and tempering process for all units.

E. In the event of a conflict between specified standards or references the more stringent or greater is to take precedent and be the one utilized for the design and installation.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver glazing materials to project site in manufacturer's unopened containers, fully identified with trade name, color, size, hardness, type, class and grade. Store each item in accordance with manufacturer's instructions. Immediately remove from the job site all damaged or otherwise unsuitable material, when so ascertained.

1.6 WARRANTY

A. Insulating Glass Units:

1. Provide insulating glass unit manufacturer's written warranty for the insulating glass units to be free of visual obstruction due to internal moisture or dust collecting on the interior glass surfaces.
2. Provide warranty in accordance with the General Conditions, except the warranty period is to be for ten (10) years instead of one (1) year.
3. Provide warranty signed by the subcontractor and Insulating Glass Manufacturer with copies submitted to the Architect.

B. Coated Glass: Provide a written ten (10) year warranty from date of manufacture for coated glass. Warranty covers deterioration due to normal conditions of use and not to handling, installing, and cleaning practices contrary to the glass manufacturer’s published instructions.

C. The above warranties are in addition to, and not a limitation of, other rights the Owner may have under the Contract Documents.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Clear Float Glass: Complying with ASTM C 1036, Type I, Class 1, Quality q3, thickness as shown or specified, tempered in doors and adjacent lights where shown on Drawings or required by codes, one of the following:

1. AGC, clear float glass.
2. Guardian, clear glass.
3. PPG Industries, clear glass.
4. Viracon, clear glass.

B. Glazing Tape: Polyisobutylene/Butyl, complying with ASTM C 1281:

1. Dap, Inc., Butyl Rubber Tape.
2. Pecora Corporation, G-66 or BB-50.
3. Tremco, Tremco 400 Tape.

C. Setting Blocks: Neoprene blocks, 70 to 90 Type A durometer hardness.

D. Spacers: Neoprene blocks, 40 to 50 Type A durometer hardness, 3 inches long, self-adhesive on one face only.

2.2 HEAT TREATED TEMPERED AND HEAT STRENGTHENED GLASS

A. Provide tempered and heat strengthened glass horizontally heat treated in accordance with FS DD-G-1430B. Fabricate tempered and heat strengthened glass units so that roll distortion lines are parallel to the bottom edge of the glass units and the bottom or sill of the glazing pocket into which the glass unit is being installed.

B. Provide heat treated glass complying with ASTM C 1048 for the following:

1. Kind FT: Fully tempered.

2.3 FABRICATION OF GLAZING UNITS

A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.

B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites to produce square edges with slight chamfers at junctions of edges and faces.

C. Grind smooth and polish exposed glass edges and corners.

2.4 GLAZING SCHEDULE

A. Glass Type GL-1 (Monolithic): Minimum 1/4 inch clear glass, fully tempered.

PART 3 - EXECUTION

3.1 PREPARATION

A. Examine all surfaces to receive the parts of the work specified herein. Verify all dimensions of in-place and subsequent construction. Application or installation of materials constitutes acceptance of the related construction.

3.2 INSTALLATION - GENERAL

A. Employ only experienced glazers who have had previous experience with the materials and systems being applied. Use tools and equipment recommended by the glass manufacturer.

B. Measure all openings and cut glass accurately to fit each opening with minimum edge clearances and bite on glass as specified by GANA. If glass is to be cut to size at project site deliver each piece to project at least 2 inches larger (in both dimensions) than required, so as to facilitate the cutting of clean cut edges without necessity of seaming or nipping. Do not seam, nip or abrade tempered glass at the job site.

C. Maintain a minimum temperature of 40 deg F during glazing unless the manufacturer of the glazing materials specifically agrees to application of his materials at lower temperatures. If job progress or other conditions require glazing work when temperatures are below 40 deg F (or below minimum temperature recommended by the manufacturer), consult the manufacturer and establish the minimum provisions required to ensure satisfactory work. Record in writing to the manufacturer, with copy to the Architect, the conditions under which such glazing work proceeds and the provisions made to ensure satisfactory work.

D. Inspect each piece of glass immediately before installation. Do not install pieces which have significant impact damage at edges, scratches or abrasion of faces or any other evidence or damage.

E. Locate setting blocks at the quarter points of sill but no closer than 6 inches to corners of glass. Use blocks of proper size to support the glass in accordance with manufacturer's recommendations.

F. Provide spacers for all glass to separate glass from stops, except where continuous gaskets or tape are required. Locate spacers 36 inches o.c. maximum inside and out, with a minimum of two (2) spacers per edge of glass. Provide thickness equal to sealant or compound thickness shown. Provide width as required for minimum of 3/8 inch bite on glass at all four (4) edges.

G. Set glass in a manner which produces greatest possible degree of uniformity in appearance. Face all glass, which has dissimilar faces, with matching faces in the same direction. Set all glass with bow (if any) to exterior.

H. Install tempered and heat strengthened glass units with the roll distortion parallel to the bottom or sill glazing pocket in accordance with the glass manufacturer's recommendations for the type of glass installation.

I. Glazing Tape:

1. Butt or lap ends of sealant tape in accordance with the manufacturer's recommendations.
2. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.
3. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
4. Where framing joints are vertical, cover these joints by applying tapes to heads and sills first and then to jambs. Where framing joints are horizontal, cover these joints by applying tapes to jambs and then to heads and sills.
5. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
6. Do not remove release paper from tape until just before each glazing unit is installed.

J. Clean excess sealant from glass and framing members immediately after application, using solvents or cleaners recommended by manufacturers.

3.3 PROTECTION AND CLEANING

A. Protect glass from breakage immediately upon installation. Use streamers or ribbons suitably attached to framing and held free of glass. Do not apply warning markings directly to the glass.

B. Remove and replace glass which is broken, cracked, chipped or damaged in any way and from any source, including weather, vandalism and accidents during the construction period at no additional cost to the Owner.

C. Maintain glass in a reasonably clean condition during construction so that it will not become stained and will not contribute to the deterioration of glazing materials.

D. Wash and polish glass on both faces just prior to final acceptance. Comply with instructions and recommendations of glass manufacturer and glazing materials manufacturer for cleaning in each case.

END OF SECTION

SECTION 09 22 16
NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Non-structural metal framing, including the following:

1. Non-load bearing interior light gauge steel studs and furring.
2. Ceiling and soffit suspension systems for interior gypsum wallboard assemblies.
3. Backing plates not provided by other trades for support of items attached to metal framing system.
4. Supplementary parts and components, such as clips, fasteners, supplementary framing, and other miscellaneous accessories required for a complete installation.

B. Related Sections:

1. Rough carpentry: Section 06 10 00; for fire retardant treated wood blocking in walls
2. Penetration fire stopping: Section 07 84 13; for penetrations in fire rated walls and floors.
3. Gypsum board: Section 09 29 00.

1.2 DEFINITIONS

A. Gage: Gages of wire specified are American Steel & Wire Co.'s wire gages, unless otherwise indicated.

1.3 SYSTEM DESCRIPTION

A. Delegated Design Requirements:

1. Drawings of metal support system assemblies are diagrammatic and show design intent of finished profiles, shapes and forms; relationships between elements; location, identification, dimension and size of components, assemblies and accessories; and details and diagrams of connections.
2. It is the installing contractor’s responsibility to engineer, fabricate, assemble and install metal support systems to meet or exceed the criteria indicated and specified, to conform to the profiles indicated and to other requirements of the Contract Documents, to satisfy applicable governing codes and regulations, and to provide structurally sound assemblies.
3. If required by authorities having jurisdiction, prepare and submit reviewed shop drawings, specifications, load and deflection tables and any other supporting data required by authorities having jurisdiction for their review and approval, and pay fees incurred, prior to beginning installation.

B. Performance Requirements: Engineer assemblies to withstand the loads prescribed by the authorities having jurisdiction, within the specified deflection limits.
   1. Lateral loading: 5 psf for interior partitions.
   2. Limit metal framing systems deflection under load to the following:
      a. L/240 where supporting gypsum board only.
      b. L/360 where supporting tile.

1.4 SUBMITTALS

A. Data:

   1. Product Data: Submit a list of proposed products and materials to be provided for complete assemblies, along with manufacturer's product data, specifications, typical installation details and other data for each material listed to prove compliance with the specified requirements.
   2. Design Data: Submit complete load and deflection tables properly annotated for the indicated framing sizes, spacing, span limits and gages to be used.

B. Shop Drawings: Submit large scale, dimensioned shop drawings for Contractor-engineered assemblies.

   1. Show framing member size, gage designations, number, type, location, and spacing.
   2. Indicate component details, framing layout, framed openings, anchorage to structure, bracing, type and location of fasteners and welds, and accessories required for related work.
   3. Show metal gages, spacing of members and span dimensions.

C. Certificates:

   1. Mill certificates and galvanizing certificates: Signed by framing member/accessory manufacturer certifying compliance with material requirements.

D. Manufacturer's Installation Instructions: Submit manufacturer-prepared instructions concerning the proper preparation and installation framing members and framing accessories.

1.5 QUALITY ASSURANCE

A. Installer's Qualifications: Firm and individuals with a minimum of 3 consecutive years experience in the installation of specified products on projects similar in material, design, complexity and extent to this Project, and whose work has resulted in applications with a record of successful in-service performance.

B. Regulatory Requirements: Where fire-resistive construction is indicated, provide materials, accessories, and application procedures listed by UL, or tested according to ASTM E 119 for the type of construction shown, and approved by the authorities having jurisdiction.

1.6 HANDLING

A. Delivery: Protect materials from excessive moisture in shipment, storage, and handling.

B. Storage: Store off ground, either in a dry, ventilated, enclosed space or protected with suitable waterproof coverings.

C. Handling: Protect metal framing units from rusting and damage.

1.7 SEQUENCING

A. Coordinate placement of concealed internal wall reinforcement, such as backing plates, for items to be attached to metal support systems.

B. Coordinate installation of ceiling and soffit suspension systems with installation of overhead structural assemblies to ensure that inserts and other provisions for anchorage to building structure have been installed to receive ceiling hangers that will develop their full strength and at spacing required to support ceilings.

C. Furnish concrete inserts, and other devices indicated, to other trades for installation well in advance of time needed for coordination with other construction.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Provide metal framing members from one of the following:

1. MarinoWARE, Inc.
2. Scafco Steel Stud Manufacturing Co.
3. Clark Dietrich Building Systems, Inc.
4. Telling Industries
5. MBA Metal Framing

2.2 STUDS, RUNNERS AND FURRING

A. Framing Members - General: Comply with ASTM C 754 for conditions indicated.

1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal unless otherwise indicated.
2. Protective Coating: ASTM A 653, G40.

B. Smooth Steel Studs: ASTM C 645, punched web complying with the following:

1. Protective coating: ASTM A 653, G40 galvanized coating.
2. Bracing: Where the wall finish does not adequately brace both flanges of studs, provide bracing or reduce allowable stresses for computing stud heights in compliance with requirements of the authorities having jurisdiction.

3. Uncoated Metal Thickness (Gage): Minimum 0.018 inch (Referenced as 25 gage), refer to the Drawings.

C. Dimpled Steel Studs and Runners:

1. Protective coating: ASTM A 653, G40 galvanized coating.
2. Bracing: Where the wall finish does not adequately brace both flanges of studs, provide bracing or reduce allowable stresses for computing stud heights in compliance with requirements of the authorities having jurisdiction.
3. Uncoated Metal Thickness: Minimum 0.015 inch.

D. Top and Bottom Tracks: As recommended by the manufacturer of each stud type and of the same gage as the studs in same wall or partition, unless otherwise indicated on the Drawings. Provide unpunched, screwable tracks with 1-1/4-inch flanges.

E. Slip-Type Head Joints: Where indicated, provide one of the following:

1. Slip-Type Head Joints: To accommodate slab deflection where studs extend to the underside of beams, floor or roof slabs, secure at top with a deep leg, minimum 16-gage slip connection manufactured by one of the following:
   a. Clark Dietrich; SLP-TRK Slotted Deflection Track.
   b. MBA Building Supplies; FlatSteel Deflection Track.
   c. Steel Network Inc. (The); VertiTrack VTD Series.
   d. Telling Industries; Vertical Slip Track.

F. Firestop Tracks: Top runner manufactured to allow partition heads to expand and contract with movement of the structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs by one of the following:

1. "Slotted Top Track" by Metal Lite, Inc.
2. "SLP-TRK" by Clark Dietrich, Inc. for fire-rated partitions.
3. “Fire Track System”, Fire Track Corp.
4. Or other Code-compliant assemblies acceptable to the Architect.

G. Furring Channels: Minimum 0.018 inch thick (25-gage), galvanized, hat-shaped.

H. Horizontal stiffener, runner channels and bridging: Complying with ASTM A 1003, minimum 0.053 inch metal thick, channels fabricated of cold-rolled steel with flanges not less than 7/16-inch wide. Minimum weights as follows:

Channel Size	Flange Width	Pounds/1000 linear foot
3/4-inch	7/16-inch	300
1-1/2-inch	7/16-inch	475
2-inch	19/32-inch	590

2.3 SUSPENSION SYSTEMS

A. Tie Wire: ASTM A 641, Class 1 zinc coating, soft temper, minimum 0.062 inch diameter wire, or double strand of minimum 0.048 inch diameter wire.

B. Wire: ASTM A 641, Class 1 zinc coating, soft temper:

1. Hanger Wire: Minimum 0.12 inch diameter, unless otherwise indicated.
2. Diagonal Bracing Wire: 0.08 inch diameter, unless otherwise indicated.
3. Tie wire: 0.05 inch diameter, single-strand annealed steel or 0.04 inch diameter, galvanized, double-strand annealed steel.

C. Metal Channels Supporting Suspended Ceilings (Carrying Channels): Provide metal channels complying with ASTM C 641, galvanized in compliance with ASTM A 924, G60 coating designation, for framing, furring and stiffening, as follows:

Size	Type	Pounds per 1,000 linear feet
3/4 inch	Cold-rolled	300
1 inch	Hot-rolled	410
1-1/2 inches	Hot-rolled	475
2 inches	Cold-rolled	590

D. Furring Channels (Furring Members):

1. Cold-Rolled Channels: 0.053-inch uncoated-steel thickness, with minimum ½ inch wide flanges, 3/4 inch deep.
2. Steel Studs and Runners: ASTM C 645.
   a. Minimum Base-Metal Thickness: minimum 0.033 inch.
   b. Depth: As indicated on Drawings.
3. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch deep.
   a. Minimum Base-Metal Thickness: Minimum 0.033 inch thickness>.

E. Direct Hung Suspension System (Alternate Method):

1. Cross Tees: 1-1/2 inch high double web .020 inch thick electro-galvanized steel with 15/16 inch wide capped flange face.
2. Wall Track: 1-1/2 inch to 1-5/8 inch inside dimensions .020 inch thick electro-galvanized steel with 15/16 inch to 1 inch wide top and bottom flange faces.
3. Acceptable Manufacturers:
   a. Drywall Suspension System, U.S. Gypsum
   b. System 640, Chicago Metallic Corp.
   c. Drywall Grid System, Armstrong Industries

2.4 FASTENERS AND ACCESSORIES

A. Screws: ASTM C 1002 for metal framing 0.024 inch thick (25-gage) and lighter; ASTM C 954 for heavier metal framing. Provide 3/8 inch head diameter, corrosion-resistant pan head screws; length and gage required by Code, or recommended by the metal framing manufacturer when not prescribed by Code.

B. Anchor bolts: ASTM A 307, non-headed type.

C. Expansion shields: FS FF-S-325, except do not use lead, fiber and plastic shields.

D. For low walls: Use “Floor Anchor” stud reinforcement by Pinquist Tool & Die Co., Inc., or approved substitute, at every stud.

E. Isolation Strip at Exterior Walls - Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch thick, in width to suit steel stud size.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine adjacent construction and supports.

B. Correct conditions detrimental to the proper and timely completion of this work before proceeding with installation.

3.2 PREPARATION

A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.

1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.

3.3 WALL INSTALLATION

A. General:

1. Erect metal framing systems in compliance with their manufacturer's recommendations, the reference standards, the Drawings and these Specifications.
2. Use minimum 0.039 inch thick (20-gage) studs at the following locations:
   a. Each side of door openings.
   b. Where studs support backing plates, plumbing fixtures and wall-supported cabinets.
3. Do not attach metal framing to ducts, conduits or pipes. Do not allow metal framing and suspension wires to contact pipes.
4. Cut framing components squarely for a tight fit against abutting members. Erect framing plumb and level to provide solid backing for finish materials. Install all steel studs in a wall/partition so that their flanges point in the same direction.

5. Do not exceed a 1/8-inch in 10-foot deviation (non-cumulative) from true lines and levels, nor 1/4-inch from true position. Perform necessary remedial work on framing to achieve specified tolerances.

B. Wall/Partition Framing:

1. Layout partitions and permanently mark on slabs.
2. Align and securely anchor ceiling and floor tracks to building construction. Space anchors within 6 inches of ends of each track segment and at 24 inches o.c. maximum. Do not drive fasteners closer than 2 inches to slab or curb edge.
3. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
   a. Firestop Track: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.
4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.
5. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.
6. Frame all openings in stud walls. Provide double studs, closer spacing, and additional reinforcement as detailed or required at doorframes, interior windows and recesses for equipment.
7. Frame both sides of control joints in gypsum board surfaces with separate studs and a discontinuous runner; do not bridge the joint with system components or accessories.
8. Assemble corners using a minimum of 3 studs.
9. Install studs in single length, without joints, extending from floor to underside of floor or roof structure above, except where indicated on the Drawings to stop at or above suspended ceilings. Splicing studs is not permitted without the Architect's approval.
10. Where studs stop at or above suspended ceilings, unless otherwise indicated, brace every fourth stud (maximum) with opposite stud bracing at 45 deg. angles securely anchored to the floor or roof above.
11. Attaching studs to runner: Attach studs to tracks by friction fit for single stud gypsum board partitions.
12. Attach the following studs to runner tracks with screws or with a crimping tool in compliance with the stud manufacturer's instructions, except where indicated to be welded.
    a. Studs with gypsum board on only one side.
    b. Studs on each side of doors.
    c. Studs supporting wall hung plumbing fixtures.
    d. Studs supporting wall hung urinal screens, toilet compartments, cabinets and equipment.
    e. Attach corner studs, partition intersections, studs on each side of doorjambs, and other openings in walls/partitions as specified above.
13. Unless otherwise indicated, provide horizontal stiffeners consisting of 3/4-inch channels spaced at not more than 54 inches o.c. maximum in all partitions/walls supporting wall supported cabinets. Attach stiffeners to each stud.

a. Provide an additional 3/4-inch channel 6 inches above door head and extend 2 stud spaces beyond jamb studs.
b. Install channels in longest possible lengths, lap 12 inches and wire-tie at joints. Do not tie channels on opposite sides of staggered and double stud partitions together.

14. Double studs (face to face to form a tube) at locations adjacent to doors and openings. Extend studs at door openings to slab or deck above and anchor securely to bottom track (as specified in subparagraph 12.b. above) and to top slab or deck with clip angles.
    a. Locate additional studs not more than 2 inches from door and window frames, abutting partitions, partition corners, and other construction.
    b. Install a section of track over door and window frames with a clip angle at each end and attach securely to the adjacent vertical studs.
    c. Install cut-to-length studs at the location of vertical joints and at standard spacing over the doorframe header extending to the ceiling track.
15. Install studs 2 inches away from abutting concrete, steel columns or other structural elements. Extend the horizontal stiffeners and attach it to the structural element.
16. Provide additional framing, as required, for attachment of electrical boxes, fire extinguisher cabinets and similar items located in stud walls.

C. Furring:

1. Provide furring attached to concrete and metal framing to conceal utilities, furred soffits, and other furring as indicated.
2. Furring to receive gypsum board shall be screw-on channels directly attached to backing material, or applied over runner channels as applicable.
3. Furring to receive plaster shall be 3/4-inch cold-rolled channels wire tied to 1-1/2-inch runner channels.
4. Space furring as indicated for studs.

D. Install extra stud, furring members and angle runners at terminations of dry wall work, and at openings and where required for support of other work occurring in the dry wall work.

1. Install sheet metal strapping, studs, hat-shaped channels or stud runners in walls where shown on the Drawings or as required by the conditions of the installation, minimum same gage as stud framing, for the support and attachment of other work. Attach to stud framing with not less than three (3) screws per stud.

3.4 INSTALLING CEILING & SOFFIT SUSPENSION SYSTEMS

A. Install suspension system components in sizes and spacings indicated on Drawings, but not less than those required by referenced installation standards for assembly types and other assembly components indicated.

B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.

C. Suspend hangers from building structure as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.
   a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices. Do not attach wires to, or bend around, interfering material such as ductwork, pipes and conduits
   a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.
3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
4. Do not attach hangers to steel roof deck.
5. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
6. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
7. Do not connect or suspend steel framing from ducts, pipes, or conduit.

D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.

E. Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

F. Space main runners not over 4 feet O.C. in any dimension so that hanger wires do not support more than 12 square foot of ceiling.

G. Hang suspended framing independent of walls, columns, pipes, ducts, and conduits, and their insulation.

H. Space runner channels not more than 6 inches from parallel walls or beams.

1. Align runner channels accurately relative to indicated ceiling height and saddle-tie with hanger wires.
2. Lap channels 12 inches at splices and tie at each end of lap.

I. Attach furring channels to runner channels at right angles to carrying channels with clips or with 0.05 inch diameter tie wire with triple wrap and triple twist.

1. Space at not over 12 inches O.C. for lath/plaster assemblies, and 16 inches O.C. for gypsum board.
2. Locate approximately 2 inches from parallel walls.
3. Lap channels 12 inches at splices and wire-tie at each end of lap.

4. Assemble and install metal grillage so that it is rigid, square, and free of movement, and level within the tolerances specified.
5. At control joints, provide discontinuous lap in main runners occurring over joints.
    a. Do not bridge joints with cross furring where joints run perpendicular to furring.
    b. Where joints run parallel to furring, provide furring to support each side of joint.

J. Provide recesses and openings where indicated for lighting fixtures, registers, access panels and other items to be installed in ceilings. Provide additional furring channels where required by opening condition.

K. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

3.5 INSTALLATION OF DIRECT HUNG CEILING SYSTEM (ALTERNATE METHOD)

A. Install direct hung ceiling (interior) system in accordance with the manufacturer's printed instructions and as specified herein. Comply with ANSI A97.2 and as further specified. Furnish and install hanger devices in coordination with other work.

B. Interconnect main furring runners with furring tees at 24 inches o.c. Install furring tees on all four sides around recessed lighting fixtures and other openings in ceiling.

C. Install additional hangers around light fixtures as required to support additional weights of light fixtures. Verify weights of light fixtures prior to installation of suspension system and hangers. Wrap hanger wires tightly at least three full turns.

END OF SECTION

SECTION 09 29 00
GYPSUM BOARD

PART 1 - GENERAL

1.1 SUMMARY

A. Gypsum board, including the following:

1. Interior gypsum board.
2. Installation accessories and finishing materials.

B. Related Sections:

1. Rough carpentry: Section 06 10 00; for wood blocking located in walls.
2. Through-penetration fire stop systems: Section 07 84 12; for penetrations of fire rated walls.
3. Fire resistive joint sealants: Section 07 84 46, for head-of-wall assemblies that incorporate gypsum board.
4. Joint sealants: Section 07 92 00; for acoustical sealants at bottom & top of walls and penetrations.
5. Non-load bearing metal framing: Section 09 22 16; for framing and suspension systems that support gypsum board.
6. Hollow steel doors and frames: Section 08 11 13; for frames located in walls.
7. Painting: Section 09 91 00.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

1.3 QUALITY ASSURANCE

A. Provide gypsum wallboard construction complying with all laws, ordinances, rules, regulations and orders of public authorities having jurisdiction over this part of the Work.

B. Provide primary materials from a single manufacturer unless otherwise approved, in writing by the Architect, to insure total unit responsibility.

C. Gypsum Wallboard:

1. Provide installation of gypsum wallboard materials and systems construction complying with ASTM C 840, the manufacturer's current printed instructions and specifications and Gypsum Association, Standard GA 216 - Recommended Specifications for the Application and Finishing of Gypsum Wall Board, and Standard GA 600 - Fire Resistance Design Manual, current editions, except as herein modified and as approved by the manufacturer.

2. In the event of a conflict between these specifications and the above named references and standards, the more stringent or greater is to take precedent and be the one utilized for the installation.

D. Fire Resistive Construction:

1. For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.
2. Where gypsum board systems are indicated to have fire resistance ratings, including those required to comply with governing regulations, provide materials and installations identical with applicable assemblies which have been tested and listed by recognized authorities, including UL.
3. Deflection and Firestop Track: Provide top runner in fire resistance rated assemblies indicated as labeled and listed by UL, Warnock Hersey, or another testing and inspecting agency acceptable to authorities having jurisdiction.

E. Sound Transmission Characteristics: For gypsum board assemblies with STC ratings noted on the Drawings, provide materials and construction identical to those tested in the assembly indicated in accordance with ASTM E 90 and classified according to ASTM E 413 by a qualified independent testing agency.

F. The Gypsum Wallboard Installing Contractor is to review the proposed system installations and the Contract Documents Drawings and Specifications. The Contractor is to include in the work, in addition to that shown on the Drawings and specified herein, all additional work and materials for compliance with the requirements of the local codes, ordinances and regulations at no additional cost to the Owner.

1.4 STORAGE AND HANDLING

A. Store materials inside under cover and keep them dry and protected against damage from weather, condensation, direct sunlight, construction traffic, and other damage. Stack panels flat to prevent sagging.

1.5 PROJECT CONDITIONS

A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.

B. Do not install interior products until installation areas are enclosed and environmentally conditioned.

C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.

2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 ACCEPTABLE GYPSUM BOARD MANUFACTURERS

A. Georgia-Pacific Corp.; Portland, OR 97204.

B. Lafarge North America Inc., Herndon, VA 20170.

C. National Gypsum Company, Charlotte, NC 28211.

D. United States Gypsum Co.; Chicago, IL 60680.

E. Certainteed Corporation, Valley Forge, PA19482.

2.2 GENERAL - PANELS

A. Size: Provide in maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.3 GYPSUM PANELS

A. Gypsum Wallboard: Complying with FS SS-L-30 and ASTM C 1396; tapered with beveled or radial edge for all finished joints, thickness as shown on the Drawings:

1. Regular.
2. Fire-Rated Type X or Type C (type as required by fire resistive rated assembly indicated on the Drawings.).

B. Gypsum Ceiling Board: Complying with ASTM C 1395; sag resistant, tapered with beveled or radial edge for all finished joints, 1/2 inch thickness, regular and Grade X (fire-rated).

2.4 TRIM ACCESSORIES

A. Interior Trim: Comply with ASTM C 1047.

1. Material: Paper faced galvanized steel sheet or rigid PVC.
2. Shapes:
   a. Cornerbead.
   b. LC-Bead: J-shaped; exposed long flange receives joint compound.
   c. Control (expansion) joint.
   d. Tear-Away Bead: L-Shaped, exposed long flange receives joint compound.

B. Control Joints: Roll formed zinc or extruded vinyl as standard with the wallboard manufacturer.

2.5 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475.

B. Joint Tape:

1. Interior Gypsum Wallboard: Paper.

C. Joint Compound for Interior Gypsum Wallboard: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.

1. Prefilling: At open joints and damaged surface areas, use setting-type taping compound.
2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use drying type, all-purpose compound.
   a. Use setting type compound for installing paper faced metal trim accessories.
3. Fill Coat: For second coat, use drying type, all-purpose compound.
4. Finish Coat: For third, coat, use drying type, all-purpose compound.

2.6 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.

B. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.

C. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.

D. Screws:

1. Metal Studs: Type S and S-12 bugle head and pan head, sized to suit thickness, zinc plated for exterior use, complying with ASTM C 1002 and ASTM C 954.
2. Gypsum: Type G, sized to suit thickness, zinc plated for exterior use, complying with ASTM C 1002 and ASTM C 954.
3. Provide fasteners with a hot-dip zinc coating complying with ASTM A 153.
4. Fastening to Metal Studs: Use 1-1/2 inches long, galvanized screws.

E. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.

1. Fire Resistance Rated Assemblies: Comply with mineral fiber requirements of assembly.

F. Acoustical Sealant: As specified in Section 07 92 00 – Joint Sealants

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames and framing, for compliance with requirements and other conditions affecting performance.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. When the outside temperature is below 55 deg F, provide heat and maintain in all areas where the work is to be performed. Provide heat continuously and uniformly at 55 deg F from one week prior to start of installation until dry wall application and joint treatment is completed. Do not start installation until windows are glazed and doors installed or openings temporarily closed. Provide ventilation to remove excess moisture during joint treatment.

3.3 APPLYING AND FINISHING PANELS - GENERAL

A. Comply with ASTM C 840.

B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.

D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.

E. Form control and expansion joints with space between edges of adjoining gypsum panels.

F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.

1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.

2. Fit gypsum panels around ducts, pipes, and conduits.
3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4 to 3/8 inch wide joints to install sealant.

G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, including floors. Provide 1/4 to 1/2 inch wide spaces at these locations, and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

I. STC Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations for locating edge trim and closing off sound flanking paths around or through assemblies, including sealing partitions above acoustical ceilings. Separate by 24 inches horizontally outlet boxes and other penetrations on opposite sides of the partition in separate stud cavities and treat with outlet box pads.

J. Install sound attenuation blankets, where shown on the Drawings, pressure fit between studs. Fill all voids. openings and gaps, butt joints of blankets and support and secure in accordance with manufacturer's recommendation when not self supporting.

3.4 APPLYING INTERIOR GYPSUM BOARD

A. Install interior gypsum board in the following locations:

1. Regular Type: Vertical and horizontal surfaces, unless otherwise indicated.
2. Type X & C: Where required for fire resistance rated assembly.
3. Ceiling Board: All ceilings unless noted otherwise.

B. Single Layer Application:

1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing, unless otherwise indicated.
2. On partitions/walls, apply gypsum panels vertically (parallel to framing), unless otherwise indicated or required by fire resistance rated assembly, and minimize end joints.
   a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
   b. At stairwells and other high walls, install panels horizontally, unless otherwise indicated or required by fire resistance rated assembly.
3. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

C. Multilayer Application:

1. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face layer joints offset at least one stud or furring member with base-layer joints, unless otherwise indicated or required by fire resistance rated assembly. Stagger joints on opposite sides of partitions.
2. Fastening Methods: Fasten base layers and face layers separately to supports with screws.

3.5 INSTALLING TRIM ACCESSORIES

A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

B. Control Joints: Install controls joints in accordance with the following:

1. Install control joints according to ASTM C 840.
2. In specific locations as drawn for visual effect.
3. Where a partition, wall, or ceiling traverses a construction joint (expansion, seismic, or building control element) in the base building structure.
4. Where a wall or partition runs in an uninterrupted straight plane exceeding 30 lineal feet.
5. Interior Ceilings with Perimeter Relief: Install control joints so that linear dimensions between control joints does not exceed 50 ft and total area between control joints does not exceed 2,500 sq. ft. Install a control joint or intermediate blocking where ceiling framing members change direction.
6. Interior Ceilings without Perimeter Relief: Install control joints so that linear dimensions between control joints does not exceed 30 ft and total area between control joints does not exceed 900 sq. ft. install a control joint or intermediate blocking where ceiling framing members change direction.

C. Interior Trim: Install in the following locations:

1. Cornerbead: Use at outside corners, unless otherwise indicated.
2. LC-Bead: Use at exposed panel edges.
3. Tear-Away Bead: Use at exposed panel edges.

D. Apply wallboard screws with an electric driver. Drive screws not less than 3/8 inch from edges or ends of panels to provide a uniform dimple not over 1/32 inch deep.

3.6 FINISHING GYPSUM BOARD

A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.

B. Prefill open joints and damaged surface areas.

C. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.

D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:

1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
2. Level 2: Panels that are substrate for tile.
3. Level 4: At panel surfaces that will be exposed to view, unless otherwise indicated.
    a. Primer and its application to surfaces are specified in other Division 9 Sections.

3.7 CLEANING AND PROTECTION

A. Take precautions to minimize spattering of joint treatment compounds and other materials on other work. Remove all joint treatment compounds promptly from doors, frames, glass and all other finishes and surfaces that could be stained or marred by these materials. Clean floors of all gypsum wallboard materials and treatment compounds upon completion of the gypsum wallboard work. At completion of work, remove all unused materials, scraps, containers and equipment. Remove all dust accumulated during finishing operations, leave areas broom clean, ready for painting, wall covering, ceramic tile or other finishes.

B. Provide temporary protection of finish surfaces in areas of high traffic and susceptible to damage from work of others. Maintain protection throughout the construction period so that the work will be without damage or deterioration at the time of Substantial Completion. Repair or replace any damaged work at no additional cost to the Owner. Remove temporary protection at completion of work or when required for completion of other work.

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

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

END OF SECTION

SECTION 09 51 00
ACOUSTICAL CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Acoustical ceiling panels and suspension systems including, intermediate support framing when required by the conditions of the installation.

B. Related Sections:

1. Gypsum board: Section 09 29 00.

1.2 PERFORMANCE REQUIREMENTS

A. Provide acoustic material conforming to the following minimum requirements:

1. ACT-1:
   a. Sound Absorption: ASTM E1264, NRC 0.70.
   b. Sound Attenuation: ASTM E1264, CAC Range: 35.
   c. Flame Spread: ASTM E84, AIMA, Class I, FS-SS-S-118b, Class 25 (0-25).
   d. Light Reflectance: ASTM E1264, 0.90 or greater.

1.3 SUBMITTALS

A. Manufacturer's Literature: Materials description and installation and maintenance instructions.

B. Shop Drawings:

1. Layout and details of acoustical ceilings.
2. Show locations of all items which are to be coordinated with, located in or supported by the ceilings.

C. Samples:

1. 12 inch square acoustical units for each type of unit.
2. 1 foot-0 inch lengths of each suspension system components with manufacturer's standard color selections.

1.4 QUALITY ASSURANCE

A. General: Install acoustical panel ceilings to comply with publications referenced below per manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."

1. Standard for Ceiling Suspension System Installations: Comply with ASTM C 636.

B. Fire Test Response Characteristics: Provide acoustical panel ceilings that comply with the following requirements:

1. Fire response tests that were performed by UL, or another independent testing and inspecting agency that is acceptable to authorities having jurisdiction and that performs testing and follow-up services.
2. Surface burning characteristics of acoustical panels comply with ASTM E 1264 for Class A materials as determined by testing identical products per ASTM E 84.
3. Products are identified with appropriate markings of applicable testing and inspecting agency.

C. Installer Qualifications: Engage an experienced installer who has completed acoustical panel ceilings similar in material, design, and extent to that indicated for this project and with a record of successful in-service performance.

D. Source Limitations for Ceiling Units and Suspension Systems: Obtain each acoustical ceiling panel and suspension system from one source with resources to provide products of consistent quality in appearance and physical properties without delaying the Work.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver unopened materials to the project site in manufacturer’s unopened containers, clearly indicating manufacturer's name, brand, type, style, size, color, texture and other identifying information.

B. Store materials in a dry location, off the ground and in a manner to prevent damage, deterioration and intrusion of foreign matter. Replace materials which have been damaged or are otherwise unsuitable. When ascertained, immediately remove all damaged or otherwise unsuitable material from the project site.

1.6 PROJECT/SITE CONDITIONS

A. Environmental Requirements: Do not install acoustical ceilings until space has been enclosed and is weathertight, and until wet work in the space has been completed and is nominally dry, and until work above ceilings has been completed, and until ambient conditions of temperature and humidity will be continuously maintained at values near those indicated for final occupancy.

B. Sequencing: Coordinate with the work of all trades above the ceiling and penetrating or supported by it. Do not start work until all appropriate work above the ceiling is complete.

C. Coordination: Coordinate with electrical, HVAC and fire protection trades to ensure edge configuration of light fixture, air diffusers and sprinkler heads to penetrate or to lay in ceilings are proper for the system and provide system layout that accommodates lighting pattern.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Armstrong World Industries, Inc., Lancaster, PA 17603.

B. CertainTeed Corporation, Valley Forge, PA 19482.

C. Rockfon, LLC, Chicago Metallic, Chicago, IL 60638.

D. United States Gypsum, Chicago, IL 60606.

2.2 CEILING PANELS

A. ACT-1 Acoustical Panels (24 inch x 24 inch, Lay-in): Mineral fiber acoustical panels; nominal 24 inch x 24 inch units not less than 5/8 (3/4) inch thick, with beveled tegular edges, factory applied washable white finish with DuraBrite acoustically transparent membrane and flame spread not greater than 25.

1. Basis of Design Product: Ultima Tegular, Item No. 1911, as manufactured by Armstrong or comparable products, subject to the Architect's approval, of CertainTeed, Rockfon or United States Gypsum, as approved by Architect.

2.3 CEILING SUSPENSION SYSTEM MATERIALS

A. General: Comply with ASTM C 635 intermediate duty and heavy duty, as applicable to the type of suspension system required for the type of ceiling units indicated. Coordinate with other work supported by or penetrating through the ceiling, including light fixtures, HVAC equipment sprinklers and partition system.

B. Attachment Devices: Size for 5 times the design load indicated in ASTM C 635, Table 1, direct hung. Coordinate types of devices compatible with floor construction, verify with precast concrete plank manufacturer.

C. Hanger Wires: Galvanized carbon steel, ASTM A 641, soft tempered, pre-stretched, yield stress load of at least three (3) times design load, but not less than 12 gage (0.016 inch).

D. Edge Molding: Zinc coated steel or aluminum, configurations shown on the Drawings, or if not shown manufacturer's standard for system with baked enamel finish to match suspension systems.

E. GS-1 Exposed Grid Suspension Systems (24 inch x 24 inch, Lay-in): Direct hung, intermediate duty, double web, snap grid, exposed main runners, cross runners (15/16 inch wide) and accessories, with exposed cross runners and wall trim coped to lay flush with main runners with factory applied baked enamel (white) finish, one of the following:

1. Armstrong, Prelude ML.
2. Rockfon, Chicago Metallic Corp., 200 Snap-Grid.

3. USG, DX.

F. Cold-Rolled Intermediate Support Channels: Minimum 1-1/2 inch, 475 lbs. per 1,000 lin. ft., complying with ASTM A 1008.

G. Hold-Down (Retention) Clips for Non Fire Resistance Rated Ceilings: For interior ceilings consisting of acoustical panels weighing less than 1 lb/sq. ft., provide hold-down clips spaced 24 inches o.c. on all cross tees.

H. Grid Clips: Ceiling manufacturer's standard clip for attachment of ceiling grid to cold-rolled intermediate support channels complying with the requirements of Code Section 27-350, RS-16, 51.1.4.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine all surfaces to receive the parts of the Work specified herein. Verify all dimensions of in-place and subsequent construction. Application or installation of materials constitutes acceptance of the supporting construction.

3.2 INSTALLATION OF MECHANICAL GRID SUSPENSION SYSTEM

A. Install suspension system in accordance with ASTM C 636 and current AIMA recommended procedures.

B. System Installation:

1. Unless otherwise shown on the Drawings or required by the systems manufacturer's printed installation instructions, install hangers 4 ft. o.c. in rows 4 ft. apart.
2. Do not attach hangers to steel roof deck. Attach hangers to structural members or intermediate support channels.
3. Furnishing inserts and intermediate support framing and directing placement of inserts and framing is the responsibility of the acoustical ceilings installer.
4. Where supporting construction is steel, wrap the wire hanger around or through the steel member or attach by other secure methods.
5. Wrap hanger around carrying channel, or if directly suspended, insert through hole in main tee and secure hanger with at least three (3) turns around itself.
6. Intermediate Support Channels:
    a. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with the location of hangers at spacings required to support standard suspension system members, or where spacing of primary support does accommodate hangar spacing, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications

b. When required by the conditions of the installation, install intermediate support cold-rolled channels spaced not more than 4 feet-6 inches above direct hung ceiling grid system.
c. Grid Clips: Install ceiling manufacturer's standard grid clips attached to cold-rolled channels and direct hung ceiling grid system not more than 4 feet-0 inches o.c.

7. Ceiling Grid: Install direct hung ceiling grid system to the ceiling panel model sizes shown on the Drawings and in accordance with the manufacturer's printed installation instructions.

C. Coordinate spacing of hangers, carrying channels, runners, and molding with the location of ductwork, piping, conduit, electrical fixtures and other items occurring in or on ceilings.

D. Provide additional hangers at corners of light fixtures at midpoint of cross tees adjacent to light fixtures and duct outlets and adjacent to main tee splices.

3.3 INSTALLATION OF PANELS

A. Install acoustical panels in coordination with suspension system with edges concealed by support of suspension members and faces flush with grid webs. Arrange acoustical units and orient directionally patterned units in the configurations shown on the reflected ceiling plans and as directed by the Architect.

B. Scribe or cut panels to fit accurately at penetrations.

C. Use procedures that will minimize damage or soiling of the units during installation. Replace units which are damaged or cannot be adequately cleaned, as directed by the Architect at no additional cost to the Owner.

D. Provide ceiling panel manufacturer's standard hold-down (retention) clips where shown or noted on the Drawings, or where required by conditions of the installation.

3.4 CLEANING AND PROTECTION

A. Upon completion of the Work remove all unused materials, debris, containers and equipment form the project site. Clean and repair floors, walls and other surfaces that have been stained, marred or otherwise damaged by work under this Section.

B. Protect acoustical ceilings during the construction period so that they will be without any indication of deterioration or damage at the time of acceptance by Owner.

END OF SECTION

SECTION 09 65 13
RESILIENT WALL BASE

PART 1 - GENERAL

1.1 SUMMARY

A. Resilient wall base, including installation materials.

B. Related Sections:

1. Unit masonry: Section 04 20 00; for walls
2. Gypsum board: Section 09 29 00: for gypsum walls
3. Resilient sheet flooring: Section 09 65 16
4. Resilient tile flooring: Section 09 65 19
5. Carpet: Section 09 68 00
6. Carpet tile: Section 09 6813

1.2 SUBMITTALS

A. Manufacturer's Literature: Materials description, installation and maintenance instructions.

B. Samples: Samples of vinyl base for color selection.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer, with not less than five (5) consecutive years experience, to perform work of this Section who has specialized in installing resilient products similar to those required for this Project and with a record of successful in-service performance.

B. Source Limitations: Obtain each type, color, and pattern of product specified from one source with resources to provide products of consistent quality in appearance and physical properties without delaying the Work.

1.4 DELIVERY, STORAGE AND HANDLING

A. Receive materials in undamaged condition as packaged by the manufacturer with manufacturer's seals and labels intact.

B. Store materials at the job site within the building and in a dry place at least 24 hours before installing flooring materials. Maintain space temperature not be less than 70 degrees F. nor more than 90 degrees F.

C. Immediately removed from the job site damaged or otherwise unsuitable material, when so ascertained.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Resilient Base:

1. Vinyl: Complying with ASTM F 1861, Type TV, Group 1 or 2, vinyl, .080 gage, coved in resilient flooring areas and straight in carpeted areas, set-on type.
2. Lengths: Coils in manufacturer's standard length.
3. Base types, heights, colors, products and manufacturers are indicated on the Drawings.
4. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Armstrong World Industries, Inc.
   b. Burke Mercer Flooring Products; Division of Burke Industries, Inc.
   c. Endura Rubber Flooring; Division of Burke Industries, Inc.
   d. Johnsonite.
   e. Musson, R. C. Rubber Co.
   f. Roppe Corporation, USA.
   g. VPI, LLC; Floor Products Division.

B. Adhesive: Water and alkali resistant, complying with recommendations of resilient flooring manufacturer.

PART 3 - EXECUTION

3.1 PREPARATION

A. When solvent-based adhesives are used, ventilate spaces; use spark-proof fans if natural ventilation is inadequate. Prohibit all smoking.

3.2 INSTALLATION

A. Mix and apply adhesive as recommended by the manufacturer. Cover surface evenly. Do not exceed the maximum working area of the material. Install base within time limits recommended. If adhesive films over or dries, remove the adhesive and recoat the area.

B. Firmly adhere resilient base to walls, columns, and permanent bases. Use longest lengths practical. Form internal and external corners and end stops with preformed units. Corners may be hand formed if method is demonstrated and approved by the Architect. Do not use mitered corners. Scribe bases accurately to abutting surfaces.

C. Remove excessive adhesive in accordance with manufacturer's instructions.

3.3 CLEANING

A. Not less than 4 days after flooring installation, clean base. Wash thoroughly, with a cleaner recommended by the manufacturer, in accordance with manufacturer's printed instructions.

END OF SECTION

SECTION 09 68 13
CARPET TILE

PART 1 - GENERAL

1.1 SUMMARY

A. Carpet tile as shown on the Drawings and specified herein, including edge strips, subfloor preparation and related materials of the carpet tile installation.

B. Related Sections:

1. Resilient wall base: Section 09 65 13.

1.2 QUALITY ASSURANCE

A. Installer Qualifications: Provide carpet tile installation by firm experience in carpet tile installations of similar size as evidenced by not less than five (5) consecutive years of carpet tile installations. Provide written evidence of such experience to the Architect upon request.

1.3 SUBMITTALS

A. Manufacturer`s Literature: Materials description and installation instructions for all materials of the installation.

B. Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.

1. Carpet Tile: Full-size Sample.
2. Edge Strips: 6 inch long pieces and samples of manufacturer's complete color range.

C. Warranty: Signed copies of terms specified herein.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver installation materials to project site in original factory containers, labeled with identification of manufacturer and brand name

B. Store materials in original undamaged packages and containers, inside well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity. Lay flat, blocked off ground. Maintain minimum temperature of 68 deg F at least three days prior to and during installation in area where materials are stored.

1.5 WARRANTY

A. General Warranty: Special warranty specified in this Article is not to deprive Owner of other rights Owner may have under other provisions of the Contract Documents and is in addition to, and is to run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Product Warranty: The carpet tile manufacturer is to provide a written warranty agreeing to replace defective carpet tiles in accordance with the General Conditions, except that warranty will be for ten (10) years, instead of one (1) year. Provide written warranty signed by the Carpet Tile Manufacturer and the Installing Contractor and submit to the Architect.

1. Defects include, but are not limited to, more than 10 percent edge raveling, snags, runs, dimensional stability, excess static discharge, loss of tuft bind strength, loss of face fiber and delamination.

1.6 PROJECT/SITE CONDITIONS

A. Substrate Conditions:

1. No condensation on underside of 4-foot by 4-foot polyethylene sheet within 48 hours, fully taped at perimeter to substrate.
2. If condensation is apparent on the underside of the sheet after 48 hours, it is improper to install carpet tile. Retest floors until no condensation is present on the underside of the sheet. Alternate methods of testing for moisture will be considered upon written request and review of the Architect.

1.7 EXTRA MATERIALS

A. Furnish extra materials described below, before installation begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

B. Carpet Tile: Full-size units in boxes, equal to 5 percent of amount installed for each type or color indicated, but not less than 10 sq. yd.

C. Submit a copy of the Owner's representative signed itemized receipt for extra material required.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Carpet Tile: As scheduled on drawings.

B. Installation Adhesive: Water resistant and nonstaining, release adhesive as recommended by carpet tile manufacturer to comply with flammability requirements for installed carpet tile.

C. Latex leveling compound: As recommended by the carpet and padding manufacturers.

D. Edge Strips: Solid vinyl of type shown on the Drawings, if not shown as selected by Architect from standard products and colors manufactured by one of the following:

1. Mercer Plastics Co. Inc., Newark, NJ 07114
2. Johnson Rubber Co., Middlefield, OH 44062
3. Flexco Co., Tuscumbia, AL 35674

PART 3 - EXECUTION

3.1 PREPARATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance. Examine carpet tile for type, color, pattern, and potential defects. Application or installation of materials constitutes acceptance of substrate.

B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710 and the following:

1. Verify that floor lab substrates are dry and free of curing compounds, sealers, hardeners, and other materials that may interfere with adhesive bond. If present remove in accordance with the carpet and adhesive manufacturer's requirements.
2. Subfloor finishes comply with requirements specified in Section 03 30 00 - Cast-in-Place Concrete, for slabs receiving carpet tile.
3. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits.

C. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.

D. Test for Moisture: Perform one or both of the following tests as required by the flooring material manufacturer to determine the manufacturer's acceptable floor slab moisture before installation.

1. Test floor slab for moisture by anhydrous calcium chloride method according to ASTM F 1869. Proceed with carpet tile installation only after substrates have maximum moisture-vapor-emission rate recommended by the carpet tile and adhesive manufacturers. Proceed with installation only after substrates pass testing.

2. Test floor slab for humidity by ASTM F 2170 Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes. Proceed with installation only after substrates have maximum level humidity in the floor slab recommended by the carpet tile and adhesive manufacturers. Proceed with installation only after substrates pass testing.

E. Level subfloors to be free of irregularities. Fill or gradually raised all irregularities in the subfloor height affecting the carpet installation and appearance with troweled latex underlayment to create a ramp-like effect.

F. Just prior to installation of carpeting and related materials, dry subfloors, broom clean, and remove oil, grease, paint or concrete treatment that may interfere with adhesion of carpet adhesive.

G. Broom and vacuum clean substrates to be covered immediately before installing carpet tile. After cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION - GENERAL

A. Comply with manufacturer's recommendations for installation of carpet tile; maintain uniformity of carpet direction and lay of pile, unless otherwise indicated.

B. Extend carpet tile under removable flanges and furnishings and into alcoves and closets of each space.

C. Install carpet edge guard where edge of carpet tile is exposed; anchor guards to substrate.

D. Install with pattern parallel to walls and borders. Install perimeter tiles as half-size or larger.

E. Dry-fit sections of carpet tile prior to application of adhesive.

F. Apply adhesive uniformly to substrate in accordance with manufacturer's instructions. Butt edges tight to form seams without gaps.

G. Adhere perimeter tiles and partial tiles with a full spread of adhesive. Dry-fit cut tiles and apply adhesive to tile back after tile has been cut. In corridor areas, use full tiles down the center and cut perimeter tile borders.

3.3 CLEANING AND PROTECTION

A. Remove adhesive from carpet tile surface with manufacturer's recommended cleaning agent.

B. Vacuum using commercial machine with face-beater element. Remove soil. Replace carpet tiles where soil cannot be removed. Remove protruding face yarn.

C. Adequately covered carpet tile and protected against damage of any kind during shipment and delivery to the job site, and until final acceptance by Owner. Protect by means of clean drop cloths or heavy reinforced non-staining paper. Damaged carpet tile will be rejected and is to be replaced by the Installer at no additional cost to the Owner. At the completion of the Work when directed by the Owner, remove covering, vacuum clean and clean carpet tile of any soiling removed to the satisfaction of the Owner.

D. Remove all rubbish, wrapping paper and salvages from the job site. Leave all excess pieces of usable carpet tile with the Owner for future repairs.

END OF SECTION

SECTION 09 84 33
SOUND-ABSORBING WALL UNITS

PART 1 - GENERAL

1.1 SUMMARY

A. Sound-absorbing wall panels, including installation accessories.

B. Related Sections:

1. Non-loadbearing metal framing: Section 09 22 16.
2. Gypsum board: Section 09 29 00.
3. Acoustical wall panels: 09 84 13.

1.2 ACTION SUBMITTALS

A. Product Data: Manufacturer's literature for materials descriptions, installation and maintenance instructions.

B. Shop Drawings:

1. Layout and details of wall panels. Show locations of items which are to be coordinated with, or penetrate the wall panels.
2. Show elevations and details indicating profiles and configuration of each wall panel. Include attachments to building structure. Indicate location, size, material, thickness of material and spacing of attachment framing and fasteners.
3. Show dimensions taken from field verified measurements. Show adjacent construction and building structure used for attachment of wall panels and adjacent materials. Show joints and fasteners, sizes, spacing and note materials and types of fasteners.

C. Samples:

1. Initial Color Selection: Manufacturers standard color selection samples.
2. Panel Edge: 12-inch- long Sample(s) showing each edge profile, corner, and finish.
3. Core Material: 12-inch- square Sample at corner.
4. Assembled Panels: Approximately 36 by 36 inches, including joints and mounting methods.

1.3 INFORMATIONAL SUBMITTALS

A. Warranty: Signed copies of specified warranty.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of unit to include in maintenance manuals. Include fabric manufacturers' written cleaning and stain-removal instructions.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer who has completed sound-absorbing wall panel installations similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

B. Source Limitations for Acoustic Wall Panels: Obtain each sound-absorbing wall panel from one source with resources to provide products of consistent quality in appearance and physical properties without delaying the Work.

C. Fire-Test-Response Characteristics: Provide acoustical wall panels with the following surface-burning characteristics as determined by testing identical products per ASTM E 84 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.

1. Flame Spread: 25 or less.
2. Smoke Developed: 450 or less.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to the project site in manufacturer's unopened packing, clearly indicating manufacturer's name, brand and other identifying information.

B. Store materials in a dry location, off the ground and in a manner to prevent damage, deterioration, and intrusion of foreign matter. Replace materials which have been damaged or are otherwise unsuitable. When ascertained, immediately remove damaged or otherwise unsuitable materials from the job site.

1.7 PROJECT/SITE CONDITIONS

A. Environmental Limitations: Do not install sound-absorbing wall panels until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

B. Lighting: Do not install units until a permanent level of lighting or a lighting level of not less than 50 fc is provided on surfaces to receive the units.

C. Air Quality Limitations: Protect sound-absorbing wall panels from exposure to airborne odors, such as tobacco smoke, paint and install panels under conditions free from odor contamination of ambient air.

D. Field Measurements: Verify wall surface dimensions by field measurements before fabrication and indicate measurements on shop drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.8 MOCKUP INSTALLATION

A. Before installing sound-absorbing wall panels, build mockup required to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution. Build mockups to comply with the following requirements, using materials indicated for the completed Work:

1. Build mockups in the location and of the size indicated or, if not indicated, as directed by Architect.
2. Notify Architect 7 days in advance of dates and times when mockups will be constructed.
3. Demonstrate the proposed range of aesthetic effects and workmanship.
4. Obtain Architect's approval of mockups before starting sound-absorbing wall panel fabrication.
5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
6. Demolish and remove mockups when directed.
7. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

B. Provide the following mock-ups:

1. Not less than three typical wall panels including attachments.

1.9 WARRANTY

A. General Warranty: Special warranty 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. Special Warranty: Written warranty, signed by manufacturer agreeing to repair or replace components of sound-absorbing wall panel system that fail in performance, materials, or workmanship within specified warranty period. Failure in performance includes, but is not limited to, acoustical performance. Failure in materials includes, but is not limited to, distortion of facing or warping of core.

C. Warranty Period: Provide warranty for 2 years from date of Substantial Completion signed by the Manufacturer and Installing Contractor submitted to the Architect.

D. This warranty is in addition to, and not a limitation of, other rights the Owner may have under the Contract Documents.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Basis of Design Product: “InStyle Ecoustic Panels” also known as “Ecoustic E3 Tiles” or “Ecoustic Panel 25mm” (Unika Vaev).

1. Acceptable Manufacturers:
   a. Filzfelt.
   b. Kirei.
   c. MCD.

2.2 MATERIALS

A. Polyester Acoustical Panel
1. Color: To be selected from manufacturer’s standard colors.
2. Type: Panel.
3. Thickness: 0.53”.
4. Noise Reduction Coefficient 0.50.
5. Fire Rating: Class A.

B. Adhesive: As recommended by the panel manufacturer for the substrate indicated.

C. Trim Moldings: Manufacturer’s Standard; size to match panel thickness.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Examine surfaces to receive the parts of the Work specified herein. Verify dimensions of in-place and subsequent construction. Application or installation of materials constitutes acceptance of the supporting construction.

B. Install per manufacturer’s directions. Shim as required to achieve a smooth monolithic appearance.

1. Align joints in adjacent courses to form uniform, straight joints parallel to room axis in both directions, unless otherwise shown and bring faces of wall panels to the same plane.
2. Fit adjoining units to form flush, tight joints. Scribe and cut units for accurate fit at borders and around construction penetrating wall panels.
3. No fasteners are to be visible on the exposed surface of the wall panels.

C. Scribe and cut wall panels for accurate fit at penetrations by other work through walls. Stiffen edges of cut units as required to eliminate evidence of buckling or variations in flatness for stretcher-leveled metal sheet.

D. Install edge moldings and trim of type indicated at perimeter of wall panel areas and where necessary to conceal edges of wall panels. Show method of edge trim attachment and design of edge trims on submitted shop drawings.

1. Do not use exposed fasteners, including pop rivets, on moldings and trim.

3.2 CLEANING AND PROTECTION

A. Upon completion of the work, remove unused materials, debris, containers and equipment from the project site. Clean and repair floors, walls and other surfaces that have been stained, marred or otherwise damaged by work under this Section.

B. Protect wall panels during the construction period so that they will be without any indication of deterioration or damage at the time of acceptance by the Owner.

END OF SECTION

SECTION 09 84 36
SOUND-ABSORBING CEILING UNITS

PART 1 - GENERAL

1.1 SUMMARY

A. Sound-Absorbing Ceiling Units, including the following:
   1. Sound-absorbing baffle panels.

B. Related Sections:

   1. Gypsum Board: Section 09 29 00.
   2. Acoustical Ceilings: Section 09 51 00.
   3. Painting: Section 09 91 00.

1.2 DEFINITIONS:

A. NRC: Noise Reduction Coefficient.

B. SAA: Sound Absorption Average.

1.3 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: Units shall comply with "Surface-Burning Characteristics" or "Fire Growth Contribution" Subparagraph below, or both, as determined by testing identical products by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:

   1. Surface-Burning Characteristics: Comply with ASTM E 84 or UL 723; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

      a. Flame-Spread Index: 25 or less.
      b. Smoke-Developed Index: 450 or less.

   2. Fire Growth Contribution: Comply with acceptance criteria of local code and authorities having jurisdiction when tested according to NFPA 286.

B. Acoustical Performance Characteristics: Provide baffles and free hanging screens with acoustical absorption characteristics as indicated in Part 2, which have been determined by testing fully assembled production material in accordance with ASTM C-423 (typical baffle mounting) by a testing organization acceptable to authorities having jurisdiction. Approved testing organization must be independent of the manufacturer.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meetings: Conduct conference at Project site.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include fabric facing, panel edge, core material, and mounting indicated.

B. Shop Drawings: For unit assembly and installation.

1. Include reflected ceiling plans, elevations, sections, and mounting devices and details.
2. Include details at joints and corners; and details at ceiling intersections and intersections with walls. Indicate panel edge profile and core materials.
3. Include direction of fabric weave and pattern matching.

C. Samples:

1. Fabric: Full-width by approximately 36-inch- long Sample, but not smaller than required to show complete pattern repeat, from dye lot to be used for the Work, and with specified treatments applied. Mark top and face of fabric.
2. Panel Edge: 12-inch- long Sample(s) showing each edge profile, corner, and finish.
3. Core Material: 12-inch- square Sample at corner.
4. Mounting Devices: Full-size Samples.
5. Assembled Panels: Approximately 36 by 36 inches, including joints and mounting methods.

1.6 INFORMATIONAL SUBMITTALS

A. Certificates: showing compliance to specified acoustical and fire performance criteria.

B. Qualification Data: For professional engineer.

C. Design Calculations: Submit calculations prepared by a qualified (Structural) (Professional) Engineer licensed in the State of XXXXXXXXX, showing compliance with the specified performance criteria.

D. Coordination Drawings: Reflected ceiling plans and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Electrical outlets.
2. Suspended ceiling components above ceiling units.
3. Structural members to which suspension devices will be attached.
4. Items penetrating or covered by units including the following:

a. Lighting fixtures.
b. Air outlets and inlets.
c. Speakers.
d. Alarms.
e. Sprinklers.
f. Access panels.

5. Show operation of hinged and sliding components covered by or adjacent to units.

E. Warranties: Signed copies for the following:

1. Units.

F. LEED Submittals:

1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
2. Product Certificates: For materials manufactured within 100 miles of Project, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project and cost for each raw material.
3. Chain-of-Custody Certificates: For certified wood products. Include statement of costs.
4. Chain-of-Custody Qualification Data: For manufacturer and vendor.
5. Laboratory Test Reports: For composite wood products, indicating compliance with requirements for low-emitting materials.
6. Laboratory Test Reports: For ceiling products, indicating compliance with requirements for low-emitting materials.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of unit to include in maintenance manuals. Include fabric manufacturer's written cleaning and stain-removal instructions.

1.8 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of Sound-Absorbing Ceiling Units from one source and by a single manufacturer.

B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials, fabrication, and installation.

1. Build mockup of typical ceiling area as shown on Drawings.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE AND HANDLING

A. Deliver Sound-Absorbing Ceiling Units components to the project site clearly marked for proper identification.

B. Store Sound-Absorbing Ceiling Units in accordance with manufacturer's instructions, above ground, in wrapping and protected from weather, construction activities and other causes of damage or loss.

C. Handle materials at the project site in such a manner as to prevent damage. Immediately remove from the project site damaged or otherwise unsuitable material when so ascertained.

1.10 PROJECT CONDITIONS

A. Environmental Limitations: Do not install units until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work at and above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

B. Lighting: Do not install units until a permanent level of lighting or a lighting level of not less than 50 fc is provided on surfaces to receive the units.

C. Air-Quality Limitations: Protect units from exposure to airborne odors, such as tobacco smoke, and install units under conditions free from odor contamination of ambient air.

D. Field Measurements: Verify unit locations and actual dimensions of openings and penetrations by field measurements before fabrication, and indicate them on Shop Drawings.

1.11 WARRANTIES

A. Special Warranty: Manufacturer agrees to repair or replace units and components that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Acoustical performance.
b. Fabric sagging, distorting, or releasing from panel edge.
c. Warping of core.

2. Warranty Period: Two years from date of Substantial Completion.

B. The above warranties are in addition to, and not a limitation of, other rights the Owner may have under the Contract Documents.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Acoustical Solutions, Inc., Richmond VA 23294.

B. Armstrong World Industries, Inc., Lancaster PA 17603.

C. Conwed Designscape; an Owens Corning company, Ladysmith WI 54848.

D. Decoustics Limited; a Saint Gobain company, Woodbridge ON L4H 1X9.

E. Pinta Acoustic, Inc., Minneapolis MN.

F. Rockfon (Rockwool International), Chicago IL 60638.

G. Tectum Inc., Newark OH 43055.

H. Wall Technology, Inc.; an Owens Corning company, Ladysmith WI 54848.

2.2 SOUND-ABSORBING CEILING UNITS

A. Sound-Absorbing Ceiling Panel: Manufacturer's standard panel construction consisting of facing material and sound-absorbing core.

1. Panel Shape: As indicated on Drawings.
2. Mounting: Back mounted with manufacturer's standard system, secured to substrate.
3. Core: Manufacturer's standard.
4. Edge Construction: Manufacturer's standard.
5. Edge Profile: as indicated on Drawings.
6. Facing Material: As indicated on Drawings.
7. Acoustical Performance: Sound absorption NRC or SAA of 0.50 to 0.90 according to ASTM C 423 for mounting according to ASTM E 795.
8. Nominal Thickness: 1 inch.

B. Sound-Absorbing Baffle Panel: Manufacturer's standard panel construction consisting of facing material and sound-absorbing core.

1. Basis of Design Product: “Claro” (Decoustics).

2. Panel Shape: As indicated on Drawings.
3. Mounting: Top-edge mounted with manufacturer's standard system, secured to substrate.
4. Core: Manufacturer's standard.
5. Edge Construction: Manufacturer's standard.
6. Edge Profile: as indicated on Drawings.
7. Facing Material: As indicated on Drawings.
8. Acoustical Performance: Sound absorption NRC or SAA of 0.50 to 0.90 according to ASTM C 423 for mounting according to ASTM E 795.

9. Nominal Thickness: 1 inch.

C. Mounting Devices: Concealed on back or top edge of unit, recommended by manufacturer to support weight of unit.

2.3 FABRICATION

A. Standard Construction: Use manufacturer's standard construction unless otherwise indicated, with facing material applied to face, edges, and back border of dimensionally stable core and with rigid edges to reinforce panel perimeter against warpage and damage.

B. Measure each area and establish layout of panels and joints of uniform size with balanced borders at opposite edges unless otherwise indicated on Drawings within a given area.

C. Edge Hardening: For cores, chemically harden core edges and areas of core where mounting devices are attached.

D. Facing Material: Apply fabric facing fully covering visible surfaces of unit; with material stretched straight, on the grain, tight, square, and free from puckers, ripples, wrinkles, sags, blisters, seams, adhesive, or other visible distortions or foreign matter.

1. Square Corners: Tailor corners.
2. Radius and Other Nonsquare Corners: Attach facing material so there are no seams or gathering of material.
3. Fabrics with Directional or Repeating Patterns or Directional Weave: Mark fabric top and attach fabric in same direction so pattern or weave matches adjacent units.

E. Dimensional Tolerances of Finished Units: Plus or minus 1/16 inch for the following:

1. Thickness.
2. Edge straightness.
3. Overall length and width.
4. Squareness from corner to corner.
5. Chords, radii, and diameters.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine fabric, fabricated units, substrates, areas, and conditions for compliance with requirements, installation tolerances, and other conditions affecting unit performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install units in locations indicated. Unless otherwise indicated, install units with edges in alignment with walls and other units, faces flush, and scribed to fit adjoining work accurately at borders and at penetrations.

B. Comply with manufacturer's written instructions for installation of units using type of mounting devices indicated. Mount units securely to supporting substrate.

C. Align fabric pattern and grain with adjacent units unless otherwise indicated on Drawings.

3.3 INSTALLATION TOLERANCES

A. Variation from Alignment with Surfaces: Plus or minus 1/16 inch in 48 inches, noncumulative.

B. Variation from Level or Slope: Plus or minus 1/16 inch.

C. Variation of Joint Width: Not more than 1/16 inch wide from line in 48 inches, noncumulative.

3.4 CLEANING

A. Clip loose threads; remove pills and extraneous materials.

B. Clean panels on completion of installation to remove dust and other foreign materials according to manufacturer's written instructions.

END OF SECTION

SECTION 09 91 00
PAINTING

PART 1 - GENERAL

1.1 SUMMARY

A. Painting, coatings and finishing, including the following:

1. Painting and finishing of interior exposed items and surfaces as specified herein and scheduled and noted on the Drawings.
2. Surface preparation, priming and coats of paint specified are in addition to shop priming and surface treatment specified under other Sections, except as otherwise specified.
3. Paint as used herein means all coating system materials, including primers, emulsions, enamels, sealers and fillers and other applied materials whether used as prime, intermediate or finish coats.
4. Paint all exposed surfaces except where the natural finish of the material is obviously intended and specifically noted as a surface not to be painted. Where items or surfaces are not specifically mentioned, paint these the same as adjacent similar materials or areas.

B. Related Sections:

1. Hollow steel frames: Section 08 11 13
2. Flush wood doors: 08 14 16
3. Finish door hardware: Section 08 71 00
4. Gypsum board: Section 09 29 00

1.2 PAINTING NOT INCLUDED

A. General: The following categories of work are not included as part of the painter applied finish work or are included in other Sections of these Specifications, unless otherwise shown or specified.

1. Shop Priming: Unless otherwise specified, shop priming of ferrous metal items is included under the various Sections for structural steel, metal fabrications, ornamental metal fabrications, hollow metal work and similar items.
2. Pre-Finished Items: Unless otherwise indicated, do not include painting when factory finishing or installer finishing is specified for such items as (but not limited to) toilet enclosures, acoustic materials and casework.
3. Concealed Surfaces: Unless otherwise indicated, painting is not required on surfaces such as walls or ceilings in concealed areas and inaccessible areas, furred areas, spaces and duct shafts.
4. Finished Metal Surfaces: Metal surfaces of anodized aluminum, aluminum paint finish system, stainless steel, chromium-plated, copper, bronze and similar finished materials will not required finish painting, except as otherwise indicated.
5. Operating Parts and Labels: Do not paint any moving parts of operating units, mechanical and electrical parts, such as valve and damper operators, linkages, sinkages, sensing devices, motor and fan shafts, unless otherwise

indicated. Do not paint over any code required labels, such as UL name or nomenclature plates.

1.3 SUBMITTALS

A. Manufacturer's Literature: Materials description, installation and maintenance instructions for each type of paint.

B. Samples: Architect's review will be for color and texture only. Compliance with all other requirements is the exclusive responsibility of the Contractor. Provide a listing of the material and application for each coat of each finished sample, include color sample chips from manufacturer.

1. Initial Color Selection: Prior to beginning painting work, Contractor will be furnished sample color chips and copies of Color Schedule for all surfaces to be painted. Colors will be selected by the Architect.
2. Draw-Downs: After initial colors have been selected provide actual paint draw-downs for each color and sheen specified.
3. On site Samples: On each actual wall surface, ceiling and other building components of each paint system. On at least 100 sq. ft. of surface as directed, provide full coat finish samples of required sheen, color and texture. Simulate finished lighting conditions for review of in-place work.

C. Paint Schedule: Submit copies of the paint schedule indicating each type of surface to be painted, paint product and generic description of paint product and each type of primer for each type of surface material.

1.4 QUALITY ASSURANCE

A. Provide all materials used on this part of the Work as hereinafter specified. No claims as to the suitability of any materials specified, or the applicator's inability to produce first class finishes with these materials will be considered unless such claims are made in writing prior to the start of the painting work.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver all materials to the job site in original, new and unopened packages and containers bearing manufacturer's name and label.
B. Provide labels on each container with the following information:

1. Name of title of material.
2. Manufacturer's stock number.
3. Manufacturer's name.
4. Contents by volume, for major pigment and vehicle constituents.
5. Thinning instructions.
6. Application instructions.

1.6 PROJECT/SITE CONDITIONS

A. Existing Conditions:

1. Starting of painting work will constitute the applicator's acceptance of the surfaces and conditions within any particular area.
2. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces or conditions otherwise detrimental to the formation of a durable paint film.

B. Protection:

1. Protect work of other trades, whether to be painted or not, against damage by painting and finishing work. Correct any damages by cleaning, repairing or replacing and repainting.
2. Provide "Wet Paint" signs as required to protect newly painted finishes. Remove temporary protective wrappings provided by others for protection of their work, after completion of painting operations.
3. During the progress of the work, remove from the project daily all discarded paint materials, rubbish, cans and rags.
4. Upon completion of painting work, clean all window glass and other paint spattered surface. Remove spattered paint by proper methods of washing and scraping, using care not to scratch or otherwise damage finished surfaces.

PART 2 - PRODUCTS

2.1 COLORS AND FINISHES

A. Prior to beginning of work, sample color chips for surfaces to be painted will be furnished by the Architect. Match the colors of the chips and submit samples to the Architect as specified herein, before proceeding with the work.

B. Final acceptance of colors will be from samples applied on the job.

C. Proprietary names used to designate colors or materials are not intended to imply that products of the manufacturers are required to the exclusion of equivalent products of other named manufacturers, but the Architect is to be informed in writing of all manufacturers and materials used on the job for various colors and finishes

2.2 PAINT COORDINATION

A. Provide finish coats which are compatible with prime paints used. Review other Sections of these Specifications in which prime paints are to be provided to ensure compatibility of total coating system for various substrates. Upon request from other trades, furnish information on characteristics of specified finish materials, to ensure compatible prime coats as used. Provide barrier coats over incompatible primers or remove and reprime as required for specified finish coat.

2.3 PAINT MATERIALS

A. Provide the best quality grade of the various types of coatings as regularly manufactured by approved paint materials manufacturers. Materials not displaying the manufacturer's identification as a well known standard, best grade product will not be acceptable.

B. Provide undercoat paint compatible with and produced by the same manufacturer as the finish coats. Use only thinners approved by the paint manufacturer and use only within recommended limits.

C. Provide paint manufactured by one of the following:

1. Benjamin Moore (Moore), Montvale, NJ 07645
2. Glidden Professional, Cleveland, OH 44115
3. PPG Pittsburgh (Ameron)Paints, Pittsburgh, PA 15222
4. Pratt & Lambert (P & L) , Buffalo, NY 14240
5. Sherwin Williams (S-W), Cleveland, OH 44115
6. Devoe Paints, ICI Paints, Strongsville OH 44136
7. MAB Paints, Broomall, PA 19008
8. Tnemec Company, Inc., Kansas City, MO 64141
9. Carboline Company, St. Louis, MO 63144

D. Refer to the Paint Schedule at the end of this Section and building exterior, interior elevations and schedules on the Drawings.

PART 3 - EXECUTION

3.1 SURFACE PREPARATION

A. General:

1. Perform preparation and cleaning procedures in strict accordance with the paint manufacturer's instructions and as herein specified for each particular substrate condition.
2. Remove all hardware, hardware accessories, machined surfaces, plates, lighting fixtures and similar items in-place and not to be finish painted or provide surface applied protection prior to surface preparation and painting operations. Remove, if necessary, for the complete painting of the items and adjacent surfaces. Following completion of painting of each space or area, reinstall the removed items by workmen skilled in the trades involved.
3. Clean surfaces to be painted before applying paint or surface treatments. Remove oil and grease prior to mechanical cleaning. Program the cleaning and painting so that contaminants from the cleaning process will not fall onto wet newly painted surfaces.

B. Cementitious Materials:

1. Prepare cementitious surfaces to be painted by removing all efflorescence, chalk, dust, dirt, grease, oils and by roughening as required to remove glaze.
2. Determine the alkalinity and moisture content of the surface to be painted by performing appropriate tests. If the surfaces are found to be sufficiently alkaline to cause blistering and burning of the finish paint, correct this condition before application of paint. Do not paint over surfaces where the moisture content exceeds that permitted in manufacturer's printed directions.

C. Wood:

1. Clean wood surfaces to be painted of all dirt, oil or other foreign substance with scrapers, mineral spirits and sandpaper, as required. Sandpaper smooth those finished surfaces exposed to view and dust off. Scrape and clean small, dry, seasoned knots and apply a thin coat of white shellac or other paint manufacturer approved sealer, before application of the priming coat. After priming fill holes and imperfections in finish surfaces with putty or plastic wood filler. Sandpaper smooth when dried.
2. Prime, stain or seal wood required to be job painted immediately upon delivery to job. Prime edges, ends, face, undersides and backsides of such wood. When transparent finish is required, use spar varnish for back priming.
3. Seal tops and bottoms of wood door with a heavy coat of varnish or equivalent sealer immediately upon delivery to the job.

D. Ferrous Metals:

1. Clean ferrous surfaces which are not galvanized or shop coated of oil, grease, dirt, loose mill scale and other foreign substances by solvent or mechanical cleaning.
2. Touch up shop applied prime coats wherever damaged or bare, where required by other Sections of these Specifications. Clean and touch up with the same type shop primer.

E. Galvanized Metal: Clean free of all oil and other surface contaminants with a non-petroleum base solvent recommended by paint manufacturer.

3.2 SURFACE PREPARATION OF PREVIOUSLY COATED SURFACES

A. General:

1. Remove cracked and deteriorated sealants and calking.
2. Remove chalk deposits and loose, blistered, peeling, scaling, or crazed finish to bare base material or sound substrate by scraping and sanding.
3. Wash surfaces with solution of TSP to remove wax, oil, grease, and other foreign material; rinse, and allow to dry. Exercise caution that TSP solution does not soften existing coating.
4. Abrade glossy surfaces by sanding or wiping with liquid de-glosser.
5. Remove mildew as specified above.
6. Test compatibility of existing coatings by applying new coating to small, inconspicuous area. If new coatings lift or blister existing coatings, provide test results and recommendations from paint manufacturer to Architect.
7. Apply specified primer to surfaces scheduled to receive coatings.

B. Gypsum Wallboard:

1. Fill cracks and voids with spackling compound.
2. Apply primer over bare surfaces and newly applied texture coatings.

C. Metal:

1. Remove rust from surfaces to bare metal in accordance with SP3 "Power Tool Cleaning".
2. Exercise care not to remove galvanizing.
3. Complete preparation as specified for new work.

D. Wood:

1. Fill cracks, crevices and nail holes with putty or wood filler.
2. Apply primer over bare surfaces and filler material.

E. Materials Preparation: Mix and prepare paint materials according to manufacturer's written instructions.

1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
2. Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.
3. Use only thinners approved by paint manufacturer and only within recommended limits.

3.3 MATERIALS PREPARATION

A. Mix and prepare painting materials in accordance with manufacturer's directions.

B. Store materials not in actual use in tightly covered containers. Maintain containers used in storage, mixing and application of paint in a clean condition, free of foreign materials and residue.

C. Stir materials before application to produce a mixture of uniform density and stir as required during the application of the materials. Do not stir surface film into the material. Remove the film and, if necessary, strain the material before using.

3.4 PAINT APPLICATION

A. General:

1. Apply paint in accordance with the manufacturer's directions; use applicators and techniques best suited for the type of material being applied.
2. Apply additional coats when undercoats, stains or other conditions show through the final coat of paint, until the paint film is of uniform finish, color and appearance.
3. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Paint surfaces behind permanently fixed equipment of furniture with prime coat only.
4. Paint interior surfaces of ducts, where visible through registers or grilles with a flat, non-specular black paint.
5. Finish exterior doors on tops, bottoms, and side edges same as exterior faces, unless otherwise indicated.
6. Sand lightly between each succeeding enamel or varnish coat.
7. Omit first coat (primer) on metal surfaces which have been shop-primed and touch-up painted, unless otherwise indicated.
8. Prime all surfaces to receive vinyl, fabric, paper wall and other types of wall coverings, unless otherwise indicated.

B. Application Restrictions:

1. Do not apply water base paints when the temperature of surfaces to be painted and the surrounding air temperatures are below 50 degrees F., unless otherwise permitted by the paint manufacturer's printed instructions.
2. Do not apply solvent thinned paints when the temperature of surfaces to be painted and the surrounding air temperatures are below 45 degF, unless otherwise permitted by the paint manufacturer's printed instructions.
3. Do not apply paint in snow, rain, fog or mist; or when the relative humidity exceeds 85 percent; or to damp or wet surfaces, unless otherwise permitted by the paint manufacturer's printed instructions. Painting may be continued during inclement weather only if the areas and surfaces to be painted are enclosed and heated within the temperature limits specified by the paint manufacturer during application of drying periods.

C. Minimum Coating Thickness: Provide the following minimum coating thicknesses unless herein noted otherwise:

1. Apply each material at not less than the manufacturer's recommended spreading rate to provide a total dry film thickness of not less than 3 mils for the entire coating system of prime and finish coats of 3 coat work.
2. Provide a total dry film thickness of not less than 2 mils for the entire coating system of prime and finish coat for 2 coat work.

D. Prime Coats:

1. Apply a prime coat to material which is required to be painted or finished and which has not been prime coated by others.
2. Re-coat primed and sealed walls and ceilings where there is evidence of suction spots or unsealed areas in first coat, to assure a finish coat with no burn-through or other defects due to insufficient sealing.
3. Roll and redistribute paint to an even and fine texture. Leave no evidence of rolling such as laps, irregularity in texture, skid marks or other surface imperfections.

E. Pigmented (Opaque) Finishes: Completely cover to provide an opaque, smooth surface of uniform finish, color, appearance and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness or other surface imperfections will not be acceptable.

F. Completed Work: Match reviewed samples for color, texture and coverage. Remove, refinish or repaint work not in compliance with specified requirements.

3.5 PAINT SCHEDULE

A. Interior - New Construction:

1. Gypsum Wallboard Walls for Eggshell Finish:
   a. One Coat:
      1) Moore: Ecospec Interior Latex Primer Sealer (231)
      2) S-W: ProMar 200 Zero VOC Latex Wall Primer

3) PPG: Pure Performance Latex Primer

b. Two Coats:
1) Moore: Pristine Ecospec Interior Latex Eggshell (223)
2) S-W: ProMar 200 Zero VOC Latex Eggshell
3) PPG: Pure Performance Latex Eggshell

2. Gypsum Wallboard Walls for Semi-Gloss Finish:
a. One Coat:
1) Moore: Ecospec Interior Latex Primer Sealer (231)
2) S-W: ProMar 200 Zero VOC Latex Wall Primer
3) PPG: Pure Performance Latex Primer

b. Two Coats:
1) Moore: Pristine Ecospec Interior Latex Semi-Gloss (224)
2) S-W: ProMar 200 Zero VOC Latex Semi-Gloss
3) PPG: Pure Performance Latex Semi-Gloss

3. Gypsum Wallboard Ceilings for Latex Flat Finish:
a. One Coat:
1) Moore: Ecospec Interior Latex Primer Sealer (231)
2) S-W: ProMar 200 Zero VOC Latex Wall Primer
3) PPG: Pure Performance Latex Primer

b. Two Coats:
1) Moore: Pristine Ecospec Interior Latex Flat (219)
2) S-W: ProMar 200 Zero VOC Latex Flat
3) PPG: Pure Performance Latex Flat

4. Concrete Unit Masonry and Concrete Walls for Eggshell Finish:
a. One Coat
1) Moore: Moorcraft Super Craft Latex Block Filler No. 285P
2) S-W: PrepRite Block Filler
3) PPG: 6-7 Speedhide

b. Two Coats:
1) Moore: Pristine Ecospec Interior Latex Eggshell (223)
2) S-W: ProMar 200 Zero VOC Latex Eggshell
3) PPG: Pure Performance Latex Eggshell

5. Concrete Unit Masonry and Concrete Walls for Semi-Gloss Finish:
a. One Coat
1) Moore: Moorcraft Super Craft Latex Block Filler No. 285P
2) S-W: PrepRite Block Filler
3) PPG: 6-7 Speedhide

b. Two Coats:
1) Moore: Pristine Ecospec Interior Latex Semi-Gloss (224)
2) S-W: ProMar 200 Zero VOC Latex Semi-Gloss
3) PPG: Pure Performance Latex Semi-Gloss

6. All Shop Primed Metal - H.M. Doors and Frames and Ferrous Metals for Semi-Gloss Finish:
a. Sand, scrape and spot prime with compatible primer
b. Two (2) full coats, acrylic enamel, semi-gloss, one of the following:
1) Moore: DTM Acrylic Semi-Gloss M29
2) S-W: Pro Industrial Semi-Gloss Acrylic
3) PPG: Semi-Gloss Acrylic Metal Finish, 7-375

7. All Unprimed Metal:
a. On Galvanized Metal:
1) Sand, scrape and spot prime with compatible primer.

2) One (1) coat, acrylic latex galvanized metal primer, one of the following:
   a) Moore: Super Spec HP
   b) S-W: Pro Industrial Pro-Cryl
   c) PPG: 90-712 Series Pitt-Tech
3) Two (2) full coats, acrylic enamel, semi-gloss, one of the following:
   a) Moore: DTM Acrylic Semi-Gloss M29
   b) S-W: Pro Industrial Semi-Gloss Acrylic
   c) PPG: Semi-Gloss Acrylic Metal Finish, 7-375

b. Unprimed Metal:
1) Sand, scrape and spot prime with compatible primer
2) One (1) coat acrylic rust inhibiting primer, one of the following:
   a) Moore; Super Spec HP
   b) S-W: Pro Industrial Pro-Cryl
   c) PPG: 90-712 Series Pitt-Tech
3) Two (2) full coats, acrylic enamel, semi-gloss, one of the following:
   a) Moore: DTM Acrylic Semi-Gloss M29
   b) S-W: Pro Industrial Semi-Gloss Acrylic
   c) PPG: Semi-Gloss Acrylic Metal Finish, 7-375

8. Gypsum Wallboard (scheduled for wall covering):
a. One Coat:
1) Moore: Ecospec Interior Latex Primer Sealer (231)
2) S-W: Multi-Purpose Latex Primer B51W450
3) PPG Pure Performance Latex Primer

9. Exposed to View Overhead Construction:
a. One (1) coat, acrylic or latex dry fall out spray, one of the following:
1) Moore : Sweep-Up Latex Flat
2) S-W: Pro Industrial Waterborne Acrylic Dryfall
3) PPG: Speedhide Plus Latex Dry Fall Out Spray Coating

10. Architectural Woodwork, Window Frames, Wood Doors and Trim for Latex Semi-Gloss:
a. One Coat:
1) Moore: Ecospec Interior Latex Primer Sealer (231)
2) S-W: Premium Wall and Wood Latex Primer
3) PPG: Pure Performance Latex Prinmer
b. Two Coats:
1) Moore: Advance Wtaerborne Interior Alkyd Paint,Semi-Gloss (793)
2) S-W: ProMar 200 Zero WB Acrylic-Alkyd, Semi-Gloss, B34W8251
3) PPG: Speedhide WB Alkyd, Semi-Gloss 6-1510

11. Exposed Structural Steel, Decorative Ferrous Metal and Handrails, Guardrails and Railings, indicate for high performance coating:
a. Sand, scrape and spot prime with compatible primer.
b. One coat, Epoxy-Polyamide Coating, 3.00 mild dry film thickness, one of the following:
1) Tnemec: Series N69 Hi-Build Epoxoline II
2) PPG: Ameron Amerliock 400 Hi-Build Epoxy
3) Carboline: Carboguard 825, Hi-Build Epoxy
4) S-W: Macropoxy 646-100 Fast Cure Epoxy
c. One coat, High-Build Acrylic Polyurethane Enamel 2 to 3 mils dry film thickness, one of the following, no substitutions:

1) Tenmec: Series 73 (Semi-Gloss) Endura-Shield III Semi-Gloss, (1054 Gloss & 1075 High Gloss)
2) PPG: Ameron Amercoat 450H
3) Carboline: Carbothane 133 HB Semi-Gloss
4) S-W: Hi Solids Polyurethane100

B. Interior - Existing Construction:

1. Gypsum Wallboard and Plaster Walls for Eggshell Finish:
   a. One Coat:
      1) Moore: Pristine Ecospec Interior Latex Eggshell (223)
      2) S-W: ProMar 200 Zero VOC Latex Eggshell
      3) PPG: Pure Performance Latex Eggshell
2. Gypsum Wallboard and Plaster Walls for Semi-Gloss Finish:
   a. One Coat:
      1) Moore: Pristine Ecospec Interior Latex Semi-Gloss (224)
      2) S-W: ProMar 200 Zero VOC Latex Semi-Gloss
      3) PPG: Pure Performance Latex Semi-Gloss
3. Gypsum Wallboard and Plaster Ceilings for Latex Flat Finish:
   a. One Coat:
      1) Moore: Pristine Ecospec Interior Latex Flat (219)
      2) S-W: ProMar 200 Zero VOC Latex Flat
      3) PPG: Pure Performance Latex Flat
4. Concrete Unit Masonry Walls for Eggshell Finish:
   a. One Coat:
      1) Moore: Pristine Ecospec Interior Latex eggshell (223)
      2) S-W: ProMar 200 Zero VOC Latex Eggshell
      3) PPG: Pure Performance Latex Eggshell
5. Concrete Unit Masonry Walls for Semi-Gloss Finish:
   a. One Coat:
      1) Moore: Pristine Ecospec Interior Latex Semi-Gloss (224)
      2) S-W: ProMar 200 Zero VOC Latex Semi-Gloss
      3) PPG: Pure Performance Latex Semi-Gloss
6. H.M. Doors and Frames and Ferrous Metals for Semi-Gloss Finish:
   a. Sand, scrape and spot prime with compatible primer
   b. One Coat:
      1) Moore: DTM Acrylic Semi-Gloss M29
      2) S-W: Pro Industrial Semi-Gloss Acrylic
      3) PPG: Semi-Gloss Acrylic Metal Finish, 7-375
7. Architectural Woodwork, Window Frames, Wood Doors and Trim for Latex Semi-Gloss:
   a. One Coat:
      1) Moore: Advance Wtaerborne Interior Alkyd Paint,Semi-Gloss (793)
      2) S-W: ProMar 200 Zero WB Acrylic-Alkyd, Semi-Gloss, B34W8251
      3) PPG: Speedhide WB Alkyd, Semi-Gloss 6-1510

3.6 CLEAN UP

A. Just prior to final completion and acceptance, examine all painted and finished surfaces and retouch or refinish as necessary and required, to leave all surfaces in perfect condition.

B. Upon completion of work, remove all paint and finishing spots and overspray from floors, glass and other surfaces. Remove all rubbish, containers and accumulated material of whatever nature not caused by other trades from the project site and level work in a clean, orderly and acceptable condition.

END OF SECTION

SECTION 21 00 00
GENERAL REQUIREMENTS FOR FIRE SUPPRESSION

PART 1 - GENERAL

1.1 WORK INCLUDED

A. The work includes the furnishing of all materials, supplies, labor, equipment, tools, transportation, facilities and services necessary for and required in connection with or properly incidental to all work, as shown on the drawings and specified herein or reasonably implied therefore. Contractor shall be responsible for his own required cutting and patching.

B. Accomplish necessary demolition and removal work, including but not limited to sprinkler heads and piping.

C. Contractor shall provide all temporary services required to maintain normal building operation during construction. Temporary interruption of services shall occur during non-school hours. Contractor shall be solely responsible for determining construction sequencing and shall include all costs required for maintaining fire suppression systems active throughout construction.

D. Training of Owner’s personnel.

1.2 DRAWINGS

A. Drawings for this work consist of plans and specifications. These drawings and diagrams show arrangement of sprinkler heads and areas of work requiring full fire suppression coverage. The contractor shall inspect the site, all existing conditions and shall consult the architectural drawings before submitting his bid. Failure to do so does not relieve this contractor from installing the system complete in all details as described and shown.

B. The drawings for this work accompanying these specifications are to be considered as an integral part of same and anything omitted from one and embodied in the other is to be considered essential to the requirements of the contract and must be furnished and installed by this contractor.

C. Should the drawings and specifications contradict each other, the matter should be referred to the Owner's representative for his interpretation and correction before signing the contract. Otherwise, this contractor shall be held responsible for and he shall meet the requirements without extra cost to the Owner.

1.3 QUALITY ASSURANCE

A. Standard and regulations: The work under the mechanical sections shall comply with the latest editions of the following applicable standards, in addition to local (city) and state codes:

ASME	American Society of Mechanical Engineers
ASHRAE	American Society of Heating Refrigeration and Air Conditioning Engineers
ACRI	Air Conditioning and Refrigeration Institute
ASTM	American Society of Testing Materials
ANSI	American National Standards Institute
NFPA	National Fire Protection Association
UL	Underwriter's Laboratories
NEMA	National Electrical Manufacturers' Association
NEC	National Electrical Code
AGA	American Gas Association
IMC	International Mechanical Code
IBC	International Building Code

B. Include all items of labor and material required to comply with such codes in accordance with the contract documents. Where quantities, sizes or other requirements indicated on the drawings or herein specified are in excess of code requirements, the specifications and/or drawings shall govern regardless of code requirements.

1.4 SUBMITTALS

A. At the completion of the work covered by this contract, this contractor shall be responsible for furnishing a complete set of certified as-built drawings showing the heating, ventilating, air conditioning, plumbing and fire protection work as it was actually installed so as to make a permanent record. As-builts shall be furnished to Owner electronically in AutoCAD format. As-builts shall be uniformly drafted at 1/4” scale.

1.5 SHOP DRAWINGS

A. Submit to the Owner’s representative copies of a list of the materials which he proposes to use in the execution of his contract. If any items are omitted from the list, such undeclared items shall be furnished strictly as specified. Provide manufacturer’s certified drawings for all equipment as herein specified.

B. Manufacturer’s standard drawings will be accepted for manufacturer's standard production items if verified for installation at the location noted. Shop drawings shall be made for all items of equipment specially fabricated for this contract. Installation drawings shall show, in detail, the work to be installed by this contractor and the clearances, spaces, provisions or requirements for the work of the other contractors. When phrase "by others" appears on shop drawings, indicate who is to furnish material or operations so marked.

C. Quarter-inch (1/4”) scale shop drawings indicating sprinkler heads, piping, valves and all devices shop drawings shall be submitted for review. Shop drawings shall contain all required installation information including, but not limited to:

1. Bottom of pipe height.
2. Pipe size, length, fittings, etc.

3. Hangers and supports.
4. Indicate all coordination conflicts with other trades.

D. Note: All equipment and ductwork shall be weather protected at all times. Non-protected material and equipment will be rejected and removed from the project without exception.

1.6 RULES AND REGULATIONS

A. All workmanship and materials shall conform and comply with the requirements of the building ordinances and rules and regulations of all departments and bureaus of the Municipality, County and State of Illinois having lawful jurisdiction irrespective of any statements herein to the contrary.

B. All changes in the work of this contract which may be required by the said departments or bureaus or by the law or ordinances, when approved and ordered by the Owner's representative, shall be made by this contractor without extra cost to the Owner.

C. One final inspection will be conducted for completion of work after written notification from the contractor. Additional inspections will be conducted at the expense of the contractor.

1.7 MATERIALS AND WORKMANSHIP

A. All materials used throughout this installation shall be the best of their respective kind, and same shall be installed in a neat, accurate and workmanlike manner. This workmanship and these materials must be executed and furnished in a manner entirely satisfactory to the Owner's representative.

B. Wherever in the specifications a particular article or material is definitely mentioned, it shall be provided and no substitutions will be allowed, especially insofar as the submittal of the base bid is concerned. Should the contractor desire to substitute other materials for those specified, he may submit these substitutions in the form of alternates to the base bid designating appropriate additions or deductions for each alternate.

C. Final approval of all equipment will be by the Owner’s representative.

D. All materials used shall be asbestos free.

1.8 SUBSTANTIAL AND FINAL COMPLETION

A. The contractor shall provide written notification to the engineer that the project is substantially complete. The engineer will accomplish a substantial completion inspection and provide the contractor with a list of work requiring corrective action. Upon completion of the corrective work, the contractor shall provide written notice that all corrective work has been completed. The engineer will conduct an inspection of the corrective work. The contractor shall bear costs of correcting such

work, including additional testing and inspections, and compensation for the engineer's services and expenses made necessary thereby.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 COORDINATION

A. It is presumed that the contractor has carefully examined the drawings and specifications for the entire work and the job conditions which will ensure before submitting his bid and has reported to the Owner's representative in writing any interferences or conflicts with his work.

B. If the contractor has failed to call such interferences or conflicts relative to his work and the drawings, specifications, the work of other contractors in the event of separate contracts and job conditions to the Owner's representative's attention in writing prior to execution of the contract, it will be presumed that no conflicts exist.

C. When conflicts arise during the construction period, they shall be immediately reported to the Owner's representative in writing and they will be subject to the Owner's representative's decision. Contractor shall submit coordinated 1/4-inch scale shop drawings.

3.2 PROJECT CONDITIONS

A. Existing Building Systems: Contractor shall provide all temporary services required to maintain normal building operation during construction. Temporary interruption of services shall occur during non-school hours. Contractor shall be solely responsible for determining construction sequencing and shall include all costs required for maintaining fire suppression systems active throughout construction.

B. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Architect at least two weeks in advance of proposed utility interruptions. Identify extent and duration of utility interruptions.
2. Indicate method of providing temporary utilities.
3. Do not proceed with utility interruptions without Architect’s written permission.

3.3 COOPERATION OF CONTRACTORS

A. Each contractor, in laying out his work, shall cooperate with the other contractors on the work so as to avoid any interferences with their work. If this is not done, Owner’s representative reserves the right to make such changes in the work as are

necessary to avoid interferences and such changes will not be considered as cause for additional compensation or extension of time for the contractor.

3.4 JURISDICTION OF WORK

A. Where it becomes necessary for contractor in order to fulfill his contract to furnish labor or materials other than that which is generally accepted by trade agreement or general practice to belong to his particular trade or branches of work, the contractor shall submit same to subcontractor engaged in the type of work involved to the end that there will be no stoppage of work due to violations of trade agreements as to jurisdiction.

B. All cutting, patching, and fire safeing related to this contractor's work shall be accomplished by this contractor. All fire safeing material will be as directed by the architectural specification.

3.5 DEFECTIVE WORK AND MATERIALS

A. All materials or work found to be defective, or not in strict conformity with the drawings, or different from the requirements of the drawings and specifications, or defaced or injured through negligence of this contractor or his employees, or through the action of fire, shall immediately be removed from the premises by this contractor and satisfactory material and work substituted therefore without delay.

B. Any defected work or imperfect work which may be discovered shall be corrected immediately upon notice from the Owner’s representative.

3.6 COORDINATION AND COOPERATION

A. Coordinate the mechanical work with the other contractors on this project.

B. All work shall be so arranged that there will be no delay in the proper installation and completion of any part or parts of all piping and sheet metal duct systems and mechanical equipment and the equipment shall be installed in proper sequence with other trades without any unnecessary delay.

C. Should it be necessary, detailed drawings of a proposed departure due to actual field conditions or other causes shall be submitted to the Owner’s representative for approval.

D. Cover with all other contractors engaged in the construction of the project whose work may in any way affect his installation, and whenever interferences might occur and before installing any of the work in question, this contractor shall consult with them as to the exact location and level of his piping and/or other parts of his equipment. This contractor shall be solely responsible for the proper arrangement of his piping and equipment.

3.7 ACCESS PANELS

A. Arrange piping so that all concealed valves and/or concealed equipment can be operated and/or properly maintained through access panels. Contractor shall be responsible for coordinating locations with architect. Contractor shall furnish and install proper number and rated access panels required for his work. Access panels shall be 18-inch x 18-inch or larger as required.

3.8 FIRE-STOPS

A. Penetrations through fire rated walls and floors shall be sealed to the original hourly fire rating with a fire-stop system capable of preventing the passage of flames and hot gases when subject to the requirements of the test standards specific for Fire-Stops ASTM E119 and E814 (UL 1479).

END OF SECTION

SECTION 21 05 00
COMMON WORK RESULTS FOR FIRE SUPPRESSION

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.

1.2 SUMMARY

A. This Section includes the following:

1. Sleeves.
2. Grout.
3. Fire-suppression piping demolition.
4. Supports and anchorages.

1.3 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in chases.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

1.5 COORDINATION

A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for fire-suppression installations.

B. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

C. Coordinate requirements for access panels and doors for fire-suppression items requiring access that are concealed behind finished surfaces. Access panels and doors are specified in Division 08 Section "Access Doors and Frames."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 SLEEVES

A. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.

B. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

PART 3 - EXECUTION

3.1 FIRE-SUPPRESSION DEMOLITION

A. Refer to Division 01 Section "Cutting and Patching" and Division 02 Section "Selective Structure Demolition" for general demolition requirements and procedures.

B. Disconnect, demolish, and remove fire-suppression systems, equipment, and components indicated to be removed.

1. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.

C. 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 GROUTING

A. Mix and install grout for fire-suppression equipment base bearing surfaces, pump and other equipment base plates, and anchors.

B. Clean surfaces that will come into contact with grout.

C. Provide forms as required for placement of grout.

D. Avoid air entrapment during placement of grout.

E. Place grout, completely filling equipment bases.

F. Place grout on concrete bases and provide smooth bearing surface for equipment.

G. Place grout around anchors.

H. Cure placed grout.

END OF SECTION

SECTION 21 05 53
IDENTIFICATION FOR FIRE SUPPRESSION

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 the following mechanical identification materials and their installation:

1. Access panel and door markers.
2. Pipe markers.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples: For color, letter style, and graphic representation required for each identification material and device.

1.4 QUALITY ASSURANCE

A. ASME Compliance: Comply with ASME A13.1, "Scheme for the Identification of Piping Systems," for letter size, length of color field, colors, and viewing angles of identification devices for piping.

1.5 COORDINATION

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with location of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 PIPING IDENTIFICATION DEVICES

A. Manufactured Pipe Markers, General: Preprinted, color-coded, with lettering indicating service, and showing direction of flow.

1. Colors: Comply with ASME A13.1, unless otherwise indicated.
2. Lettering: **Use piping system terms indicated and abbreviate only as necessary for each application length**.
3. Pipes with OD, Including Insulation, Less Than 6 Inches: Full-band pipe markers extending 360 degrees around pipe at each location.
4. Pipes with OD, Including Insulation, 6 Inches and Larger: Either full-band or strip-type pipe markers at least three times letter height and of length required for label.

B. Self-Adhesive Pipe Markers: Plastic with pressure-sensitive, permanent-type, self-adhesive back.

PART 3 - EXECUTION

3.1 APPLICATIONS, GENERAL

A. Products specified are for applications referenced in other Divisions 21 and 23 Sections. If more than single-type material, device, or label is specified for listed applications, selection is Installer's option.

3.2 PIPING IDENTIFICATION

A. Install manufactured pipe markers indicating service on each piping system. Install with flow indication arrows showing direction of flow.

1. Pipes with OD, Including Insulation, Less Than 6 Inches: Self-adhesive pipe markers. Use color-coded, self-adhesive plastic tape, 1-1/2 inches wide, lapped at least 1-1/2 inches at both ends of pipe marker, and covering full circumference of pipe.

B. Locate pipe markers and color bands where piping is exposed in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior nonconcealed locations as follows:

1. Near each valve and control device.
2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
3. Near penetrations through walls, floors, ceilings, and nonaccessible enclosures.
4. At access doors, manholes, and similar access points that permit view of concealed piping.
5. Near major equipment items and other points of origination and termination.

6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
7. On piping above removable acoustical ceilings. Omit intermediately spaced markers.

3.3 ADJUSTING

A. Relocate mechanical identification materials and devices that have become visually blocked by other work.

3.4 CLEANING

A. Clean faces of mechanical identification devices.

END OF SECTION

SECTION 21 13 13
WET-PIPE SPRINKLER 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.

1.2 SUMMARY

A. Section Includes:

1. Pipes, fittings, and specialties.
2. Sprinklers.

1.3 DEFINITIONS

A. Standard-Pressure Sprinkler Piping: Wet-pipe sprinkler system piping designed to operate at working pressure of 175-psig maximum.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings: For wet-pipe sprinkler systems.

1. Include plans, elevations, sections, and attachment details.
2. Include diagrams for power, signal, and control wiring.

C. Delegated-Design Submittal: For wet-pipe sprinkler systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Sprinkler systems, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Domestic water piping.

2. HVAC hydronic piping.
3. Items penetrating finished ceiling include the following:

    a. Lighting fixtures.
    b. Air outlets and inlets.
    c. Smoke detectors, fire alarm notification devices, speakers.

B. Qualification Data: For qualified Installer and professional engineer.

C. Approved Sprinkler Piping Drawings: Working plans, prepared according to NFPA 13, that have been approved by authorities having jurisdiction, including hydraulic calculations if applicable.

D. Welding certificates.

E. Fire-hydrant flow test report.

F. Field Test Reports and Certificates: Indicate and interpret test results for compliance with performance requirements and as described in NFPA 13. Include "Contractor's Material and Test Certificate for Aboveground Piping."

G. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For wet-pipe sprinkler systems and specialties to include in emergency, operation, and maintenance manuals.

1.7 QUALITY ASSURANCE

A. Installer Qualifications:

1. Installer's responsibilities include designing, fabricating, and installing sprinkler systems and providing professional engineering services needed to assume engineering responsibility. Base calculations on results of self-performed fire-hydrant flow test.

    a. Engineering Responsibility: Preparation of working plans, calculations, and field test reports by a qualified professional engineer.

B. Welding Qualifications: Qualify procedures and operators according to 2010 ASME Boiler and Pressure Vessel Code.

C. Submit working plans, calculations, and field test reports to local fire department for review and approval.

1.8 FIELD CONDITIONS

A. Interruption of Existing Sprinkler Service: Do not interrupt sprinkler service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary sprinkler service according to requirements indicated:

1. Notify Architect no fewer than five days in advance of proposed interruption of sprinkler service.
2. Do not proceed with interruption of sprinkler service without Architect's written permission.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Sprinkler system equipment, specialties, accessories, installation, and testing shall comply with the following:

1. NFPA 13.

B. Standard-Pressure Piping System Component: Listed for 175-psig minimum working pressure.

C. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design wet-pipe sprinkler systems.

1. Contractor shall perform flow test prior to work. Coordinate with Municipality.
2. Sprinkler system design shall be approved by authorities having jurisdiction.

a. Margin of Safety for Available Water Flow and Pressure: 10 percent, including losses through water-service piping, valves, and backflow preventers.
b. Sprinkler Occupancy Hazard Classifications:

1) Office and Public Areas: Light Hazard.

3. Minimum Density for Automatic-Sprinkler Piping Design:

a. Light-Hazard Occupancy: 0.10 gpm over 1500-sq. ft. area.
b. Ordinary-Hazard, Group 1 Occupancy: 0.15 gpm over 1500-sq. ft. area.

4. Maximum Protection Area per Sprinkler:

a. Office Spaces: 225 sq. ft.
b. Storage Areas: 130 sq. ft.
c. Other Areas: According to NFPA 13 recommendations unless otherwise indicated.

2.2 STEEL PIPE AND FITTINGS

A. Standard-Weight, Schedule 40 Black-Steel Pipe: ASTM A 53/A 53M, Type E, Grade B. Pipe ends may be factory or field formed to match joining method.

B. Black-Steel Pipe Nipples: ASTM A 733, made of ASTM A 53/A 53M, standard-weight, seamless steel pipe with threaded ends.

C. Steel Couplings: ASTM A 865/A 865M, threaded.

D. Gray-Iron Threaded Fittings: ASME B16.4, Class 125, standard pattern.

E. Malleable- or Ductile-Iron Unions: UL 860.

F. Grooved-Joint, Steel-Pipe Appurtenances:

1. Pressure Rating: 175-psig minimum.
2. Grooved-End Fittings for Steel Piping: ASTM A 47/A 47M, malleable-iron casting or ASTM A 536, ductile-iron casting, with dimensions matching steel pipe.
3. Grooved-End-Pipe Couplings for Steel Piping: AWWA C606 and UL 213 rigid pattern, unless otherwise indicated, for steel-pipe dimensions. Include ferrous housing sections, EPDM-rubber gasket, and bolts and nuts.
4. Branch Outlets: Grooved, plain-end pipe, or threaded.

2.3 SPRINKLERS

A. Listed in UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."

B. Pressure Rating for Automatic Sprinklers: 175-psig minimum.

C. Automatic Sprinklers with Heat-Responsive Element:

1. Nonresidential Applications: UL 199.
2. Characteristics: Nominal 1/2-inch orifice with Discharge Coefficient K of 5.6, and for "Ordinary" temperature classification rating unless otherwise indicated or required by application.

D. Sprinkler Finishes: Chrome plated and bronze.

E. Sprinkler Escutcheons: Materials, types, and finishes for the following sprinkler mounting applications. Escutcheons for concealed type sprinklers are specified with sprinklers.

1. Ceiling Mounting: White finish, one piece, flat.

PART 3 - EXECUTION

3.1 PREPARATION

A. Perform fire-hydrant flow test according to NFPA 13 and NFPA 291. Use results for system design calculations required in "Quality Assurance" Article.

B. Report test results promptly and in writing.

3.2 PIPING INSTALLATION

A. Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of sprinkler heads. Install piping as indicated on approved working plans.

1. Coordinate layout and installation of sprinklers with other construction that penetrates ceilings, including light fixtures, HVAC equipment, and partition assemblies.

B. Piping Standard: Comply with NFPA 13 requirements for installation of sprinkler piping.

C. Use listed fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.

D. Install "Inspector's Test Connections" in sprinkler system piping, complete with shutoff valve, and sized and located according to NFPA 13.

E. Install sprinkler piping with drains for complete system drainage.

F. Install hangers and supports for sprinkler system piping according to NFPA 13. Comply with requirements for hanger materials in NFPA 13.

G. Fill sprinkler system piping with water.

H. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 21 05 00.

3.3 JOINT CONSTRUCTION

A. Install couplings, flanges, flanged fittings, unions, nipples, and transition and special fittings that have finish and pressure ratings same as or higher than system's pressure rating for aboveground applications unless otherwise indicated.

B. Install unions adjacent to each valve in pipes NPS 2 and smaller.

C. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.

D. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

E. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

F. Flanged Joints: Select appropriate gasket material in size, type, and thickness suitable for water service. Join flanges with gasket and bolts according to ASME B31.9.

G. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

H. Steel-Piping, Roll-Grooved Joints: Roll rounded-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe grooved joints.

3.4 SPRINKLER INSTALLATION

A. Install sprinklers in suspended ceilings in center of acoustical ceiling panels.

3.5 IDENTIFICATION

A. Install labeling and pipe markers on equipment and piping according to requirements in NFPA 13.

B. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."

3.6 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Leak Test: After installation, charge systems and test for leaks. Repair leaks and retest until no leaks exist.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
3. Flush, test, and inspect sprinkler systems according to NFPA 13, "Systems Acceptance" Chapter.
4. Energize circuits to electrical equipment and devices.
5. Coordinate with fire-alarm tests. Operate as required.
6. Coordinate with fire-pump tests. Operate as required.

7. Verify that equipment hose threads are same as local fire department equipment.

B. Sprinkler piping system will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.7 CLEANING

A. Clean dirt and debris from sprinklers.

B. Only sprinklers with their original factory finish are acceptable. Remove and replace any sprinklers that are painted or have any other finish than their original factory finish.

3.8 PIPING SCHEDULE

A. Standard-pressure, wet-pipe sprinkler system, NPS 2 and smaller, shall be the following:

1. Standard-weight, Schedule 40, black-steel pipe with threaded ends; uncoated, gray-iron threaded fittings; and threaded joints.

B. Standard-pressure, wet-pipe sprinkler system, NPS 2-1/2 to NPS 4, shall be the following:

1. Schedule 10 black-steel pipe with roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.

3.9 SPRINKLER SCHEDULE

A. Use sprinkler types in subparagraphs below for the following applications:

1. Rooms without Ceilings: Upright sprinklers.
2. Rooms with Suspended Ceilings: Concealed sprinklers.

B. Provide sprinkler types in subparagraphs below with finishes indicated.

1. Concealed Sprinklers: Rough brass, with factory-painted white cover plate.

END OF SECTION

SECTION 23 00 00
GENERAL REQUIREMENTS FOR HEATING, VENTILATING AND AIR CONDITIONING

PART 1 - GENERAL

1.1 WORK INCLUDED

A. The work includes the furnishing of all materials, supplies, labor, equipment, tools, transportation, facilities and services necessary for and required in connection with or properly incidental to all work, as shown on the drawings and specified herein or reasonably implied therefore. Contractor shall be responsible for his own required cutting and patching.

B. Accomplish necessary demolition and removal work, including but not limited to VAV boxes, temperature control system, piping, exhaust fans, ductwork, grilles, etc.

C. Contractor shall provide all temporary services required to maintain normal building operation during construction. Temporary interruption of services shall occur during non-school hours. Contractor shall be solely responsible for determining construction sequencing and shall include all costs required for maintaining all mechanical services during construction.

D. Training of Owner’s personnel.

1.2 DRAWINGS

A. Drawings for this work consist of mechanical plans and detailed drawings and diagrams to which will be added, during the period of construction any other detail drawings as may be necessary in the opinion of the Owner's representative to show the proper installation of various appliances or equipment. These drawings and diagrams show arrangement and size of connection and shall be considered as part of and complementing the specifications. They shall be followed as closely as actual building construction will permit. For all locations of fixtures, partitions and all other details of construction, this contractor shall consult the architectural drawings before submitting his bid to make sure all equipment will fit in the assigned space. Failure to do so does not relieve this contractor from installing the system complete in all details as described and shown.

B. The drawings for this work accompanying these specifications are to be considered as an integral part of same and anything omitted from one and embodied in the other is to be considered essential to the requirements of the contract and must be furnished and installed by this contractor.

C. Should the drawings and specifications contradict each other, the matter should be referred to the Owner's representative for his interpretation and correction before signing the contract. Otherwise, this contractor shall be held responsible for and he shall meet the requirements without extra cost to the Owner.

1.3 QUALITY ASSURANCE

A. Standard and regulations: The work under the mechanical sections shall comply with the latest editions of the following applicable standards, in addition to local (city) and state codes:

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UL	Underwriter's Laboratories
NEMA	National Electrical Manufacturers' Association
NEC	National Electrical Code
AGA	American Gas Association
ADA	Americans with Disabilities Act
IMC	International Mechanical Code
IBC	International Building Code

B. Include all items of labor and material required to comply with such codes in accordance with the contract documents. Where quantities, sizes or other requirements indicated on the drawings or herein specified are in excess of code requirements, the specifications and/or drawings shall govern regardless of code requirements.

1.4 SUBMITTALS

A. At the completion of the work covered by this contract, this contractor shall be responsible for furnishing a complete set of certified as-built drawings showing the heating, ventilating, air conditioning, plumbing and fire protection work as it was actually installed so as to make a permanent record. As-builts shall be furnished to Owner electronically in AutoCAD format. As-builts shall be uniformly drafted at 1/4” scale.

1.5 SHOP DRAWINGS

A. Submit to the Owner’s representative copies of a list of the materials which he proposes to use in the execution of his contract. If any items are omitted from the list, such undeclared items shall be furnished strictly as specified. Provide manufacturer’s certified drawings for all equipment as herein specified.

B. Manufacturer’s standard drawings will be accepted for manufacturer's standard production items if verified for installation at the location noted. Shop drawings shall be made for all items of equipment specially fabricated for this contract. Installation drawings shall show, in detail, the work to be installed by this contractor and the clearances, spaces, provisions or requirements for the work of the other contractors. When phrase "by others" appears on shop drawings, indicate who is to furnish material or operations so marked.

C. Quarter-inch (1/4") scale piping and ductwork shop drawings shall be submitted for review. Shop drawings shall contain all required installation information including, but not limited to:

1. Bottom of duct/pipe height.
2. Duct/pipe size.
3. All fittings.
4. Hangers and supports.
5. Insulation/lining size and location.
6. Indicate all coordination conflicts with other trades.

D. Note: All equipment and ductwork shall be weather protected at all times. Non-protected material and equipment will be rejected and removed from the project without exception.

1.6 RULES AND REGULATIONS

A. All workmanship and materials shall conform and comply with the requirements of the building ordinances and rules and regulations of all departments and bureaus of the County and State of Illinois having lawful jurisdiction irrespective of any statements herein to the contrary.

B. All changes in the work of this contract which may be required by the said departments or bureaus or by the law or ordinances, when approved and ordered by the Owner's representative, shall be made by this contractor without extra cost to the Owner.

C. One final inspection will be conducted for completion of work after written notification from the contractor. Additional inspections will be conducted at the expense of the contractor.

1.7 MATERIALS AND WORKMANSHIP

A. All materials used throughout this installation shall be the best of their respective kind, and same shall be installed in a neat, accurate and workmanlike manner. This workmanship and these materials must be executed and furnished in a manner entirely satisfactory to the Owner's representative.

B. Wherever in the specifications a particular article or material is definitely mentioned, it shall be provided and no substitutions will be allowed, especially insofar as the submittal of the base bid is concerned. Should the contractor desire to substitute other materials for those specified, he may submit these substitutions in the form of alternates to the base bid designating appropriate additions or deductions for each alternate.

C. Final approval of all equipment will be by the Owner's representative.

D. All materials used shall be asbestos free.

1.8 SUBSTANTIAL AND FINAL COMPLETION

A. The contractor shall provide written notification to the engineer that the project is substantially complete. The engineer will accomplish a substantial completion inspection and provide the contractor with a list of work requiring corrective action. Upon completion of the corrective work, the contractor shall provide written notice that all corrective work has been completed. The engineer will conduct an inspection of the corrective work. The contractor shall bear costs of correcting such work, including additional testing and inspections, and compensation for the engineer's services and expenses made necessary thereby.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 COORDINATION

A. It is presumed that the contractor has carefully examined the drawings and specifications for the entire work and the job conditions which will ensure before submitting his bid and has reported to the Owner's representative in writing any interferences or conflicts with his work.

B. If the contractor has failed to call such interferences or conflicts relative to his work and the drawings, specifications, the work of other contractors in the event of separate contracts and job conditions to the Owner's representative's attention in writing prior to execution of the contract, it will be presumed that no conflicts exist.

C. When conflicts arise during the construction period, they shall be immediately reported to the Owner's representative in writing and they will be subject to the Owner's representative's decision. Contractor shall submit coordinated 1/4-inch scale shop drawings. Drawings shall indicate multiple conduit runs.

3.2 PROJECT CONDITIONS

A. Contractor shall provide all temporary services required to maintain normal building operation during construction. Temporary interruption of services shall occur during non-school hours. Contractor shall be solely responsible for determining construction sequencing and shall include all costs required for maintaining all mechanical services during construction.

B. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Architect at least two weeks in advance of proposed utility interruptions. Identify extent and duration of utility interruptions.
2. Indicate method of providing temporary utilities.

3. Do not proceed with utility interruptions without Architect's written permission.

3.3 COOPERATION OF CONTRACTORS

A. Each contractor, in laying out his work, shall cooperate with the other contractors on the work so as to avoid any interferences with their work. If this is not done, Owner's representative reserves the right to make such changes in the work as are necessary to avoid interferences and such changes will not be considered as cause for additional compensation or extension of time for the contractor.

3.4 JURISDICTION OF WORK

A. Where it becomes necessary for contractor in order to fulfill his contract to furnish labor or materials other than that which is generally accepted by trade agreement or general practice to belong to his particular trade or branches of work, the contractor shall submit same to subcontractor engaged in the type of work involved to the end that there will be no stoppage of work due to violations of trade agreements as to jurisdiction.

B. All cutting, patching, and fire safeing related to this contractor's work shall be accomplished by this contractor. All fire safeing material will be as directed by the architectural specification.

3.5 DEFECTIVE WORK AND MATERIALS

A. All materials or work found to be defective, or not in strict conformity with the drawings, or different from the requirements of the drawings and specifications, or defaced or injured through negligence of this contractor or his employees, or through the action of fire, shall immediately be removed from the premises by this contractor and satisfactory material and work substituted therefore without delay.

B. Any defected work or imperfect work which may be discovered shall be corrected immediately upon notice from the Owner's representative.

3.6 BASIS OF DESIGN

A. Contract documents have been designed using scheduled/specified equipment manufacturers. Use of a specified acceptable manufacturer that requires changes in design shall be completed by the contractor at no additional cost to the Owner.

3.7 COORDINATION AND COOPERATION

A. Coordinate the mechanical work with the other contractors on this project and also coordinate the mechanical work in this contract with the local gas company.

B. All work shall be so arranged that there will be no delay in the proper installation and completion of any part or parts of all piping and sheet metal duct systems and mechanical equipment and the equipment shall be installed in proper sequence with other trades without any unnecessary delay.

C. Should it be necessary, detailed drawings of a proposed departure due to actual field conditions or other causes shall be submitted to the Owner's representative for approval.

D. Cover with all other contractors engaged in the construction of the project whose work may in any way affect his installation, and whenever interferences might occur and before installing any of the work in question, this contractor shall consult with them as to the exact location and level of his piping and ductwork and/or other parts of his equipment. This contractor shall be solely responsible for the proper arrangement of his piping and equipment.

3.8 ACCESS PANELS

A. Arrange piping so that all concealed valves and/or concealed equipment can be operated and/or properly maintained through access panels. Contractor shall be responsible for coordinating locations with architect. Contractor shall furnish and install proper number and rated access panels required for his work. Access panels shall be 18-inch x 18-inch or larger as required.

3.9 FIRE-STOPS

A. Penetrations through fire rated walls and floors shall be sealed to the original hourly fire rating with a fire-stop system capable of preventing the passage of flames and hot gases when subject to the requirements of the test standards specific for Fire-Stops ASTM E119 and E814 (UL 1479).

3.10 INSTRUCTIONS AND TRAINING

A. Each contractor shall instruct Owner's personnel in the operation and maintenance of equipment installed. In addition, each contractor shall furnish to Owner three (3) sets of typewritten instructions on the operation and maintenance of each piece of equipment. Each contractor shall also furnish to Owner three (3) sets of equipment maintenance and operations manuals for each item of equipment.

B. In addition to written instructions and manufacturer's training requirements, the contractors shall provide field training sessions as follows:

Contractor	Minimum No. Of Sessions	Minimum Hours Of Instruction
HVAC	1	4

C. Training session scheduling requests shall be presented to Owner's representatives seven days prior to date for scheduling of all Owner's personnel.

D. For each session, the contractor shall submit a training session log prepared by the contractor and signed by the Owner and contractor, certifying that the above has been satisfactorily completed and that the Owner's operations manuals and written instruction were on hand at the time of the session.

E. All training sessions shall be video taped by the contractor and two copies shall be given to the Owner.

F. The training sessions shall be coordinated by the contractor to avoid numerous trips by Owner's personnel. Training should be combined when possible.

3.11 CONTROLS COMMISSIONING

A. All devices and points in the control system shall be thoroughly and systematically verified for proper installation, wiring, calibration, addressing, operations, etc.

B. Provide five (5) copies of a commissioning report, which documents, in detail, the commissioning of each and every point and field device in the system. The commissioning report shall contain, as a minimum, the following data for each point and device:

1. Point name.
2. Device tag as shown on as-built drawings.
3. Point type (analog input, analog output, binary input, binary output).
4. Point address.
5. Description of field device.
6. Manufacturer of field device.
7. Part number of field device.
8. The computer state or value of the point as displayed on the CPU (temperature/pressure/humidity reading, on/off, % open/closed, etc.).
9. The actual, measured value or state of the point. This data must be measured on a separate device such as a thermometer, pressure gauge, meter, etc.
10. The signature of the temperature control contractor's employee who commissioned the point.
11. The date that the point was commissioned.

C. Provide a technician to demonstrate to the engineers/architects the operation of all control sequences, alarm activation, etc. Include eight (8) hours for this demonstration.

D. The temperature control contractor shall be responsible for providing one hour of technical check-out time per each piece of equipment to assist the balancing contractor at start-up. This time is separate from the temperature control start-up and commissioning described above.

E. An additional 10% over the normal contract amount to be held back from the temperature controls contractor until training and commissioning are completed and Owner has accepted.

END OF SECTION

SECTION 23 05 00
COMMON WORK RESULTS FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Piping materials and installation instructions common to most piping systems.
2. Sleeves.
3. Grout.
4. HVAC demolition.
5. Equipment installation requirements common to equipment sections.
6. Supports and anchorages.

1.3 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and chases.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

1.4 SUBMITTALS

A. Welding certificates.

1.5 QUALITY ASSURANCE

A. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

B. Electrical Characteristics for HVAC Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.7 COORDINATION

A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for HVAC installations.

B. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

C. 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."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 PIPE, TUBE, AND FITTINGS

A. Refer to individual Division 23 piping Sections for pipe, tube, and fitting materials and joining methods.

B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.3 JOINING MATERIALS

A. Refer to individual Division 23 piping Sections for special joining materials not listed below.

B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.

1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.

a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.

2. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.

C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

D. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

E. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAg1, silver alloy for refrigerant piping, unless otherwise indicated.

F. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

2.4 DIELECTRIC FITTINGS

A. Description: Combination fitting of copper alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.

B. Insulating Material: Suitable for system fluid, pressure, and temperature.

C. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig minimum working pressure at 180 deg F.

1. Manufacturers:

a. Capitol Manufacturing Co.
b. Central Plastics Company.
c. Eclipse, Inc.
d. Epco Sales, Inc.
e. Hart Industries, International, Inc.
f. Watts Industries, Inc.; Water Products Div.
g. Zurn Industries, Inc.; Wilkins Div.

2.5 SLEEVES

A. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.

B. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

2.6 GROUT

A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.

1. Characteristics: Post-hardening, volume-adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
2. Design Mix: 5000-psi, 28-day compressive strength.
3. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 HVAC DEMOLITION

A. Refer to Division 01 Section "Cutting and Patching" and Division 02 Section "Selective Structure Demolition" for general demolition requirements and procedures.

B. Disconnect, demolish, and remove HVAC systems, equipment, and components indicated to be removed.

1. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
2. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
3. Equipment to Be Removed: Disconnect and cap services and remove equipment.
4. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.

C. Provide the Owner with the option to keep all VAV terminal units, diffusers, grilles, sensors, valves, etc. removed and not reused as a part of this work. If Owner decides to keep any item in whole or part, deliver to location designated by Owner. Contractor shall properly dispose of all declined items.

D. 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.

E. Contractor is responsible for all isolation, draining, storage and refilling of system water and chemicals. Contractor to field verify all required isolation or lack thereof and include all related costs in bid.

3.2 PIPING SYSTEMS - COMMON REQUIREMENTS

A. Install piping according to the following requirements and Division 23 Sections specifying piping systems.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping to permit valve servicing.

G. Install piping at indicated slopes.

H. Install piping free of sags and bends.

I. Install fittings for changes in direction and branch connections.

J. Install piping to allow application of insulation.

K. Select system components with pressure rating equal to or greater than system operating pressure.

L. Install sleeves for pipes passing through concrete and masonry walls and concrete floor and roof slabs.

M. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.

1. Cut sleeves to length for mounting flush with both surfaces.

a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.

2. Install sleeves in new walls and slabs as new walls and slabs are constructed.
3. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:

a. Steel Pipe Sleeves: For pipes smaller than NPS 6.

4. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using joint sealants appropriate for size, depth, and location of joint. Refer to Division 07 Section "Joint Sealants" for materials and installation.

N. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Refer to Division 07 Section "Penetration Firestopping" for materials.

O. Verify final equipment locations for roughing-in.

P. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

3.3 PIPING JOINT CONSTRUCTION

A. Join pipe and fittings according to the following requirements and Division 23 Sections specifying piping systems.

B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

D. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.

E. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.

2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

F. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.

G. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

3.4 PIPING CONNECTIONS

A. Make connections according to the following, unless otherwise indicated:

1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.
3. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

3.5 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.

3.6 PAINTING

A. Painting of HVAC systems, equipment, and components is specified in Division 09 Sections "Interior Painting" and "Exterior Painting."

B. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.7 ERECTION OF METAL SUPPORTS AND ANCHORAGES

A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor HVAC materials and equipment.

B. Field Welding: Comply with AWS D1.1.

3.8 GROUTING

A. Mix and install grout for HVAC equipment base bearing surfaces, pump and other equipment base plates, and anchors.

B. Clean surfaces that will come into contact with grout.

C. Provide forms as required for placement of grout.

D. Avoid air entrapment during placement of grout.

E. Place grout, completely filling equipment bases.

F. Place grout on concrete bases and provide smooth bearing surface for equipment.

G. Place grout around anchors.

H. Cure placed grout.

END OF SECTION

SECTION 23 05 23
GENERAL-DUTY VALVES FOR HVAC PIPING

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.

1.2 SUMMARY

A. Section Includes:

1. Bronze ball valves.
2. Bronze globe valves.

B. Related Sections:

1. Section 23 05 53 "Identification for HVAC Piping and Equipment" for valve tags and schedules.

1.3 DEFINITIONS

A. CWP: Cold working pressure.

B. EPDM: Ethylene propylene copolymer rubber.

C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.

D. NRS: Nonrising stem.

E. RS: Rising stem.

F. SWP: Steam working pressure.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of valve indicated.

1.5 QUALITY ASSURANCE

A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.

B. ASME Compliance:

1. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
2. ASME B31.1 for power piping valves.
3. ASME B31.9 for building services piping valves.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:

1. Protect internal parts against rust and corrosion.
2. Protect threads, flange faces, grooves, and weld ends.
3. Set angle, gate, and globe valves closed to prevent rattling.
4. Set ball and plug valves open to minimize exposure of functional surfaces.

B. Use the following precautions during storage:

1. Maintain valve end protection.
2. Store valves indoors and maintain at higher than ambient dew point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

A. Refer to HVAC valve schedule articles for applications of valves.

B. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

C. Valve Sizes: Same as upstream piping unless otherwise indicated.

D. Valve Actuator Types:

1. Handlever: For quarter-turn valves NPS 6 and smaller except plug valves.

E. Valves in Insulated Piping: With 2-inch stem extensions and the following features:

1. Gate Valves: With rising stem.
2. Ball Valves: With extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.

F. Valve-End Connections:

1. Solder Joint: With sockets according to ASME B16.18.
2. Threaded: With threads according to ASME B1.20.1.

G. Valve Bypass and Drain Connections: MSS SP-45.

2.2 BRONZE BALL VALVES

A. Two-Piece, Full-Port, Bronze Ball Valves with Bronze Trim and Blowout-Proof Stem:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Crane Co.; Crane Valve Group; Crane Valves.
   b. Milwaukee Valve Company.
   c. NIBCO INC.

2. Description:

   a. Standard: MSS SP-110.
   b. SWP Rating: 150 psig.
   c. CWP Rating: 600 psig
   d. Body Design: Two piece.
   e. Body Material: Bronze.
   f. Ends: Threaded or solder.
   g. Seats: PTFE.
   h. Stem: Bronze.
   i. Ball: Chrome-plated brass.
   j. Port: Full.

2.3 BRONZE GLOBE VALVES

A. Class 150, Bronze Globe Valves with Nonmetallic Disc:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Crane Co.; Crane Valve Group.
   b. Milwaukee Valve Company.
   c. NIBCO INC.

2. Description:

   a. Standard: MSS SP-80, Type 2.
   b. CWP Rating: 300 psig.
   c. Body Material: ASTM B 62, bronze with integral seat and union-ring bonnet.
   d. Ends: Threaded or solder.
   e. Stem: Bronze.
   f. Disc: PTFE.
   g. Packing: Asbestos free.
   h. Handwheel: Malleable iron.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.

B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.

C. Examine threads on valve and mating pipe for form and cleanliness.

D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.

E. Do not attempt to repair defective valves; replace with new valves.

3.2 VALVE INSTALLATION

A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

B. Locate valves for easy access and provide separate support where necessary.

C. Install valves in horizontal piping with stem at or above center of pipe.

D. Install valves in position to allow full stem movement.

3.3 ADJUSTING

A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.4 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

A. If valve applications are not indicated, use the following:

1. Shutoff Service: Ball valves.
2. Throttling Service except Steam: Globe valves.

B. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP classes or CWP ratings may be substituted.

C. Select valves, except wafer types, with the following end connections:

1. For Copper Tubing, NPS 2 and Smaller: Threaded ends except where solder-joint valve-end option is indicated in valve schedules below.
2. For Steel Piping, NPS 2 and Smaller: Threaded ends.

3.5 HEATING-WATER VALVE SCHEDULE

A. Pipe NPS 2 and Smaller:

1. Bronze Valves: May be provided with solder-joint ends instead of threaded ends.
2. Ball Valves: Two piece, full bronze with bronze trim.
3. Bronze Globe Valves: Class 150, bronze with nonmetallic disc.

END OF SECTION

SECTION 23 05 29
HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

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.

1.2 SUMMARY

A. Section Includes:

1. Metal pipe hangers and supports.
2. Trapeze pipe hangers.
3. Thermal-hanger shield inserts.
4. Fastener systems.
5. Equipment supports.

B. Related Sections:

1. Section 05 50 00 "Metal Fabrications" for structural-steel shapes and plates for trapeze hangers for pipe and equipment supports.
2. Section 23 31 13 "Metal Ducts" for duct hangers and supports.

1.3 DEFINITIONS

A. MSS: Manufacturers Standardization Society of The Valve and Fittings Industry Inc.

1.4 PERFORMANCE REQUIREMENTS

A. Structural Performance: Hangers and supports for HVAC piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.

1. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.
2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show fabrication and installation details and include calculations for the following; include Product Data for components:

1. Trapeze pipe hangers.

1.6 INFORMATIONAL SUBMITTALS

A. Welding certificates.

1.7 QUALITY ASSURANCE

A. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.1 METAL PIPE HANGERS AND SUPPORTS

A. Carbon-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Galvanized Metallic Coatings: Hot dipped.
3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
5. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel with scheduled finish.

B. Copper Pipe Hangers:

1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.
2. Hanger Rods: Continuous-thread rod, nuts, and washer made of copper-coated steel.

2.2 TRAPEZE PIPE HANGERS

A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

2.3 THERMAL-HANGER SHIELD INSERTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Carpenter & Paterson, Inc.
2. ERICO International Corporation.
3. National Pipe Hanger Corporation.
4. PHS Industries, Inc.
5. Pipe Shields, Inc.; a subsidiary of Piping Technology & Products, Inc.
6. Piping Technology & Products, Inc.
7. Rilco Manufacturing Co., Inc.

B. Insulation-Insert Material for Hot Piping: ASTM C 552, Type II cellular glass with 100-psig or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig minimum compressive strength.

C. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

D. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

E. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.4 FASTENER SYSTEMS

A. Mechanical-Expansion Anchors: Insert-wedge-type, stainless- steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

2.5 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

2.6 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.

B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.

1. Properties: Nonstaining, noncorrosive, and nongaseous.
2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT INSTALLATION

A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.

B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.

1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.
2. Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.

C. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

D. Fastener System Installation:

1. Do not use powder-actuated concrete fasteners.
2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

E. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

F. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

G. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

H. Install lateral bracing with pipe hangers and supports to prevent swaying.

I. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

J. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

K. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.

L. Insulated Piping:

1. Attach clamps and spacers to piping.

a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
b. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.

2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.

a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.

a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

4. Shield Dimensions for Pipe: Not less than the following:

a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.

5. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.2 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

B. Grouting: Place grout under supports for equipment and make bearing surface smooth.

C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.3 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.4 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1-1/2.

3.5 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

3.6 MATERIAL/FINISH SCHEDULE

A. Plain Carbon Steel Support Systems: All hanger hardware, rods, etc. shall be plain carbon steel.

B. Copper Plated Support Systems: All hanger hardware, rods, etc. shall be copper plated carbon steel.

3.7 HANGER AND SUPPORT SCHEDULE

A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.

B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Use padded hangers for piping that is subject to scratching.

F. Use thermal-hanger shield inserts for insulated piping and tubing.

G. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30.
2. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36, requiring clamp flexibility and up to 4 inches of insulation.
3. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes NPS 1/2 to NPS 24 if little or no insulation is required.
4. Pipe Hangers (MSS Type 5): For suspension of pipes NPS 1/2 to NPS 4, to allow off-center closure for hanger installation before pipe erection.
5. Adjustable, Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of noninsulated, stationary pipes NPS 3/4 to NPS 8.
6. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
7. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
8. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
9. Split Pipe Ring with or without Turnbuckle Hangers (MSS Type 11): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 8.
10. Extension Hinged or Two-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 3.
11. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30.
12. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.
13. Single-Pipe Rolls (MSS Type 41): For suspension of pipes NPS 1 to NPS 30, from two rods if longitudinal movement caused by expansion and contraction might occur.
14. Adjustable Roller Hangers (MSS Type 43): For suspension of pipes NPS 2-1/2 to NPS 24, from single rod if horizontal movement caused by expansion and contraction might occur.
15. Complete Pipe Rolls (MSS Type 44): For support of pipes NPS 2 to NPS 42 if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.
16. Pipe Roll and Plate Units (MSS Type 45): For support of pipes NPS 2 to NPS 24 if small horizontal movement caused by expansion and contraction might occur and vertical adjustment is not necessary.

17. Adjustable Pipe Roll and Base Units (MSS Type 46): For support of pipes NPS 2 to NPS 30 if vertical and lateral adjustment during installation might be required in addition to expansion and contraction.

H. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24.
2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 if longer ends are required for riser clamps.

I. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.

J. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction, to attach to top flange of structural shape.
3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
6. C-Clamps (MSS Type 23): For structural shapes.
7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
11. Malleable-Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
12. Welded-Steel Brackets: For support of pipes from below or for suspending from above by using clip and rod. Use one of the following for indicated loads:

a. Light (MSS Type 31): 750 lb.
b. Medium (MSS Type 32): 1500 lb.
c. Heavy (MSS Type 33): 3000 lb.

13. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
14. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
15. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.

K. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

L. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.

M. Comply with MFMA-103 for metal framing system selections and applications that are not specified in piping system Sections.

N. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

END OF SECTION

SECTION 23 05 53
IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

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.

1.2 SUMMARY

A. Section Includes:

1. Equipment labels.
2. Pipe labels.
3. Duct labels.
4. Valve tags.
5. Ceiling grid markers.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples: For color, letter style, and graphic representation required for each identification material and device.

C. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.

D. Valve numbering scheme.

E. Valve Schedules: For each piping system to include in maintenance manuals.

1.4 COORDINATION

A. All labels and valve tags shall match existing labeling type and nomenclature. Valve tags shall match existing tag type and numbering system.

B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

C. Coordinate installation of identifying devices with locations of access panels and doors.

D. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Plastic Labels for Equipment:

1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.
2. Letter Color: White.
3. Background Color: Black.
4. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
6. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
7. Fasteners: Stainless-steel rivets or self-tapping screws.
8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified.

C. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 PIPE LABELS

A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.

B. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

C. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.
2. Lettering Size: At least 1-1/2 inches high.

2.3 DUCT LABELS

A. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

B. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

C. Duct Label Contents: Include identification of duct service using same designations or abbreviations as used on Drawings, duct size, and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with duct system service lettering to accommodate both directions, or as separate unit on each duct label to indicate flow direction.
2. Lettering Size: At least 1-1/2 inches high.

2.4 VALVE TAGS

A. Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers.

1. Tag Material: Brass, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
2. Fasteners: Brass wire-link or beaded chain; or S-hook.

B. Valve Schedules: For each piping system, on 8-1/2-by-11-inch bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.

1. Valve-tag schedule shall be included in operation and maintenance data.

2.5 CEILING GRID MARKERS

A. Ceiling Grid Markers: Self-adhesive round, 1/2 inch diameter color coding removable labels.

1. Similar to Avery® Model 5050, 5051, 5052, or 5053.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment.

B. Locate equipment labels where accessible and visible.

3.3 PIPE LABEL INSTALLATION

A. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

1. Near each valve and control device.
2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
4. At access doors, manholes, and similar access points that permit view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

B. Pipe Label Color Schedule: Match existing type, size and nomenclature.

C. Install self-adhesive duct labels with permanent adhesive on air ducts in the following existing color codes and nomenclature.

D. Locate labels near points where ducts enter into concealed spaces and at maximum intervals of 50 feet in each space where ducts are exposed or concealed by removable ceiling system.

3.4 VALVE-TAG INSTALLATION

A. Install tags on valves and control devices in piping systems, except check valves; valves within factory-fabricated equipment units; shutoff valves; faucets; convenience and lawn-watering hose connections; and HVAC terminal devices and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.

B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in the following subparagraphs:

1. Valve-Tag Size, Shape and Color: Match existing
2. Valve Tag Numbering: Match Existing.

3.5 CEILING GRID MARKER INSTALLATION

A. Install ceiling grid markers on lay-in tile ceiling grid, ceiling access panels and wall access panels. Locate markers visible from occupied space to identify mechanical equipment, valves, dampers, etc., located above.

B. Ceiling Grid Markers Schedule:

1. Equipment: Red, Avery® 5051
2. Valves: Green, Avery® 5052
3. Control Device: Orange, Avery® 5062

C. If schedule requires different color labels in one location, install all colors required for proper identification.

END OF SECTION

SECTION 23 05 93
TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Balancing Air Systems:

a. Variable-air-volume systems.

2. Balancing Hydronic Piping Systems:

a. Variable-flow hydronic systems.

1.3 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.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: Within 15 days of Contractor's Notice to Proceed, submit documentation that the TAB contractor and this Project's TAB team members meet the qualifications specified in "Quality Assurance" Article.

B. Contract Documents Examination Report: Within 45 days of Contractor's Notice to Proceed, submit the Contract Documents review report as specified in Part 3.

C. Strategies and Procedures Plan: Within 60 days of Contractor's Notice to Proceed, submit TAB strategies and step-by-step procedures as specified in "Preparation" Article.

D. Certified TAB reports.

E. Sample report forms.

F. Instrument calibration reports, to include the following:

1. Instrument type and make.
2. Serial number.
3. Application.
4. Dates of use.
5. Dates of calibration.

1.5 QUALITY ASSURANCE

A. TAB Contractor Qualifications: Engage a TAB entity certified by NEBB.

1. TAB Field Supervisor: Employee of the TAB contractor and certified by NEBB.
2. TAB Technician: Employee of the TAB contractor and who is certified by NEBB as a TAB technician.

B. Certify TAB field data reports and perform the following:

1. Review field data reports to validate accuracy of data and to prepare certified TAB reports.
2. Certify that the TAB team complied with the approved TAB plan and the procedures specified and referenced in this Specification.

C. TAB Report Forms: Use standard TAB contractor's forms approved by Architect.

D. Instrumentation Type, Quantity, Accuracy, and Calibration: As described in ASHRAE 111, Section 5, "Instrumentation."

E. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 7.2.2 - "Air Balancing."

F. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6.7.2.3 - "System Balancing."

1.6 PROJECT CONDITIONS

A. Full Owner Occupancy: Owner will occupy the site and existing building during entire TAB period. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.

1.7 COORDINATION

A. Notice: Provide seven 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.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 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 used for supply, return, or relief air to verify that they meet the leakage class of connected ducts as specified in Section 23 31 13 "Metal Ducts" 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 heat-transfer coils for correct piping connections and for clean and straight fins.

M. Examine existing system pumps to ensure absence of entrained air in the suction piping.

N. Examine operating safety interlocks and controls on HVAC equipment.

O. 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.

3.2 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.

3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

A. Perform testing and balancing procedures on each system according to the procedures contained in ASHRAE 111 or NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" and in this Section.

1. Comply with requirements in ASHRAE 62.1, Section 7.2.2 - "Air Balancing."

B. 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. After testing and balancing, install test ports and duct access doors that comply with requirements in Section 23 33 00 "Air Duct Accessories."

3. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish according to Section 23 07 13 "Duct Insulation" and Section 23 07 19 "HVAC Piping Insulation."

C. 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.

D. Take and report testing and balancing measurements in inch-pound (IP) units.

3.4 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. Prepare schematic diagrams of systems' "as-built" duct layouts.

C. Determine the best locations for accurate duct-airflow measurements.

D. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.

E. Check dampers for proper position to achieve desired airflow path.

F. Check for airflow blockages.

G. Verify that air duct system is sealed as specified in Section 23 31 13 "Metal Ducts."

3.5 PROCEDURES FOR VARIABLE-AIR-VOLUME SYSTEMS

A. Pressure-Independent, Variable-Air-Volume Systems: Adjust the variable-air-volume systems as follows:

1. Measure total system airflow. Adjust to within indicated airflow.
2. Set terminal units at maximum airflow and adjust controller or regulator to deliver the designed maximum airflow. Use terminal-unit manufacturer's written instructions to make this adjustment. When total airflow is correct, balance the air outlets downstream from terminal units the same as described for constant-volume air systems.
3. Set terminal units at minimum airflow and adjust controller or regulator to deliver the designed minimum airflow. Check air outlets for a proportional reduction in airflow the same as described for constant-volume air systems.

    a. If air outlets are out of balance at minimum airflow, report the condition but leave outlets balanced for maximum airflow.

4. Measure static pressure at the most critical terminal unit and adjust the static-pressure controller at the main supply-air sensing station to ensure that adequate static pressure is maintained at the most critical unit.
5. Record final fan-performance data.

3.6 GENERAL PROCEDURES FOR HYDRONIC SYSTEMS

A. Prepare test reports with pertinent design data, and number in sequence starting at pump to end of system. Check the sum of branch-circuit flows against the approved pump flow rate. Correct variations that exceed plus or minus 5 percent.

B. Prepare schematic diagrams of systems' "as-built" piping layouts.

C. Prepare hydronic systems for testing and balancing according to the following, in addition to the general preparation procedures specified above:

1. Open all manual valves for maximum flow.
2. Check flow-control valves for specified sequence of operation, and set at indicated flow.
3. Set system controls so automatic valves are wide open to heat exchangers.
4. Check pump-motor load. If motor is overloaded, throttle main flow-balancing device so motor nameplate rating is not exceeded.
5. Check air vents for a forceful liquid flow exiting from vents when manually operated.

3.7 PROCEDURES FOR VARIABLE-FLOW HYDRONIC SYSTEMS

A. Balance systems with automatic two-way control valves by setting systems at maximum flow through heat-exchange terminals and proceed as specified above for hydronic systems.

3.8 PROCEDURES FOR HEAT-TRANSFER COILS

A. Measure, adjust, and record the following data for each water coil:

1. Entering- and leaving-water temperature.
2. Water flow rate.
3. Water pressure drop.
4. Dry-bulb temperature of entering and leaving air.
5. Wet-bulb temperature of entering and leaving air for cooling coils.
6. Airflow.
7. Air pressure drop.

B. 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.

C. Measure, adjust, and record the following data for each steam coil:

1. Dry-bulb temperature of entering and leaving air.
2. Airflow.
3. Air pressure drop.
4. Inlet steam pressure.

D. 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.
5. Refrigerant suction pressure and temperature.

3.9 PROCEDURES FOR TESTING, ADJUSTING, AND BALANCING EXISTING SYSTEMS

A. Perform a preconstruction inspection of existing equipment that is to remain and be reused.

1. Measure and record the operating speed, airflow, and static pressure of main supply and return fan.
2. Measure motor voltage and amperage. Compare the values to motor nameplate information.
3. Check the condition of filters.
4. Check the condition of coils.
5. Check the operation of the drain pan and condensate-drain trap.
6. Check bearings and other lubricated parts for proper lubrication.
7. Report on the operating condition of the equipment and the results of the measurements taken. Report deficiencies.

B. Before performing testing and balancing of existing systems, inspect existing equipment that is to remain and be reused to verify that existing equipment has been cleaned and refurbished. Verify the following:

1. New filters are installed.
2. Coils are clean and fins combed.
3. Drain pans are clean.
4. Fans are clean.
5. Bearings and other parts are properly lubricated.
6. Deficiencies noted in the preconstruction report are corrected.

C. Perform testing and balancing of existing systems to the extent that existing systems are affected by the renovation work.

1. Compare the indicated airflow of the renovated work to the measured fan airflows, and determine the new fan speed and the face velocity of filters and coils.
2. Verify that the indicated airflows of the renovated work result in filter and coil face velocities and fan speeds that are within the acceptable limits defined by equipment manufacturer.
3. If calculations increase or decrease the air flow rates and water flow rates by more than 5 percent, make equipment adjustments to achieve the calculated

rates. If increase or decrease is 5 percent or less, equipment adjustments are not required.
4. Balance each air outlet.

3.10 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.

3.11 REPORTING

A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article, prepare a report on the adequacy of design for systems' balancing devices. Recommend changes and additions to systems' balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.

B. Status Reports: Prepare weekly progress reports to describe completed procedures, procedures in progress, and scheduled procedures. Include a list of deficiencies and problems found in systems being tested and balanced. Prepare a separate report for each system and each building floor for systems serving multiple floors.

3.12 FINAL REPORT

A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.

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. Manufacturers' test data.
2. Field test reports prepared by system and equipment installers.
3. 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.

12. Nomenclature sheets for each item of equipment.
13. Data for terminal units, including manufacturer's name, type, size, and fittings.
14. Notes to explain why certain final data in the body of reports vary from indicated values.
15. 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. Fan drive settings including settings and percentage of maximum pitch diameter.
    e. Settings for supply-air, static-pressure controller.
    f. 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 supply, return, and exhaust airflows.
2. Water flow rates.
3. Duct, outlet, and inlet sizes.
4. Pipe and valve sizes and locations.
5. Terminal units.
6. Position of balancing devices.

E. Existing Air-Handling-Unit Test Reports: For air-handling units with coils, include the following:

1. Unit Data:

    a. Unit identification.
    b. Location.
    c. Make and type.
    d. Model number and unit size.

e. Manufacturer's serial number.
f. Unit arrangement and class.
g. Discharge arrangement.
h. Sheave make, size in inches, and bore.
i. Center-to-center dimensions of sheave, and amount of adjustments in inches.
j. Number, make, and size of belts.
k. Number, type, and size of filters.

2. Motor Data:

a. Motor make, and frame type and size.
b. Horsepower and rpm.
c. Volts, phase, and hertz.
d. Full-load amperage and service factor.
e. Sheave make, size in inches, and bore.
f. Center-to-center dimensions of sheave, and amount of adjustments in inches.

3. Test Data (Indicated and Actual Values):

a. Total air flow rate in cfm.
b. Total system static pressure in inches wg
c. Fan rpm.
d. Discharge static pressure in inches wg.
e. Filter static-pressure differential in inches wg.
f. Preheat-coil static-pressure differential in inches wg.
g. Cooling-coil static-pressure differential in inches wg.
h. Heating-coil static-pressure differential in inches wg.
i. Outdoor airflow in cfm.
j. Return airflow in cfm.
k. Outdoor-air damper position.
l. Return-air damper position.

F. Fan Test Reports: For supply, return, and exhaust fans, include the following:

1. Fan Data:

a. System identification.
b. Location.
c. Make and type.
d. Model number and size.
e. Manufacturer's serial number.
f. Arrangement and class.
g. Sheave make, size in inches, and bore.
h. Center-to-center dimensions of sheave, and amount of adjustments in inches.

2. Motor Data:

a. Motor make, and frame type and size.
b. Horsepower and rpm.

c. Volts, phase, and hertz.
d. Full-load amperage and service factor.
e. Sheave make, size in inches, and bore.
f. Center-to-center dimensions of sheave, and amount of adjustments in inches.
g. Number, make, and size of belts.

3. Test Data (Indicated and Actual Values):

a. Total airflow rate in cfm.
b. Total system static pressure in inches wg.
c. Fan rpm.
d. Discharge static pressure in inches wg.
e. Suction static pressure in inches wg

G. Round, Flat-Oval, and Rectangular Duct Traverse Reports: Include a diagram with a grid representing the duct cross-section and record the following:

1. Report Data:

a. System and air-handling-unit number.
b. Location and zone.
c. Traverse air temperature in deg F.
d. Duct static pressure in inches wg.
e. Duct size in inches.
f. Duct area in sq. ft.
g. Indicated air flow rate in cfm.
h. Indicated velocity in fpm.
i. Actual air flow rate in cfm.
j. Actual average velocity in fpm.
k. Barometric pressure in psig.

H. Air-Terminal-Device Reports:

1. Unit Data:

a. System and air-handling unit identification.
b. Location and zone.
c. Apparatus used for test.
d. Area served.
e. Make.
f. Number from system diagram.
g. Type and model number.
h. Size.
i. Effective area in sq. ft.

2. Test Data (Indicated and Actual Values):

a. Air flow rate in cfm.
b. Air velocity in fpm.
c. Preliminary air flow rate as needed in cfm.
d. Preliminary velocity as needed in fpm.

e. Final air flow rate in cfm.
f. Final velocity in fpm.
g. Space temperature in deg F.

I. System-Coil Reports: For reheat coils and water coils of terminal units, include the following:

1. Unit Data:

a. System and air-handling-unit identification.
b. Location and zone.
c. Room or riser served.
d. Coil make and size.
e. Flowmeter type.

2. Test Data (Indicated and Actual Values):

a. Air flow rate in cfm.
b. Entering-water temperature in deg F.
c. Leaving-water temperature in deg F.
d. Water pressure drop in feet of head or psig.
e. Entering-air temperature in deg F.
f. Leaving-air temperature in deg F.

J. Existing Pump Test Reports: Calculate impeller size by plotting the shutoff head on pump curves and include the following:

1. Unit Data:

a. Unit identification.
b. Location.
c. Service.
d. Make and size.
e. Model number and serial number.
f. Water flow rate in gpm.
g. Water pressure differential in feet of head or psig.
h. Required net positive suction head in feet of head or psig.
i. Pump rpm.
j. Impeller diameter in inches.
k. Motor make and frame size.
l. Motor horsepower and rpm.
m. Voltage at each connection.
n. Amperage for each phase.
o. Full-load amperage and service factor.
p. Seal type.

2. Test Data (Indicated and Actual Values):

a. Static head in feet of head or psig.
b. Pump shutoff pressure in feet of head or psig.
c. Actual impeller size in inches.
d. Full-open flow rate in gpm.

e. Full-open pressure in feet of head or psig.
f. Final discharge pressure in feet of head or psig.
g. Final suction pressure in feet of head or psig.
h. Final total pressure in feet of head or psig.
i. Final water flow rate in gpm.
j. Voltage at each connection.
k. Amperage for each phase.

K. Instrument Calibration Reports:

1. Report Data:

a. Instrument type and make.
b. Serial number.
c. Application.
d. Dates of use.
e. Dates of calibration.

3.13 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 10 percent of air outlets.
b. Measure water flow of at least 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. TAB Work will be considered defective if it does not pass 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.

C. Prepare test and inspection reports.

3.14 ADDITIONAL TESTS

A. Within 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
DUCT INSULATION

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.

1.2 SUMMARY

A. Section includes insulating the following duct services:

1. Indoor, concealed supply air.

B. Related Sections:

1. Section 23 07 19 "HVAC Piping Insulation."
2. Section 23 31 13 "Metal Ducts" for duct liners.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory- and field-applied if any).

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail insulation application at elbows, fittings, dampers, specialties and flanges for each type of insulation.
2. Detail application at linkages of control devices.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.

C. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.

B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.7 COORDINATION

A. Coordinate clearance requirements with duct Installer for duct insulation application. Before preparing ductwork Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

1.8 SCHEDULING

A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.

B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Comply with requirements in "Duct Insulation Schedule, General," "Indoor Duct and Plenum Insulation Schedule," and "Aboveground, Outdoor Duct and Plenum Insulation Schedule" articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

F. Glass-Fiber Blanket Insulation: Glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type III with factory-applied FSK jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Products: Subject to compliance with requirements, provide one of the following:

a. CertainTeed Corp.; SoftTouch Duct Wrap.
b. Johns Manville; Microlite XG.
c. Knauf Insulation; Friendly Feel Duct Wrap.
d. Owens Corning; SOFTR All-Service Duct Wrap.

2.2 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.

B. Glass-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-127.Eagle Bridges - Marathon Industries; 225.
b. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-60/85-70.Mon-Eco Industries, Inc.; 22-25.

2. For indoor applications, adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. ASJ Adhesive, and FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-82.
    b. Eagle Bridges - Marathon Industries; 225.
    c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-50.Mon-Eco Industries, Inc.; 22-25.

2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.3 LAGGING ADHESIVES

A. Description: Comply with MIL-A-3316C, Class I, Grade A and shall be compatible with insulation materials, jackets, and substrates.

1. For indoor applications, use lagging adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Products: Subject to compliance with requirements, provide one of the following:

    a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-50 AHV2.Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-36.
    b. Vimasco Corporation; 713 and 714.

3. Fire-resistant, water-based lagging adhesive and coating for use indoors to adhere fire-resistant lagging cloths over duct insulation.
4. Service Temperature Range: 0 to plus 180 deg F.
5. Color: White.

2.4 SEALANTS

A. FSK and Metal Jacket Flashing Sealants:

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-76.Eagle Bridges - Marathon Industries; 405.
    b. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 95-44.
    c. Mon-Eco Industries, Inc.; 44-05.

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F.
5. Color: Aluminum.
6. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
7. Sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.5 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.

2.6 TAPES

A. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.

1. Products: Subject to compliance with requirements available products that may be incorporated into the Work include, but are not limited to, the following:

   a. ABI, Ideal Tape Division; 491 AWF FSK.
   b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0827.
   c. Compac Corporation; 110 and 111.
   d. Venture Tape; 1525 CW NT, 1528 CW, and 1528 CW/SQ.

2. Width: 3 inches.
3. Thickness: 6.5 mils.
4. Adhesion: 90 ounces force/inch in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch in width.
7. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

2.7 SECUREMENTS

A. Bands:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. ITW Insulation Systems; Gerrard Strapping and Seals.
b. RPR Products, Inc.; Insul-Mate Strapping, Seals, and Springs.

2. Stainless Steel: ASTM A 167 or ASTM A 240/A 240M, Type 316; 0.015 inch thick, 3/4 inch wide with wing seal.
3. Aluminum: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 3/4 inch wide with wing seal.
4. Springs: Twin spring set constructed of stainless steel with ends flat and slotted to accept metal bands. Spring size determined by manufacturer for application.

B. Insulation Pins and Hangers:

1. Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch-diameter shank, length to suit depth of insulation indicated.

a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

1) AGM Industries, Inc.; CWP-1.
2) GEMCO; CD.
3) Midwest Fasteners, Inc.; CD.
4) Nelson Stud Welding; TPA, TPC, and TPS.

2. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch-diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch galvanized carbon-steel washer.

a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

1) AGM Industries, Inc.; CHP-1.
2) GEMCO; Cupped Head Weld Pin.
3) Midwest Fasteners, Inc.; Cupped Head.
4) Nelson Stud Welding; CHP.

3. Metal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:

a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

1) AGM Industries, Inc.; Tactoo Perforated Base Insul-Hangers.
2) GEMCO; Perforated Base.
3) Midwest Fasteners, Inc.; Spindle.

b. Baseplate: Perforated, galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
c. Spindle: Copper- or zinc-coated, low-carbon steel, Aluminum or Stainless steel, fully annealed, 0.106-inch-diameter shank, length to suit depth of insulation indicated.
d. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.

4. Nonmetal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate fastened to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:

a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

1) GEMCO; Nylon Hangers.
2) Midwest Fasteners, Inc.; Nylon Insulation Hangers.

b. Baseplate: Perforated, nylon sheet, 0.030 inch thick by 1-1/2 inches in diameter.
c. Spindle: Nylon, 0.106-inch-diameter shank, length to suit depth of insulation indicated, up to 2-1/2 inches.
d. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.

5. Self-Sticking-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:

a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

1) AGM Industries, Inc.; Tactoo Self-Adhering Insul-Hangers.
2) GEMCO; Peel & Press.
3) Midwest Fasteners, Inc.; Self Stick.

b. Baseplate: Galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
c. Spindle: Copper- or zinc-coated, low-carbon steel, Aluminum or Stainless steel, fully annealed, 0.106-inch-diameter shank, length to suit depth of insulation indicated.
d. Adhesive-backed base with a peel-off protective cover.

6. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick, galvanized-steel, aluminum or stainless-steel sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.

    a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

        1) AGM Industries, Inc.; RC-150.
        2) GEMCO; R-150.
        3) Midwest Fasteners, Inc.; WA-150.
        4) Nelson Stud Welding; Speed Clips.

    b. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in exposed locations.

7. Nonmetal Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick nylon sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.

    a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

        1) GEMCO.
        2) Midwest Fasteners, Inc.

C. Staples: Outward-clinching insulation staples, nominal 3/4-inch-wide, stainless steel or Monel.

D. Wire: 0.062-inch soft-annealed, stainless steel or 0.062-inch soft-annealed, galvanized steel.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. C & F Wire.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.

1. Verify that systems to be insulated have been tested and are free of defects.
2. Verify that surfaces to be insulated are clean and dry.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Insulation securement material shall match ductwork material.

B. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of ducts and fittings.

C. Install insulation materials, vapor barriers or retarders, jackets, and thicknesses required for each item of duct system as specified in insulation system schedules.

D. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

E. Install insulation with longitudinal seams at top and bottom of horizontal runs.

F. Install multiple layers of insulation with longitudinal and end seams staggered.

G. Keep insulation materials dry during application and finishing.

H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

I. Install insulation with least number of joints practical.

J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.

K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

L. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.
2. Cover circumferential joints with 3-inch-wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
3. Overlap jacket longitudinal seams at least 1-1/2 inches. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.

    a. For below ambient services, apply vapor-barrier mastic over staples.

4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct flanges and fittings.

M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

3.4 PENETRATIONS

A. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

B. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Terminate insulation at fire damper sleeves for fire-rated wall and partition penetrations. Externally insulate damper sleeves to match adjacent insulation and overlap duct insulation at least 2 inches.

1. Comply with requirements in Section 07 84 13 "Penetration Firestopping" and fire-resistive joint sealers.

C. Insulation Installation at Floor Penetrations:

1. Duct: For penetrations through fire-rated assemblies, terminate insulation at fire damper sleeves and externally insulate damper sleeve beyond floor to match adjacent duct insulation. Overlap damper sleeve and duct insulation at least 2 inches.
2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 07 84 13 "Penetration Firestopping."

3.5 INSTALLATION OF GLASS-FIBER INSULATION

A. Blanket Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, of duct and plenum surfaces.
2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:

    a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
    b. On duct sides with dimensions larger than 18 inches, place pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
    c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
    d. Do not overcompress insulation during installation.
    e. Impale insulation over pins and attach speed washers.
    f. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.

4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.

    a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
    b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches.

5. Overlap unfaced blankets a minimum of 2 inches on longitudinal seams and end joints. At end joints, secure with steel bands spaced a maximum of 18 inches o.c.
6. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.

7. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch-wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

3.6 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Perform tests and inspections.

C. Tests and Inspections:

1. Inspect ductwork, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to one location(s) for each duct system defined in the "Duct Insulation Schedule, General" Article.

D. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.7 DUCT INSULATION SCHEDULE, GENERAL

A. Plenums and Ducts Requiring Insulation:

1. Indoor, concealed supply air.

B. Items Not Insulated:

1. Metal ducts with duct liner of sufficient thickness to comply with energy code and ASHRAE/IESNA 90.1.
2. Factory-insulated flexible ducts.
3. Factory-insulated plenums and casings.
4. Flexible connectors.
5. Vibration-control devices.
6. Factory-insulated access panels and doors.

3.8 INDOOR DUCT AND PLENUM INSULATION SCHEDULE

A. Concealed, round and flat-oval, supply-air duct insulation shall be one of the following:

1. Glass-Fiber Blanket: 1-1/2 inches thick and 0.75-lb/cu. ft. nominal density.

B. Concealed, rectangular, supply-air duct insulation shall be one of the following:

1. Glass-Fiber Blanket: 1-1/2 inches thick and 0.75-lb/cu. ft. nominal density.

END OF SECTION

SECTION 23 07 19
HVAC PIPING INSULATION

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.

1.2 SUMMARY

A. Section includes insulating the following HVAC piping systems:

1. Heating hot-water piping, indoors.

B. Related Sections:

1. Section 23 07 13 "Duct Insulation."

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory and field applied if any).

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
2. Detail attachment and covering of heat tracing inside insulation.
3. Detail insulation application at pipe expansion joints for each type of insulation.
4. Detail insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
5. Detail removable insulation at piping specialties.
6. Detail application of field-applied jackets.
7. Detail application at linkages of control devices.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance

of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.

C. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.

B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.7 COORDINATION

A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 23 05 29 "Hangers and Supports for HVAC Piping and Equipment."

B. Coordinate clearance requirements with piping Installer for piping insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

C. Coordinate installation and testing of heat tracing.

1.8 SCHEDULING

A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.

B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Comply with requirements in "Piping Insulation Schedule, General," "Indoor Piping Insulation Schedule," "Outdoor, Aboveground Piping Insulation Schedule," and "Outdoor, Underground Piping Insulation Schedule" articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

F. Glass-Fiber, Preformed Pipe Insulation:

1. Products: Subject to compliance with requirements, provide one of the following:

a. Fibrex Insulations Inc.; Coreplus 1200.
b. Johns Manville; Micro-Lok.
c. Knauf Insulation; Earthwool 1000-Degree Pipe Insulation.
d. Manson Insulation Inc.; Alley-K.
e. Owens Corning; Fiberglas Pipe Insulation.

2. Type I, 850 deg F Materials: Glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ-SSL. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

2.2 INSULATING CEMENTS

A. Glass-Fiber Insulating Cement: Comply with ASTM C 195.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Ramco Insulation, Inc.; Super-Stik.

B. Glass-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Ramco Insulation, Inc.; Ramcote 1200 and Quik-Cote.

2.3 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.

B. Glass-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

1. Products: Subject to compliance with requirements provide one of the following:

    a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-127.
    b. Eagle Bridges - Marathon Industries; 225.
    c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-60/85-70.
    d. Mon-Eco Industries, Inc.; 22-25.

2. For indoor applications, adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. 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.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-82.
    b. Eagle Bridges - Marathon Industries; 225.
    c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-50.
    d. Mon-Eco Industries, Inc.; 22-25.

2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.4 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.

1. For indoor applications, use mastics that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below-ambient services.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-80/30-90.
b. Vimasco Corporation; 749.

2. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm at 43-mildry film thickness.
3. Service Temperature Range: Minus 20 to plus 180 deg F.
4. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
5. Color: White.

C. Vapor-Barrier Mastic: Solvent based; suitable for indoor use on below-ambient services.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-30.
b. Eagle Bridges - Marathon Industries; 501.
c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-35.
d. Mon-Eco Industries, Inc.; 55-10.

2. Water-Vapor Permeance: ASTM F 1249, 0.05 perm at 35-mildry film thickness.
3. Service Temperature Range: 0 to 180 deg F.
4. Solids Content: ASTM D 1644, 44 percent by volume and 62 percent by weight.
5. Color: White.

D. Vapor-Barrier Mastic: Solvent based; suitable for outdoor use on below-ambient services.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; Encacel.
b. Eagle Bridges - Marathon Industries; 570.
c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 60-95/60-96.

2. Water-Vapor Permeance: ASTM F 1249, 0.05 perm at 30-mildry film thickness.
3. Service Temperature Range: Minus 50 to plus 220 deg F.
4. Solids Content: ASTM D 1644, 33 percent by volume and 46 percent by weight.
5. Color: White.

E. Breather Mastic: Water based; suitable for indoor and outdoor use on above-ambient services.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-10.
b. Eagle Bridges - Marathon Industries; 550.
c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 46-50.
d. Mon-Eco Industries, Inc.; 55-50.
e. Vimasco Corporation; WC-1/WC-5.

2. Water-Vapor Permeance: ASTM F 1249, 1.8 perms at 0.0625-inch dry film thickness.
3. Service Temperature Range: Minus 20 to plus 180 deg F.
4. Solids Content: 60 percent by volume and 66 percent by weight.
5. Color: White.

2.5 LAGGING ADHESIVES

A. Description: Comply with MIL-A-3316C, Class I, Grade A and shall be compatible with insulation materials, jackets, and substrates.

1. For indoor applications, use lagging adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Products: Subject to compliance with requirements, provide one of the following:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-50 AHV2.
b. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-36.
c. Vimasco Corporation; 713 and 714.

3. Fire-resistant, water-based lagging adhesive and coating for use indoors to adhere fire-resistant lagging cloths over pipe insulation.
4. Service Temperature Range: 0 to plus 180 deg F.
5. Color: White.

2.6 SEALANTS

A. ASJ Flashing Sealants and PVC Jacket Flashing Sealants:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

   a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-76.

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F.
5. Color: White.
6. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
7. Sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.7 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.

2.8 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. ABI, Ideal Tape Division; 428 AWF ASJ.
b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0836.
c. Compac Corporation; 104 and 105.
d. Venture Tape; 1540 CW Plus, 1542 CW Plus, and 1542 CW Plus/SQ.

2. Width: 3 inches.
3. Thickness: 11.5 mils.
4. Adhesion: 90 ounces force/inch in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch in width.
7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

2.9 SECUREMENTS

A. Bands:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. ITW Insulation Systems; Gerrard Strapping and Seals.
b. RPR Products, Inc.; Insul-Mate Strapping, Seals, and Springs.

2. Stainless Steel: ASTM A 167 or ASTM A 240/A 240M, Type 304; 0.015 inch thick, 3/4 inch wide with wing seal.
3. Aluminum: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 3/4 inch wide with wing seal.
4. Springs: Twin spring set constructed of stainless steel with ends flat and slotted to accept metal bands. Spring size determined by manufacturer for application.

B. Staples: Outward-clinching insulation staples, nominal 3/4-inch-wide, stainless steel or Monel.

C. Wire: 0.062-inch soft-annealed, stainless steel.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. C & F Wire.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.

1. Verify that systems to be insulated have been tested and are free of defects.
2. Verify that surfaces to be insulated are clean and dry.
3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

B. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

F. Keep insulation materials dry during application and finishing.

G. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

H. Install insulation with least number of joints practical.

I. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.

3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

J. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

K. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.
2. Cover circumferential joints with 3-inch-wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.

    a. For below-ambient services, apply vapor-barrier mastic over staples.

4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.

L. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

M. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

N. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

O. For above-ambient services, do not install insulation to the following:

1. Vibration-control devices.
2. Testing agency labels and stamps.
3. Nameplates and data plates.

3.4 PENETRATIONS

A. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

B. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.

1. Comply with requirements in Section 07 84 13 "Penetration Firestopping" for firestopping and fire-resistive joint sealers.

C. Insulation Installation at Floor Penetrations:

1. Pipe: Install insulation continuously through floor penetrations.
2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 07 84 13 "Penetration Firestopping."

3.5 GENERAL PIPE INSULATION INSTALLATION

A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.

B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:

1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.
6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.

8. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
9. Stencil or label the outside insulation jacket of each union with the word "union." Match size and color of pipe labels.

C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

3.6 INSTALLATION OF GLASS-FIBER INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above-ambient surfaces, secure laps with outward-clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as straight segments of pipe insulation when available.

2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

3.7 FIELD QUALITY CONTROL

A. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.8 PIPING INSULATION SCHEDULE, GENERAL

A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.

3.9 INDOOR PIPING INSULATION SCHEDULE

A. Heating-Hot-Water Supply and Return, 200 Deg F and Below:

1. NPS 1-1/2 and Smaller: Insulation shall be the following:

   a. Glass-Fiber: 1-1/2 inches thick.

2. NPS 2 and Larger: Insulation shall be the following:

   a. Glass-Fiber: 2 inches thick.

END OF SECTION

SECTION 23 09 00
INSTRUMENTATION AND CONTROL FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes control equipment for HVAC systems and components, including control components for terminal heating and cooling units not supplied with factory-wired controls.

B. Related Sections include the following:

1. Section 23 09 93 "Sequence of Operations for HVAC Controls" for requirements that relate to this Section.

1.3 DEFINITIONS

A. DDC: Direct digital control.

B. I/O: Input/output.

C. LonWorks: A control network technology platform for designing and implementing interoperable control devices and networks.

D. MS/TP: Master slave/token passing.

E. PC: Personal computer.

F. PID: Proportional plus integral plus derivative.

G. RTD: Resistance temperature detector.

1.4 SEQUENCE OF OPERATION

1.5 ACTION SUBMITTALS

A. Product Data: Include manufacturer's technical literature for each control device. Indicate dimensions, capacities, performance characteristics, electrical

characteristics, finishes for materials, and installation and startup instructions for each type of product indicated.

1. DDC System Hardware: Bill of materials of equipment indicating quantity, manufacturer, and model number. Include technical data for operator workstation equipment, interface equipment, control units, transducers/transmitters, sensors, actuators, valves, relays/switches, control panels, and operator interface equipment.
2. Control System Software: Include technical data for operating system software, operator interface, color graphics, and other third-party applications.
3. Controlled Systems: Instrumentation list with element name, type of device, manufacturer, model number, and product data. Include written description of sequence of operation including schematic diagram.

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. Bill of materials of equipment indicating quantity, manufacturer, and model number.
2. Schematic flow diagrams showing fans, pumps, coils, dampers, valves, and control devices.
3. Wiring Diagrams: Power, signal, and control wiring.
4. Details of control panel faces, including controls, instruments, and labeling.
5. Written description of sequence of operation.
6. Schedule of dampers including size, leakage, and flow characteristics.
7. Schedule of valves including flow characteristics.
8. DDC System Hardware:

    a. Wiring diagrams for control units with termination numbers.
    b. Schematic diagrams and floor plans for field sensors and control hardware.
    c. Schematic diagrams for control, communication, and power wiring, showing trunk data conductors and wiring between operator workstation and control unit locations.

9. Control System Software: List of color graphics indicating monitored systems, data (connected and calculated) point addresses, output schedule, and operator notations.
10. Controlled Systems:

    a. Schematic diagrams of each controlled system with control points labeled and control elements graphically shown, with wiring.
    b. Scaled drawings showing mounting, routing, and wiring of elements including bases and special construction.
    c. Written description of sequence of operation including schematic diagram.
    d. Points list.

1.6 INFORMATIONAL SUBMITTALS

A. Data Communications Protocol Certificates: Certify that each proposed DDC system component complies with ASHRAE 135.

B. Qualification Data: For Installer and manufacturer.

C. Software Upgrade Kit: For Owner to use in modifying software to suit future systems revisions or monitoring and control revisions.

D. Field quality-control test reports.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For HVAC instrumentation and control system to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 01 78 23 "Operation and Maintenance Data," include the following:

1. Maintenance instructions and lists of spare parts for each type of control device and compressed-air station.
2. Interconnection wiring diagrams with identified and numbered system components and devices.
3. Keyboard illustrations and step-by-step procedures indexed for each operator function.
4. Inspection period, cleaning methods, cleaning materials recommended, and calibration tolerances.
5. Calibration records and list of set points.

B. Software and Firmware Operational Documentation: Include the following:

1. Software operating and upgrade manuals.
2. Program Software Backup: On a magnetic media or compact disc, complete with data files.
3. Device address list.
4. Printout of software application and graphic screens.
5. Software license required by and installed for DDC workstations and control systems.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: Automatic control system manufacturer's authorized representative who is trained and approved for installation of system components required for this Project.

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.

C. Comply with ASHRAE 135 for DDC system components.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Factory-Mounted Components: Where control devices specified in this Section are indicated to be factory mounted on equipment, arrange for shipping of control devices to equipment manufacturer.

B. System Software: Update to latest version of software at Project completion.

1.10 COORDINATION

A. Coordinate location of thermostats, humidistats, and other exposed control sensors with plans and room details before installation.

B. Coordinate equipment with Section 28 31 11 "Digital, Addressable Fire-Alarm System" to achieve compatibility with equipment that interfaces with that system.

C. Coordinate supply of conditioned electrical branch circuits for control units and operator workstation.

D. Coordinate equipment with Division 26 Sections to achieve compatibility with starter coils and annunciation devices.

E. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Section 03 30 00 "Cast-in-Place Concrete."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 CONTROL SYSTEM

A. Manufacturers:

1. Staefa Control System Inc.; Siemens Building Technologies, Inc.

B. Extend existing control system as required for new and relocated VAV terminal units. System shall consist of sensors, indicators, actuators, final control elements, interface equipment, other apparatus, and accessories to control mechanical systems. Incorporate existing control sequences for all new new and relocated VAV Terminal units. Modify graphics to incorporate all new and relocated VAV terminal units and sensors.

2.3 DDC EQUIPMENT

A. Operator Workstation: Existing.

B. Control Units: Modular, comprising processor board with programmable, nonvolatile, random-access memory; local operator access and display panel; integral interface equipment; and backup power source.

1. Units monitor or control each I/O point; process information; execute commands from other control units, devices, and operator stations; and download from or upload to operator workstation or diagnostic terminal unit.
2. Stand-alone mode control functions operate regardless of network status. Functions include the following:

a. Global communications.
b. Discrete/digital, analog, and pulse I/O.
c. Monitoring, controlling, or addressing data points.
d. Software applications, scheduling, and alarm processing.
e. Testing and developing control algorithms without disrupting field hardware and controlled environment.

3. Local operator interface provides for download from or upload to operator workstation or diagnostic terminal unit.
4. ASHRAE 135 Compliance: Control units shall use ASHRAE 135 protocol and communicate using ISO 8802-3 (Ethernet) datalink/physical layer protocol.

C. Local Control Units: Modular, comprising processor board with electronically programmable, nonvolatile, read-only memory; and backup power source.

1. Units monitor or control each I/O point, process information, and download from or upload to operator workstation or diagnostic terminal unit.
2. Stand-alone mode control functions operate regardless of network status. Functions include the following:

a. Global communications.
b. Discrete/digital, analog, and pulse I/O.
c. Monitoring, controlling, or addressing data points.

3. Local operator interface provides for download from or upload to operator workstation or diagnostic terminal unit.
4. ASHRAE 135 Compliance: Control units shall use ASHRAE 135 protocol and communicate using ISO 8802-3 (Ethernet) datalink/physical layer protocol.

D. I/O Interface: Hardwired inputs and outputs may tie into system through controllers. Protect points so that shorting will cause no damage to controllers.

1. Binary Inputs: Allow monitoring of on-off signals without external power.
2. Pulse Accumulation Inputs: Accept up to 10 pulses per second.
3. Analog Inputs: Allow monitoring of low-voltage (0- to 10-V dc), current (4 to 20 mA), or resistance signals.
4. Binary Outputs: Provide on-off or pulsed low-voltage signal, selectable for normally open or normally closed operation.

5. Analog Outputs: Provide modulating signal, either low voltage (0- to 10-V dc) or current (4 to 20 mA).
6. Tri-State Outputs: Provide two coordinated binary outputs for control of three-point, floating-type electronic actuators.
7. Universal I/Os: Provide software selectable binary or analog outputs.

E. Power Supplies: Transformers with Class 2 current-limiting type or overcurrent protection; limit connected loads to 80 percent of rated capacity. DC power supply shall match output current and voltage requirements and be full-wave rectifier type with the following:

1. Output ripple of 5.0 mV maximum peak to peak.
2. Combined 1 percent line and load regulation with 100-mic.sec. response time for 50 percent load changes.
3. Built-in overvoltage and overcurrent protection and be able to withstand 150 percent overload for at least 3 seconds without failure.

F. Power Line Filtering: Internal or external transient voltage and surge suppression for workstations or controllers with the following:

1. Minimum dielectric strength of 1000 V.
2. Maximum response time of 10 nanoseconds.
3. Minimum transverse-mode noise attenuation of 65 dB.
4. Minimum common-mode noise attenuation of 150 dB at 40 to 100 Hz.

2.4 UNITARY CONTROLLERS

A. Unitized, capable of stand-alone operation with sufficient memory to support its operating system, database, and programming requirements, and with sufficient I/O capacity for the application.

1. Configuration: Local keypad and display; diagnostic LEDs for power, communication, and processor; wiring termination to terminal strip or card connected with ribbon cable; memory with bios; and 72-hour battery backup.
2. Operating System: Manage I/O communication to allow distributed controllers to share real and virtual object information and allow central monitoring and alarms. Perform automatic system diagnostics; monitor system and report failures.
3. ASHRAE 135 Compliance: Communicate using read (execute and initiate) and write (execute and initiate) property services defined in ASHRAE 135. Reside on network using MS/TP datalink/physical layer protocol and have service communication port for connection to diagnostic terminal unit.
4. Enclosure: Dustproof rated for operation at 32 to 120 deg F.

2.5 ELECTRONIC SENSORS

A. Description: Vibration and corrosion resistant; for wall, immersion, or duct mounting as required.

B. Temperature Sensors and Transmitters: Match Existing.

1. Room Security Sensors: Stainless-steel cover plate with insulated back and security screws.
2. Static-Pressure Transmitter: Nondirectional sensor with suitable range for expected input, and temperature compensated.

    a. Accuracy: 2 percent of full scale with repeatability of 0.5 percent.
    b. Output: 4 to 20 mA.
    c. Building Static-Pressure Range: 0- to 0.25-inch wg.
    d. Duct Static-Pressure Range: 0- to 5-inch wg.

2.6 ACTUATORS

A. Electronic Actuators: Direct-coupled type designed for minimum 60,000 full-stroke cycles at rated torque.

1. Manufacturers:

    a. Belimo Aircontrols (USA), Inc.

2. Valves: Size for torque required for valve close off at maximum pump differential pressure.
3. Coupling: V-bolt and V-shaped, toothed cradle.
4. Overload Protection: Electronic overload or digital rotation-sensing circuitry.
5. Fail-Safe Operation: Mechanical, spring-return mechanism. Provide external, manual gear release on nonspring-return actuators.
6. Power Requirements (Modulating): Maximum 10 VA at 24-V ac or 8 W at 24-V dc.
7. Proportional Signal: 2- to 10-V dc or 4 to 20 mA, and 2- to 10-V dc position feedback signal.
8. Temperature Rating: Minus 22 to plus 122 deg F.
9. Run Time: 12 seconds open, 5 seconds closed.

2.7 CONTROL VALVES

A. Available Manufacturers:

1. Danfoss Inc.; Air Conditioning & Refrigeration Div.
2. Erie Controls.
3. Hayward Industrial Products, Inc.
4. Magnatrol Valve Corporation.
5. Neles-Jamesbury.
6. Parker Hannifin Corporation; Skinner Valve Division.
7. Pneuline Controls.
8. Sauter Controls Corporation.

B. Control Valves: Factory fabricated, of type, body material, and pressure class based on maximum pressure and temperature rating of piping system, unless otherwise indicated.

C. Terminal Unit Control Valves: Bronze body, bronze trim, two or three ports as indicated, replaceable plugs and seats, and union and threaded ends.

1. Rating: Class 125 for service at 125 psig and 250 deg F operating conditions.
2. Sizing: 3-psig maximum pressure drop at design flow rate, to close against pump shutoff head.
3. Flow Characteristics: Two-way valves shall have equal percentage characteristics.

2.8 CONTROL CABLE

A. Electronic and fiber-optic cables for control wiring are specified in Section 27 15 00 "Communications Horizontal Cabling."

1. All cabling shall be Plenum Rated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that devices are installed before proceeding with installation.

B. Field verify location of existing duct static pressure sensors. Relocate is required.

3.2 INSTALLATION

A. Update software in control units and operator workstation(s) if required. Implement all features of existing programs and sequences of operation to existing and relocated VAV terminal units.

B. Connect and configure equipment and software to achieve sequence of operation specified. Incorporate existing control sequences for all new new and relocated VAV Terminal units. Modify graphics to incorporate all new and relocated VAV terminal units and sensors.

C. Verify location of the sensors with Drawings and room details before installation. Install devices 48 inches above the floor.

D. Install electronic and fiber-optic cables according to Section 27 15 00 "Communications Horizontal Cabling."

3.3 ELECTRICAL WIRING AND CONNECTION INSTALLATION

A. Install raceways, boxes, and cabinets according to Section 26 05 33 "Raceways and Boxes for Electrical Systems."

B. Install building wire and cable according to Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables."

C. Install signal and communication cable according to Section 27 15 00 "Communications Horizontal Cabling."

1. Conceal cable, except in mechanical rooms and areas where other conduit and piping are exposed.
2. Install exposed cable in raceway.
3. Install concealed cable in raceway.
4. Bundle and harness multiconductor instrument cable in place of single cables where several cables follow a common path.
5. Fasten flexible conductors, bridging cabinets and doors, along hinge side; protect against abrasion. Tie and support conductors.
6. Number-code or color-code conductors for future identification and service of control system, except local individual room control cables.
7. Install wire and cable with sufficient slack and flexible connections to allow for vibration of piping and equipment.

D. Connect manual-reset limit controls independent of manual-control switch positions. Automatic duct heater resets may be connected in interlock circuit of power controllers.

E. Connect hand-off-auto selector switches to override automatic interlock controls when switch is in hand position.

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing.

B. Perform the following field tests and inspections and prepare test reports:

1. Operational Test: After electrical circuitry has been energized, start units to confirm proper unit operation. Remove and replace malfunctioning units and retest.
2. Test and adjust controls and safeties.
3. Test calibration of electronic controllers by disconnecting input sensors and stimulating operation with compatible signal generator.
4. Test each point through its full operating range to verify that safety and operating control set points are as required.
5. Test each control loop to verify stable mode of operation and compliance with sequence of operation. Adjust PID actions.
6. Test each system for compliance with sequence of operation.
7. Test software and hardware interlocks.

C. DDC Verification:

1. Verify that instruments are installed before calibration, testing.
2. Check instruments for proper location and accessibility.

3. Check instrument installation for direction of flow, elevation, orientation, insertion depth, and other applicable considerations.
4. Check temperature instruments and material and length of sensing elements.
5. Check control valves. Verify that they are in correct direction.
6. Check DDC system as follows:

    a. Verify that DDC controller power supply is from emergency power supply, if applicable.
    b. Verify that wires at control panels are tagged with their service designation and approved tagging system.
    c. Verify that spare I/O capacity has been provided.
    d. Verify that DDC controllers are protected from power supply surges.

D. Replace damaged or malfunctioning controls and equipment and repeat testing procedures.

3.5 ADJUSTING

A. Calibrating and Adjusting:

1. Calibrate instruments.
2. Make three-point calibration test for both linearity and accuracy for each analog instrument.
3. Calibrate equipment and procedures using manufacturer's written recommendations and instruction manuals. Use test equipment with accuracy at least double that of instrument being calibrated.
4. Control System Inputs and Outputs:

    a. Check analog inputs at 0, 50, and 100 percent of span.
    b. Check analog outputs using milliampere meter at 0, 50, and 100 percent output.
    c. Check digital inputs using jumper wire.
    d. Check digital outputs using ohmmeter to test for contact making or breaking.
    e. Check resistance temperature inputs at 0, 50, and 100 percent of span using a precision-resistant source.

5. Pressure:

    a. Calibrate pressure transmitters at 0, 50, and 100 percent of span.
    b. Calibrate pressure switches to make or break contacts, with adjustable differential set at minimum.

6. Temperature:

    a. Calibrate resistance temperature transmitters at 0, 50, and 100 percent of span using a precision-resistance source.
    b. Calibrate temperature switches to make or break contacts.

7. Stroke and adjust control valves following the manufacturer's recommended procedure, so that valve or damper is 100 percent open and closed.

8. Provide diagnostic and test instruments for calibration and adjustment of system.
9. Provide written description of procedures and equipment for calibrating each type of instrument. Submit procedures review and approval before initiating startup procedures.

B. Adjust initial temperature and humidity set points.

C. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to one visit to Project during other than normal occupancy hours for this purpose.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain HVAC instrumentation and controls. Refer to Section 01 79 00 "Demonstration and Training."

END OF SECTION

SECTION 23 09 93
SEQUENCE OF OPERATIONS FOR HVAC CONTROLS

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.

1.2 SUMMARY

A. This Section includes control sequences for HVAC systems, subsystems, and equipment.

B. Related Sections include the following:

1. Section 23 09 00 "Instrumentation and Control for HVAC" for control equipment and devices and for submittal requirements.

1.3 DEFINITIONS

A. DDC: Direct digital control.

B. VAV: Variable air volume.

1.4 TERMINAL UNIT OPERATING SEQUENCE

A. VAV Terminal Air Units with Hydronic Coils:

1. Room Temperature:

a. Input Device: Electronic temperature sensor.
b. Output Device: Electronic damper actuators and control-valve operators.
c. Action: Modulate damper and valve to maintain temperature.

1) Incorporate existing VAV control sequence for all new and relocated VAV terminal units.

2. Display: Modify graphics to indicate new and relocated VAV Terminal units and temperature sensors. Incorporate existing VAV terminal unit graphic for all new and relocated VAV terminal units.

a. Room/area served.
b. Room occupied/unoccupied.

c. Room temperature indication.
d. Room temperature set point.
e. Room temperature set point, occupied.
f. Room temperature set point, unoccupied.
g. Air-damper position as percent open.
h. Control-valve position as percent open.
i. Discharge air temperature.
j. Airflow.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION

SECTION 23 21 13
HYDRONIC PIPING

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.

1.2 SUMMARY

A. Section includes pipe and fitting materials and joining methods for the following:

1. Hot-water heating piping.
2. Air-vent piping.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of the following:

1. Chemical treatment.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Piping layout, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Suspended ceiling components.
2. Other building services.
3. Structural members.

B. Qualification Data: For Installer.

C. Welding certificates.

D. Field quality-control reports.

E. Water Analysis: Submit a copy of the water analysis to illustrate water quality available at Project site.

1.5 QUALITY ASSURANCE

A. Steel Support Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Pipe Welding: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code: Section IX.

1. Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation.
2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Hydronic piping components and installation shall be capable of withstanding the following minimum working pressure and temperature unless otherwise indicated:

1. Hot-Water Heating Piping: 150 psig at 200 deg F.
2. Air-Vent Piping: 200 deg F.

2.2 COPPER TUBE AND FITTINGS

A. Hard Drawn-Temper Copper Tubing: ASTM B 88, Type L

B. Wrought-Copper Unions: ASME B16.22.

2.3 STEEL PIPE AND FITTINGS

A. Steel Pipe: ASTM A 53/A 53M, black steel with plain ends; welded and seamless, Grade B, and wall thickness as indicated in "Piping Applications" Article.

B. Malleable-Iron Threaded Fittings: ASME B16.3, Classes 150 and 300 as indicated in "Piping Applications" Article.

C. Malleable-Iron Unions: ASME B16.39; Classes 150, 250, and 300 as indicated in "Piping Applications" Article.

2.4 JOINING MATERIALS

A. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

B. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for joining copper with copper; or BAg-1, silver alloy for joining copper with bronze or steel.

2.5 DIELECTRIC FITTINGS

A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.

B. Dielectric Unions:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. A.Y. McDonald Mfg. Co.
b. Capitol Manufacturing Company.
c. Central Plastics Company.
d. Hart Industries International, Inc.
e. Jomar International, Ltd.
f. Matco-Norca.
g. Watts Regulator Co.
h. Zurn Industries, LLC; AquaSpec Commercial Faucet Products.

2. Description:

a. Standard: ASSE 1079.
a. Pressure Rating: 150 psig minimum at 180 deg F.
b. End Connections: Solder-joint copper alloy and threaded ferrous.

C. Dielectric Flanges:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Capitol Manufacturing Company.
b. Central Plastics Company.
c. Matco-Norca.
d. Watts Regulator Co.
e. Zurn Industries, LLC; AquaSpec Commercial Faucet Products.

2. Description:

a. Standard: ASSE 1079.
b. Factory-fabricated, bolted, companion-flange assembly.
c. Pressure Rating: 150 psig minimum at 180 deg F.
d. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

D. Dielectric-Flange Insulating Kits:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

    a. Advance Products & Systems, Inc.
    b. Calpico, Inc.
    c. Central Plastics Company.
    d. Pipeline Seal and Insulator, Inc.

2. Description:

    a. Nonconducting materials for field assembly of companion flanges.
    b. Pressure Rating: 150 psig.
    c. Gasket: Neoprene or phenolic.
    d. Bolt Sleeves: Phenolic or polyethylene.
    e. Washers: Phenolic with steel backing washers.

E. Dielectric Nipples:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

    a. Elster Perfection.
    b. Grinnell Mechanical Products.
    c. Matco-Norca.
    d. Precision Plumbing Products, Inc.
    e. Victaulic Company.

2. Description:

    a. Standard: IAPMO PS 66.
    b. Electroplated steel nipple, complying with ASTM F 1545.
    c. Pressure Rating: 300 psig, 225 deg F.
    d. End Connections: Male threaded or grooved.
    e. Lining: Inert and noncorrosive, propylene.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

A. Hot-water heating piping, aboveground, NPS 2 and smaller, shall be any of the following:

1. Type L, hard drawn-temper copper tubing, wrought-copper fittings, and brazed joints.

B. Hot-water heating piping, aboveground, NPS 2-1/2 and larger, shall be any of the following:

1. Schedule 40 steel pipe, wrought-steel fittings and wrought-cast or forged-steel flanges and flange fittings, and welded and flanged joints.

C. Air-Vent Piping:

1. Inlet: Same as service where installed with metal-to-plastic transition fittings for plastic piping systems according to piping manufacturer's written instructions.
2. Outlet: Type K, annealed-temper copper tubing with soldered or flared joints.

3.2 PIPING INSTALLATIONS

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

B. Drawings are diagrammatic and do not indicate all fittings required for installation. Contractor is responsible for the all required fittings necessary for a complete and workmanlike installation on accordance with the contract documents.

C. Drain piping as required for work. Coordinate with facility staff.

D. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

E. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

F. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

G. Install piping to permit valve servicing.

H. Install piping at indicated slopes.

I. Install piping free of sags and bends.

J. Install fittings for changes in direction and branch connections.

K. Install piping to allow application of insulation.

L. Select system components with pressure rating equal to or greater than system operating pressure.

M. Install groups of pipes parallel to each other, spaced to permit applying insulation and servicing of valves.

N. Install drains, consisting of a tee fitting, NPS 3/4 ball valve, and short NPS 3/4 threaded nipple with cap, at low points in piping system mains and elsewhere as required for system drainage.

O. Install manual air vents, consisting of a tee fitting, NPS 3/4 ball valve and NPS 3/4 type K annealed copper at all high points in piping systems. Copper pipe shall be carefully bent to point downwards.

P. Install piping at a uniform grade of 0.2 percent upward in direction of flow.

Q. Reduce pipe sizes using eccentric reducer fitting installed with level side up.

R. Install branch connections to mains using tee fittings in main pipe, with the branch connected to the bottom of the main pipe. For up-feed risers, connect the branch to the top of the main pipe.

S. Install shut-off valve at all branch connections to main pipe.

T. Install shut-off valve at all branch take-offs serving more than one piece of equipment.

U. Install valves according to Section 23 05 23 "General-Duty Valves for HVAC Piping."

V. Install unions in piping, NPS 2 and smaller, adjacent to valves, at final connections of equipment, and elsewhere as indicated.

W. Install flanges in piping, NPS 2-1/2 and larger, at final connections of equipment and elsewhere as indicated.

X. Install shutoff valve immediately upstream of each dielectric fitting.

Y. Comply with requirements in Division 23 Sections for installation of expansion loops, expansion joints, anchors, and pipe alignment guides.

Z. Comply with requirements in Section 23 05 53 "Identification for HVAC Piping and Equipment" for identifying piping.

AA. Install sleeves for piping penetrations of walls, ceilings, and floors.

3.3 DIELECTRIC FITTING INSTALLATION

A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.

B. Dielectric Fittings for NPS 2 and Smaller: Use dielectric nipples or unions.

C. Dielectric Fittings for NPS 2-1/2 to NPS 4: Use dielectric flanges, flange kits or nipples.

3.4 HANGERS AND SUPPORTS

A. Comply with requirements in Section 23 05 29 "Hangers and Supports for HVAC Piping and Equipment" for hanger, support, and anchor devices. Comply with the following requirements for maximum spacing of supports.

B. Install the following pipe attachments:

1. Adjustable steel clevis hangers for individual horizontal piping less than 20 feet long.
2. Adjustable roller hangers and spring hangers for individual horizontal piping 20 feet or longer.
3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet or longer, supported on a trapeze.
4. Spring hangers to support vertical runs.
5. Provide copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.

C. Install hangers for steel piping with the following maximum spacing and minimum rod sizes:

1. NPS 3/4: Maximum span, 7 feet.
2. NPS 1: Maximum span, 7 feet.
3. NPS 1-1/2: Maximum span, 9 feet.
4. NPS 2: Maximum span, 10 feet.
5. NPS 2-1/2: Maximum span, 11 feet.
6. NPS 3 and Larger: Maximum span, 12 feet.

D. Install hangers for hard drawn-temper copper piping with the following maximum spacing and minimum rod sizes:

1. NPS 3/4: Maximum span, 5 feet; minimum rod size, 1/4 inch.
2. NPS 1: Maximum span, 6 feet; minimum rod size, 1/4 inch.
3. NPS 1-1/4: Maximum span, 7 feet; minimum rod size, 3/8 inch.
4. NPS 1-1/2: Maximum span, 8 feet; minimum rod size, 3/8 inch.
5. NPS 2: Maximum span, 8 feet; minimum rod size, 3/8 inch.
6. NPS 2-1/2: Maximum span, 9 feet; minimum rod size, 3/8 inch.
7. NPS 3 and Larger: Maximum span, 10 feet; minimum rod size, 3/8 inch.

E. Support vertical runs at roof, at each floor, and at 10-footintervals between floors.

3.5 PIPE JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.

D. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8/A5.8M.

E. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

F. Welded Joints: Construct joints according to AWS D10.12M/D10.12, using qualified processes and welding operators according to "Quality Assurance" Article.

G. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

3.6 TERMINAL EQUIPMENT CONNECTIONS

A. Sizes for supply and return piping connections shall be the same as or larger than equipment connections.

B. Install control valves in accessible locations close to connected equipment.

C. Install bypass piping with globe valve around control valve. If parallel control valves are installed, only one bypass is required.

D. Install ports for pressure gages and thermometers at coil inlet and outlet connections.

3.7 CHEMICAL TREATMENT

A. Perform an analysis of water to determine quantities of chemical treatment needed to keep system free of scale, corrosion, and fouling.

B. Fill system with fresh water and add liquid alkaline compound with emulsifying agents and detergents to remove grease and petroleum products from piping. Circulate solution for a minimum of 24 hours, drain, clean strainer screens, and refill with fresh water.

C. Add chemical treatment using Owners existing feed system to match water quality of existing system.

D. Contract with Owner’s Chemical Treatment Vender for this work.

3.8 FIELD QUALITY CONTROL

A. Prepare hydronic piping according to ASME B31.9 and as follows:

1. Leave joints, including welds, uninsulated and exposed for examination during test.
2. Provide temporary restraints for expansion joints that cannot sustain reactions due to test pressure. If temporary restraints are impractical, isolate expansion joints from testing.
3. Flush hydronic piping systems with clean water; then remove and clean or replace strainer screens.
4. Isolate equipment from piping. If a valve is used to isolate equipment, its closure shall be capable of sealing against test pressure without damage to valve. Install blinds in flanged joints to isolate equipment.

B. Perform the following tests on hydronic piping:

1. Use ambient temperature water as a testing medium unless there is risk of damage due to freezing. Another liquid that is safe for workers and compatible with piping may be used.
2. While filling system, use vents installed at high points of system to release air. Use drains installed at low points for complete draining of test liquid.
3. Isolate expansion tanks and determine that hydronic system is full of water.
4. Subject piping system to hydrostatic test pressure that is not less than 1.5 times the system's working pressure. Test pressure shall not exceed maximum pressure for any vessel, pump, valve, or other component in system under test. Verify that stress due to pressure at bottom of vertical runs does not exceed 90 percent of specified minimum yield strength or 1.7 times the "SE" value in Appendix A in ASME B31.9, "Building Services Piping."
5. After hydrostatic test pressure has been applied for at least 10 minutes, examine piping, joints, and connections for leakage. Eliminate leaks by tightening, repairing, or replacing components, and repeat hydrostatic test until there are no leaks.
6. Prepare written report of testing.

C. Perform the following before operating the system:

1. Open manual valves fully.
2. Inspect air vents at high points of system and determine if all are installed and operating freely (automatic type), or bleed air completely (manual type).
3. Set temperature controls so all coils are calling for full flow.

END OF SECTION

SECTION 23 21 16
HYDRONIC PIPING SPECIALTIES

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.

1.2 SUMMARY

A. Section includes special-duty valves and specialties for the following:

1. Hot-water heating piping.
2. Air-vent piping.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of the following:

1. Valves: Include flow and pressure drop curves based on manufacturer's testing for calibrated-orifice balancing valves and automatic flow-control valves.
2. Air-control devices.
3. Hydronic specialties.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For air-control devices, hydronic specialties, and special-duty valves to include in emergency, operation, and maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Differential Pressure Meter: For each type of balancing valve and automatic flow control valve, include flowmeter, probes, hoses, flow charts, and carrying case.

1.6 QUALITY ASSURANCE

A. Pipe Welding: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code: Section IX.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Hydronic piping components and installation shall be capable of withstanding the following minimum working pressure and temperature unless otherwise indicated:

1. Hot-Water Heating Piping: 200 psig at 200 deg F.
2. Air-Vent Piping: 200 deg F.

2.2 VALVES

A. Gate, Globe, Check, Ball, and Butterfly Valves: Comply with requirements specified in Section 23 05 23 "General-Duty Valves for HVAC Piping."

B. Automatic Temperature-Control Valves, Actuators, and Sensors: Comply with requirements specified in Section 23 09 00 "Instrumentation and Control for HVAC."

C. Bronze, Calibrated-Orifice, Balancing Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

    a. Armstrong Pumps, Inc.
    b. Bell & Gossett Domestic Pump.
    c. Griswold Controls.
    d. Nexus Valve, Inc.
    e. Taco.

2. Body: Bronze, ball or plug type with calibrated orifice or venturi.
3. Ball: Brass or stainless steel.
4. Plug: Resin.
5. Seat: PTFE.
6. End Connections: Threaded or socket.
7. Pressure Gage Connections: Integral seals for portable differential pressure meter.
8. Handle Style: Lever, with memory stop to retain set position.
9. CWP Rating: Minimum 125 psig.
10. Maximum Operating Temperature: 250 deg F.

2.3 AIR-CONTROL DEVICES

A. Manual Air Vents:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

    a. AMTROL, Inc.

b. Armstrong Pumps, Inc.
c. Bell & Gossett Domestic Pump.
d. Nexus Valve, Inc.
e. Taco, Inc.

2. Body: Bronze.
3. Internal Parts: Nonferrous.
4. Operator: Screwdriver or thumbscrew.
5. Inlet Connection: NPS 1/2.
6. Discharge Connection: NPS 1/8.
7. CWP Rating: 150 psig.
8. Maximum Operating Temperature: 225 deg F.

2.4 HYDRONIC PIPING SPECIALTIES

A. Y-Pattern Strainers:

1. Body: ASTM A 126, Class B, cast iron with bolted cover and bottom drain connection.
2. End Connections: Threaded ends for NPS 2 and smaller; flanged ends for NPS 2-1/2 and larger.
3. Strainer Screen: Stainless-steel, 60-mesh strainer, or perforated stainless-steel basket.
4. CWP Rating: 125 psig.

PART 3 - EXECUTION

3.1 VALVE APPLICATIONS

A. Install shutoff-duty valves at each branch connection to supply mains and at supply connection to each piece of equipment.

B. Install throttling-duty valves at each branch connection to return main.

C. Install calibrated-orifice, balancing valves in the return pipe of each heating terminal.

3.2 HYDRONIC SPECIALTIES INSTALLATION

A. Install manual air vents at high points in piping, at heat-transfer coils, and elsewhere as required for system air venting.

END OF SECTION

SECTION 23 31 13
METAL DUCTS

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.

1.2 SUMMARY

A. Section Includes:

1. Single-wall rectangular ducts and fittings.
2. Single-wall round and flat-oval ducts and fittings.
3. Sheet metal materials.
4. Duct liner.
5. Sealants and gaskets.
6. Hangers and supports.

B. Related Sections:

1. Section 23 05 93 "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing requirements for metal ducts.
2. Section 23 33 00 "Air Duct Accessories" for dampers, sound-control devices, duct-mounting access doors and panels, turning vanes, and flexible ducts.

1.3 PERFORMANCE REQUIREMENTS

A. Delegated Duct Design: Duct construction, including sheet metal thicknesses, seam and joint construction, reinforcements, and hangers and supports, shall comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and performance requirements and design criteria indicated in "Duct Schedule" Article.

B. Structural Performance: Duct hangers and supports shall withstand the effects of gravity loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible".

C. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of the following products:

1. Liners and adhesives.
2. Sealants and gaskets.

B. Shop Drawings:

1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
2. Factory- and shop-fabricated ducts and fittings.
3. Duct layout indicating sizes, configuration, liner material, and static-pressure classes.
4. Diffusers, grilles, registers, louvers, etc. locations including sizes, air quantity and system.
5. Reflected ceiling plan including all devices, equipment, etc. installed in ceiling by other trades.
6. Elevation of top of ducts.
7. Dimensions of main duct runs from building grid lines.
8. Fittings.
9. Reinforcement and spacing.
10. Seam and joint construction.
11. Penetrations through fire-rated and other partitions.
12. Equipment installation based on equipment being used on Project.
13. Locations for duct accessories, including dampers, turning vanes, and access doors and panels.
14. Hangers and supports, including methods for duct and building attachment and vibration isolation.

C. Delegated-Design Submittal:

1. Sheet metal thicknesses.
2. Joint and seam construction and sealing.
3. Reinforcement details and spacing.
4. Materials, fabrication, assembly, and spacing of hangers and supports.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Duct installation in congested spaces, indicating coordination with general construction, building components, and other building services. Indicate proposed changes to duct layout.
2. Suspended ceiling components.
3. Structural members to which duct will be attached.
4. Size and location of initial access modules for acoustical tile.
5. Penetrations of smoke barriers and fire-rated construction.
6. Items penetrating finished ceiling including the following:

    a. Lighting fixtures.
    b. Air outlets and inlets.
    c. Speakers.

d. Sprinklers.
e. Access panels.
f. Other devices installed in ceiling.

B. Welding certificates.

C. Field quality-control reports.

1.6 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports.
2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum," for aluminum supports.
3. AWS D9.1M/D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.

B. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-up."

C. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6.4.4 - "HVAC System Construction and Insulation."

PART 2 - PRODUCTS

2.1 SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.

B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-1, "Rectangular Duct/Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Duct/Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Fittings and Other Construction," for

static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.2 SINGLE-WALL ROUND DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Lindab Inc.
b. McGill AirFlow LLC.
c. SEMCO Incorporated.
d. Sheet Metal Connectors, Inc.
e. Spiral Manufacturing Co., Inc.

B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Round Duct Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Round Duct Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

D. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.3 SHEET METAL MATERIALS

A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.

1. Galvanized Coating Designation: G90.
2. Finishes for Surfaces Exposed to View: Mill phosphatized.

C. Reinforcement Shapes and Plates: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

1. Where black- and galvanized-steel shapes and plates are used to reinforce aluminum ducts, isolate the different metals with butyl rubber, neoprene, or EPDM gasket materials.

D. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.4 DUCT LINER

A. Fibrous-Glass Duct Liner: Comply with ASTM C 1071, NFPA 90A, or NFPA 90B; and with NAIMA AH124, "Fibrous Glass Duct Liner Standard."

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. CertainTeed Corporation; Insulation Group.
b. Johns Manville.
c. Knauf Insulation.
d. Owens Corning.

2. Maximum Thermal Conductivity:

a. Type II, Rigid: 0.23 Btu x in./h x sq. ft. x deg F at 75 deg F mean temperature.

3. Antimicrobial Erosion-Resistant Coating: Apply to the surface of the liner that will form the interior surface of the duct to act as a moisture repellent and erosion-resistant coating. Antimicrobial compound shall be tested for efficacy by an NRTL and registered by the EPA for use in HVAC systems.
4. Water-Based Liner Adhesive: Comply with NFPA 90A or NFPA 90B and with ASTM C 916.

a. For indoor applications, adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
b. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

B. Insulation Pins and Washers:

1. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch-diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch galvanized carbon-steel washer.

2. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick galvanized steel; with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.

C. Shop Application of Duct Liner: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 7-11, "Flexible Duct Liner Installation."

1. Adhere a single layer of indicated thickness of duct liner with at least 90 percent adhesive coverage at liner contact surface area. Attaining indicated thickness with multiple layers of duct liner is prohibited.
2. Apply adhesive to transverse edges of liner facing upstream that do not receive metal nosing.
3. Butt transverse joints without gaps, and coat joint with adhesive.
4. Fold and compress liner in corners of rectangular ducts or cut and fit to ensure butted-edge overlapping.
5. Do not apply liner in rectangular ducts with longitudinal joints, except at corners of ducts, unless duct size and dimensions of standard liner make longitudinal joints necessary.
6. Apply adhesive coating on longitudinal seams in ducts with air velocity of 2500 fpm.
7. Secure liner with mechanical fasteners 4 inches from corners and at intervals not exceeding 12 inches transversely; at 3 inches from transverse joints and at intervals not exceeding 18 inches longitudinally.
8. Secure transversely oriented liner edges facing the airstream with metal nosings that have either channel or "Z" profiles or are integrally formed from duct wall. Fabricate edge facings at the following locations:

    a. Fan discharges.
    b. Intervals of lined duct preceding unlined duct.
    c. Upstream edges of transverse joints in ducts where air velocities are higher than 2500 fpm or where indicated.

9. Secure insulation between perforated sheet metal inner duct of same thickness as specified for outer shell. Use mechanical fasteners that maintain inner duct at uniform distance from outer shell without compressing insulation.

    a. Sheet Metal Inner Duct Perforations: 3/32-inch diameter, with an overall open area of 23 percent.

10. Terminate inner ducts with buildouts attached to fire-damper sleeves, dampers, turning vane assemblies, or other devices. Fabricated buildouts (metal hat sections) or other buildout means are optional; when used, secure buildouts to duct walls with bolts, screws, rivets, or welds.

2.5 SEALANT AND GASKETS

A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.

B. Two-Part Tape Sealing System:

1. Tape: Woven cotton fiber impregnated with mineral gypsum and modified acrylic/silicone activator to react exothermically with tape to form hard, durable, airtight seal.
2. Tape Width: 4 inches.
3. Sealant: Modified styrene acrylic.
4. Water resistant.
5. Mold and mildew resistant.
6. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
7. Service: Indoor and outdoor.
8. Service Temperature: Minus 40 to plus 200 deg F.
9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum.
10. For indoor applications, sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
11. Sealant shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Water-Based Joint and Seam Sealant:

1. Application Method: Brush on.
2. Solids Content: Minimum 65 percent.
3. Shore A Hardness: Minimum 20.
4. Water resistant.
5. Mold and mildew resistant.
6. VOC: Maximum 75 g/L (less water).
7. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
8. Service: Indoor or outdoor.
9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

D. Solvent-Based Joint and Seam Sealant:

1. Application Method: Brush on.
2. Base: Synthetic rubber resin.
3. Solvent: Toluene and heptane.
4. Solids Content: Minimum 60 percent.
5. Shore A Hardness: Minimum 60.
6. Water resistant.
7. Mold and mildew resistant.
8. For indoor applications, sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
9. VOC: Maximum 395 g/L.
10. Sealant shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
11. Maximum Static-Pressure Class: 10-inch wg, positive or negative.
12. Service: Indoor or outdoor.

13. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

E. Flanged Joint Sealant: Comply with ASTM C 920.

1. General: Single-component, acid-curing, silicone, elastomeric.
2. Type: S.
3. Grade: NS.
4. Class: 25.
5. Use: O.
6. For indoor applications, sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
7. Sealant shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

F. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

G. Round Duct Joint O-Ring Seals:

1. Seal shall provide maximum leakage class of 3 cfm/100 sq. ft. at 1-inch wg and shall be rated for 10-inch wg static-pressure class, positive or negative.
2. EPDM O-ring to seal in concave bead in coupling or fitting spigot.
3. Double-lipped, EPDM O-ring seal, mechanically fastened to factory-fabricated couplings and fitting spigots.

2.6 HANGERS AND SUPPORTS

A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.

B. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct."

C. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.

D. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.

E. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

F. Trapeze and Riser Supports:

1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.

B. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.

C. Install round ducts in maximum practical lengths.

D. Install ducts with fewest possible joints.

E. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.

F. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.

G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.

H. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.

I. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.

J. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches.

K. Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers. Comply with requirements in Section 23 33 00 "Air Duct Accessories" for fire and smoke dampers.

L. Protect duct interiors from moisture, construction debris and dust, and other foreign materials. Comply with SMACNA's "IAQ Guidelines for Occupied Buildings Under Construction," Appendix G, "Duct Cleanliness for New Construction Guidelines."

3.2 DUCT SEALING

A. Seal ducts for duct static-pressure, seal classes, and leakage classes specified in "Duct Schedule" Article according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

B. Seal ducts to the following seal classes according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible":

1. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
2. Unconditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg and Lower: Seal Class B.
3. Unconditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch wg: Seal Class A.

3.3 HANGER AND SUPPORT INSTALLATION

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 5, "Hangers and Supports."

B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.

1. Where practical, install concrete inserts before placing concrete.
2. Do not use powder-actuated concrete fastenerss.

C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.

D. Hangers Exposed to View: Threaded rod and angle or channel supports.

E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at maximum intervals of 16 feet.

F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.4 CONNECTIONS

A. Make connections to equipment with flexible connectors complying with Section 23 33 00 "Air Duct Accessories."

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.5 PAINTING

A. Paint interior of metal ducts that are visible through registers and grilles and that do not have duct liner. Apply one coat of flat, black, latex paint over a compatible galvanized-steel primer. Paint materials and application requirements are specified in Section 09 91 13 "Exterior Painting" and Section 09 91 23 "Interior Painting."

3.6 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Duct System Cleanliness Tests:

1. Visually inspect duct system to ensure that no visible contaminants are present.
2. Test sections of metal duct system, chosen randomly by Owner, for cleanliness according to "Vacuum Test" in NADCA ACR, "Assessment, Cleaning and Restoration of HVAC Systems."

    a. Acceptable Cleanliness Level: Net weight of debris collected on the filter media shall not exceed 0.75 mg/100 sq. cm.

C. Duct system will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

3.7 DUCT CLEANING

A. Clean new duct system(s) before testing, adjusting, and balancing.

B. Clean the following components by removing surface contaminants and deposits:

1. Air outlets and inlets (registers, grilles, and diffusers).
2. Coils and related components.
3. Supply-air ducts, dampers, actuators, and turning vanes.

3.8 START UP

A. Air Balance: Comply with requirements in Section 23 05 93 "Testing, Adjusting, and Balancing for HVAC."

3.9 DUCT SCHEDULE

A. Fabricate ducts with galvanized sheet steel except as otherwise indicated and as follows:

B. Supply Ducts:

1. Ducts Connected to and downstream of VAV Terminal Units:

a. Pressure Class: Positive 2-inch wg.

2. Ducts Connected to Variable-Air-Volume Air-Handling Units and Upstream of VAV Terminal Units:

a. Pressure Class: Positive 4-inch wg.

3. Ducts Connected to Equipment Not Listed Above:

a. Pressure Class: Positive 3-inch wg

C. Return/Transfer Ducts:

1. Ducts:

a. Pressure Class: Positive or negative 1-inch wg.

D. Intermediate Reinforcement:

1. Galvanized-Steel Ducts: Galvanized steel.

E. Liner:

1. Supply Air Ducts Connected to and Downstream of VAV Terminal Units: Fibrous glass, Type I, 1 inch thick.
2. Transfer Ducts: Fibrous glass, Type I, thick.

F. Elbow Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."

a. Velocity 1000 fpm or Lower:

1) Radius Type RE 1 with minimum 0.5 radius-to-diameter ratio.
2) Mitered Type RE 4 without vanes.

b. Velocity 1000 to 1500 fpm:

1) Radius Type RE 1 with minimum 1.0 radius-to-diameter ratio.
2) Radius Type RE 3 with minimum 0.5 radius-to-diameter ratio and two vanes.

3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."

c. Velocity 1500 fpm or Higher:

1) Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
2) Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."

2. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."

a. Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
b. Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
c. Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."

3. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "Round Duct Elbows."

a. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments.

1) Velocity 1000 fpm or Lower: 0.5 radius-to-diameter ratio and three segments for 90-degree elbow.
2) Velocity 1000 to 1500 fpm: 1.0 radius-to-diameter ratio and four segments for 90-degree elbow.
3) Velocity 1500 fpm or Higher: 1.5 radius-to-diameter ratio and five segments for 90-degree elbow.
4) Radius-to Diameter Ratio: 1.5.

b. Round Elbows, 12 Inches and Smaller in Diameter: Stamped or pleated.
c. Round Elbows, 14 Inches and Larger in Diameter: Standing seam.

G. Branch Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-6, "Branch Connection."

a. Rectangular Main to Rectangular Branch: 45-degree entry.
b. Rectangular Main to Round Branch: Spin in.

2. Round and Flat Oval: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees." Saddle taps are permitted in existing duct.

   a. Velocity 1000 fpm or Lower: 90-degree tap.
   b. Velocity 1000 to 1500 fpm: Conical tap.
   c. Velocity 1500 fpm or Higher: 45-degree lateral.

END OF SECTION

SECTION 23 33 00
AIR DUCT ACCESSORIES

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.

1.2 SUMMARY

A. Section Includes:

1. Manual volume dampers.
2. Fire dampers.
3. Turning vanes.
4. Flexible ducts.
5. Duct accessory hardware.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For duct accessories. Include plans, elevations, sections, details and attachments to other work.

1. Detail duct accessories fabrication and installation in ducts and other construction. Include dimensions, weights, loads, and required clearances; and method of field assembly into duct systems and other construction. Include the following:

a. Special fittings.
b. Manual volume damper installations.
c. Wiring Diagrams: For power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which ceiling-mounted access panels and access doors required for access to duct accessories are shown and coordinated with each other, using input from Installers of the items involved.

B. Source quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For air duct accessories to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTION

A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

2.2 MATERIALS

A. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.

1. Galvanized Coating Designation: G90.
2. Exposed-Surface Finish: Mill phosphatized.

B. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.

C. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.3 MANUAL VOLUME DAMPERS

A. Standard, Steel, Manual Volume Dampers:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Air Balance Inc.; a division of Mestek, Inc.
b. Nailor Industries Inc.
c. Ruskin Company.
d. Vent Products Company, Inc.

2. Standard leakage rating.
3. Suitable for horizontal or vertical applications.
4. Frames:

a. Frame: Hat-shaped, 0.094-inch-thick, galvanized sheet steel.
b. Mitered and welded corners.
c. Flanges for attaching to walls and flangeless frames for installing in ducts.

5. Blades:

a. Multiple or single blade.
b. Parallel- or opposed-blade design.
c. Stiffen damper blades for stability.
d. Galvanized-steel, 0.064 inch thick.

6. Blade Axles: Galvanized steel.
7. Bearings:

a. Molded synthetic.
b. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.

8. Tie Bars and Brackets: Galvanized steel.

2.4 FIRE DAMPERS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Air Balance Inc.; a division of Mestek, Inc.
2. Nailor Industries Inc.
3. Ruskin Company.
4. Vent Products Company, Inc.

B. Type: Static, rated and labeled according to UL 555 by an NRTL.

C. Closing rating in ducts up to 4-inch wg static pressure class and minimum 2000-fpm velocity.

D. Fire Rating: 1-1/2 hours.

E. Frame: Curtain type with blades inside airstream; fabricated with roll-formed, thickness per UL Listing R-5531, galvanized steel; with mitered and interlocking corners.

F. Mounting Sleeve: Factory- or field-installed, galvanized sheet steel.

1. Minimum Thickness: Per UL Listing R-5531, and of length to suit application.
2. Exception: Omit sleeve where damper-frame width permits direct attachment of perimeter mounting angles on each side of wall or floor; thickness of damper frame must comply with sleeve requirements.

G. Mounting Orientation: Vertical or horizontal as indicated.

H. Horizontal Dampers: Include blade lock and stainless-steel closure spring.

I. Heat-Responsive Device: Replaceable, 165 deg F rated, fusible links.

2.5 TURNING VANES

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Ductmate Industries, Inc.
2. METALAIRE, Inc.
3. SEMCO Incorporated.
4. Ward Industries, Inc.; a division of 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. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 4-3, "Vanes and Vane Runners," and 4-4, "Vane Support in Elbows."

D. Vane Construction: Single wall.

2.6 FLEXIBLE DUCTS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Flexmaster U.S.A., Inc.
2. McGill AirFlow LLC.
3. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Insulated, Flexible Duct: UL 181, Class 1, 2-ply vinyl film supported by helically wound, spring-steel wire; fibrous-glass insulation; polyethylene vapor-barrier film.

1. Pressure Rating: 10-inch wg positive and 1.0-inch wg negative.
2. Maximum Air Velocity: 4000 fpm.
3. Temperature Range: Minus 10 to plus 160 deg F.
4. Insulation R-value: Comply with ASHRAE/IESNA 90.1.

C. Flexible Duct Connectors:

1. Clamps: Stainless-steel band with cadmium-plated hex screw to tighten band with a worm-gear action in sizes 3 through 18 inches, to suit duct size.

2.7 DUCT ACCESSORY HARDWARE

A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct-insulation thickness.

B. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

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. 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.

1. Install steel volume dampers in steel ducts.

D. Set dampers to fully open position before testing, adjusting, and balancing.

E. Install test holes at fan inlets and outlets and elsewhere as indicated.

F. Install fire dampers according to UL listing.

G. Connect terminal units to supply ducts with maximum 12-inch lengths of flexible duct. Do not use flexible ducts to change directions.

H. Connect diffusers to ducts directly or with maximum 60-inch lengths of flexible duct clamped or strapped in place.

I. Connect flexible ducts to metal ducts with draw bands.

J. Install duct test holes where required for testing and balancing purposes.

3.2 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Operate dampers to verify full range of movement.

2. Operate fire dampers to verify full range of movement and verify that proper heat-response device is installed.
3. Inspect turning vanes for proper and secure installation.

END OF SECTION

SECTION 23 36 00
AIR TERMINAL UNITS

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.

1.2 SUMMARY

A. Section Includes:

1. Shutoff, single-duct air terminal units.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of the following products, including rated capacities, furnished specialties, sound-power ratings, and accessories.

1. Air terminal units.
2. Liners and adhesives.
3. Sealants and gaskets.

B. Shop Drawings: For air terminal units. 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.
3. Hangers and supports, including methods for duct and building attachment and vibration isolation.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from Installers of the items involved:

1. Ceiling suspension assembly members.
2. Size and location of initial access modules for acoustic tile.
3. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.

B. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For air terminal units to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 01 78 23 "Operation and Maintenance Data," include the following:

1. Instructions for resetting minimum and maximum air volumes.
2. Instructions for adjusting software set points.

1.6 QUALITY ASSURANCE

A. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-Up."

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Performance: Hangers and supports shall withstand the effects of gravity loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible".

2.2 SYSTEM DESCRIPTION

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.

2.3 SHUTOFF, SINGLE-DUCT AIR TERMINAL UNITS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Titus.

B. Configuration: Volume-damper assembly inside unit casing with control components inside a protective metal shroud.

C. Casing: 0.034-inch steel, single wall.

1. Casing Lining: Adhesive attached, 1/2-inch-thick, coated, fibrous-glass duct liner complying with ASTM C 1071, and having a maximum flame-spread index of 25 and a maximum smoke-developed index of 50, for both insulation and adhesive, when tested according to ASTM E 84.

2. Air Inlet: Round stub connection or S-slip and drive connections for duct attachment.
3. Air Outlet: S-slip and drive connections.
4. Access: Removable panels for access to parts requiring service, adjustment, or maintenance; with airtight gasket.
5. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

D. Volume Damper: Galvanized steel with peripheral gasket and self-lubricating bearings.

1. Maximum Damper Leakage: ARI 880 rated, 2 percent of nominal airflow at 3-inch wg inlet static pressure.
2. Damper Position: Normally open.

E. Hydronic Coils: Copper tube, with mechanically bonded aluminum fins spaced no closer than 0.1 inch, and rated for a minimum working pressure of 200 psig and a maximum entering-water temperature of 220 deg F. Include manual air vent and drain valve.

F. Direct Digital Controls: Bidirectional damper operators and microprocessor-based controller and room sensor. Control devices shall be by manufacturer listed temperature controls specified in Section 23 09 00 "Instrumentation and Control for HVAC" and shall have the following features:

1. Damper Actuator: 24 V, powered closed, spring return open.
2. Terminal Unit Controller: Pressure-independent, variable-air-volume controller with electronic airflow transducer with multipoint velocity sensor at air inlet, factory calibrated to minimum and maximum air volumes, and having the following features:

a. Occupied and unoccupied operating mode.
b. Remote reset of airflow or temperature set points.
c. Adjusting and monitoring with portable terminal.
d. Communication with temperature-control system specified in Section 23 09 00 "Instrumentation and Control for HVAC."

3. Room Sensor: Wall mounted blank stainless-steel plate.

2.4 HANGERS AND SUPPORTS

A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.

B. Steel Cables: Galvanized steel complying with ASTM A 603.

C. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.

D. Air Terminal Unit Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

E. Trapeze and Riser Supports: Steel shapes and plates for units with steel casings; aluminum for units with aluminum casings.

2.5 SOURCE QUALITY CONTROL

A. Factory Tests: Test assembled air terminal units according to ARI 880.

1. Label each air terminal unit with plan number, nominal airflow, maximum and minimum factory-set airflows, coil type, and ARI certification seal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install air terminal units according to NFPA 90A, "Standard for the Installation of Air Conditioning and Ventilating Systems."

B. Install air terminal units level and plumb. Maintain sufficient clearance for normal service and maintenance.

3.2 HANGER AND SUPPORT INSTALLATION

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 5, "Hangers and Supports."

B. Building Attachments: Concrete inserts or structural-steel fasteners appropriate for construction materials to which hangers are being attached.

1. Do not use powder-actuated concrete fasteners.

C. Hangers Exposed to View: Threaded rod and angle or channel supports.

D. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.3 CONNECTIONS

A. Install piping adjacent to air terminal unit to allow service and maintenance.

B. Hot-Water Piping: In addition to requirements in Section 23 21 13 "Hydronic Piping" and Section 23 21 16 Hydronic Piping Specialties," connect heating coils to supply with shutoff valve, strainer, control valve, and union or flange; and to return with balancing valve and union or flange.

C. Connect ducts to air terminal units according to Section 23 31 13 "Metal Ducts."

D. Make connections to air terminal units with flexible connectors complying with requirements in Section 23 33 00 "Air Duct Accessories."

3.4 IDENTIFICATION

A. Label each air terminal unit with plan number, nominal airflow, and maximum and minimum factory-set airflows. Comply with requirements in Section 23 05 53 "Identification for HVAC Piping and Equipment" for equipment labels and warning signs and labels.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

C. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

D. Tests and Inspections:

1. After installing air terminal units and after electrical circuitry has been energized, test for compliance with requirements.
2. Leak Test: After installation, fill water coils and test for leaks. Repair leaks and retest until no leaks exist.
3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

E. Air terminal unit will be considered defective if it does not pass tests and inspections.

F. Prepare test and inspection reports.

3.6 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.
2. Verify that inlet duct connections are as recommended by air terminal unit manufacturer to achieve proper performance.

3. Verify that controls and control enclosure are accessible.
4. Verify that control connections are complete.
5. Verify that nameplate and identification tag are visible.
6. Verify that controls respond to inputs as specified.

3.7 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain air terminal units.

END OF SECTION

SECTION 23 37 13
DIFFUSERS, REGISTERS, AND GRILLES

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.

1.2 SUMMARY

A. Section Includes:

1. Square ceiling diffusers.
2. Fixed face grilles.

B. Related Sections:

1. Section 23 33 00 "Air Duct Accessories" for fire and smoke dampers and volume-control dampers not integral to diffusers, registers, and grilles.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated, include the following:

1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.
2. Diffuser, Register, and Grille Schedule: Indicate drawing designation, room location, quantity, model number, size, and accessories furnished.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from Installers of the items involved:

1. Ceiling suspension assembly members.
2. Method of attaching hangers to building structure.
3. Size and location of initial access modules for acoustical tile.
4. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
5. Duct access panels.

B. Source quality-control reports.

PART 2 - PRODUCTS

2.1 CEILING DIFFUSERS

A. Square Ceiling Diffusers:

1. Products: Subject to compliance with requirements, provide products by one of the following:

    a. Titus, Omni.

2. Devices shall be specifically designed for variable-air-volume flows.
3. Material: Steel.
4. Finish: Baked enamel, white.
5. Face Size: 24 by 24 inches.
6. Face Style: Plaque.
7. Mounting: Lay in ceiling grid, coordinate with Architectural Drawings for grid type.
8. Pattern: Fixed.
9. Dampers: Radial opposed blade.

2.2 REGISTERS AND GRILLES

A. Fixed Face Grille:

1. Products: Subject to compliance with requirements, provide products by one of the following:

    a. Titus, 350 RL

2. Material: Steel.
3. Finish: Baked enamel, white.
4. Face Arrangement: 3/4" Blade spacing, 35-degree deflection, blades parallel to long dimension.
5. Frame: 1-1/4 inches wide.
6. Mounting: Lay in ceiling grid, coordinate with Architectural Drawings for grid type.

2.3 SOURCE QUALITY CONTROL

A. Verification of Performance: Rate diffusers, registers, and grilles according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas where diffusers, registers, and grilles are to be installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install diffusers, registers, and grilles level and plumb.

B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practical. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.

C. Install diffusers, registers, and grilles with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.3 ADJUSTING

A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION

SECTION 26 00 00
ELECTRICAL, GENERAL

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. General provisions of contract include the following: Bidding requirements, contract forms, provisions of contract, and Division 1. These provisions contain requirements which affect electrical work under Divisions 26, 27 and 28 and which must be complied with as a part of the work.

B. Divisions 26, 27 and 28 are subdivided into various sections for general convenience.

C. Provide items, articles, materials, operations and methods required by drawings and specifications including labor, equipment, supplies and incidentals necessary for completion of work in Divisions 26, 27 and 28.

D. It is the intention of Divisions 26, 27 and 28 specifications and drawings to call for finished work, tested and ready for operation.

E. Apparatus, appliance, material or work not shown on the contract drawings, but mentioned in the specifications, or vice versa, or any incidental accessories necessary to make the work complete and ready for operation, even though not specified or shown on the contract drawings, shall be furnished and installed without additional expense to Owner.

F. Should there be any discrepancies or a question of intent, refer the matter to the architect for a decision before ordering any equipment or materials or before starting any related work.

1.2 WORK INCLUDED

A. Electrical work is indicated on drawings and includes but is not limited to the following:

1. Demolition and remodeling.
2. Branch circuit wire and conduit.
3. Lighting fixtures.
4. Wiring devices such as boxes, switches, receptacles, etc.
5. Special systems.
6. Conduit fittings, supports, etc., though not shown.
7. Circuit breakers, safety switches, fuses and other over current protection and safety devices.

B. Contractor shall provide all temporary services required to maintain normal building operation during construction. Temporary interruption of services shall occur during non-school/business hours. Contractor shall be solely responsible for

determining construction sequencing and shall include all costs required for maintaining all mechanical, plumbing, and electrical services to the entire facility.

1.3 WORK NOT INCLUDED

A. Unless otherwise stated, power wiring for all mechanical equipment is the responsibility of the electrical contractor with control wiring the responsibility of the mechanical contractor. This statement is not meant to preclude a different distribution of responsibility by the general contractor, who is responsible for a complete installation through interaction of subcontractors. Wiring (120 volt) between exhaust fan and powered damper and/or line voltage thermostats is by electrical contractor.

1.4 QUALITY ASSURANCE

A. Each major component of equipment shall have the manufacturer's name, address, model number and ratings on a plate securely affixed in a conspicuous place.

B. Code ratings, labels or other data which are die-stamped or otherwise affixed to the surface of the equipment, shall be in label of Underwriter's Laboratories, Inc. (UL). Approval must be obtained for materials furnished as equals. All proposals shall be prepared on the basis of using exactly the materials and items specified. If the contractor wishes to have other items considered, he must submit these items with his proposal and state the amount to be added or deducted.

1.5 ABBREVIATION

A. Reference to a technical society, institution, association, or governmental authority is made in these specifications in accordance with the following abbreviations. All groups listed below do not necessarily apply to this project and are listed for informational purposes only:

1. ASE: Association of Safety Engineers
2. ASHRAE: American Society of Heating, Refrigerating and Air Conditioning Engineers 2013
3. ASME: American Society of Mechanical Engineers
4. EPA: Environmental Protection Agency
5. IEEE: Institute of Electrical and Electronics Engineers
6. MCAA: Mechanical Contractor's Association of America
7. NEMA: National Electrical Manufacturers Association
8. NEC: National Electrical Code 2011 and per Village of Glen Ellyn requirement, and incorporating all local amendments
9. NFPA: National Fire Protection Agency
10. ADA: Americans with Disabilities Act
11. IBC: International Building Code 2009
12. IFC: International Fire Code 2009
13. IECC: Illinois Energy Conservation Code 2015
14. IAC: Illinois Accessibility Code

1.6 SUBMITTALS

A. Submit under provisions as described within the general requirements section.

B. Shop Drawings:

1. Submit shop drawings and product data grouped to include complete submittals of related systems, products and accessories in a single submittal.
2. Contractor shall review all shop drawings prior to submitting them for Architect/Engineer's review. Contractor shall stamp each shop drawing to certify that he has reviewed it. Engineer will not check any drawings that Contractor has not stamped with his review certification.
3. Owner's representative shall have the right to review all materials, equipment, fixtures, motor control centers, panelboards, control panels, etc., and other appurtenances provided for this work before proceeding with the purchase and installation.
4. All submittals shall include adequate descriptive literature, catalog cuts, shop drawings and other data necessary for the Owner's Representative to ascertain that the proposed equipment/fixtures and materials comply with specification requirements. Catalog cuts submitted for approval shall be legible and clearly identify equipment/fixtures being submitted.
5. All shop drawings shall be submitted to permit Owner's Representative ample time to review before material is released for delivery to job.
6. Contractor shall maintain a permanent file of shop drawings to turn over to Owner's Representative at completion of project.
7. Submittals shall include 1/4" = 1'-0" dimensioned drawings of all electrical equipment rooms for review before installation continues.
8. Equipment Drawings:

    a. Provide complete set of shop drawings bound in permanent binder.
    b. Provide typewritten list of each type, quantity and manufacturer of lamp installed.
    c. Provide typewritten list of each type, quantity, size and manufacturer of fuse, motor overload heater, etc., installed.
    d. Provide a complete list of all replaceable components for maintenance purposes.

C. As-Built Drawings and Operation and Maintenance (O&M) Manuals: The contractor shall keep continuous, up-to-date records of all deviations and changes between the work as shown on the drawings and as actually installed. Upon completion of the work and as a condition prior to final acceptance and payment, he shall furnish directly to the Owner the project record data. The accuracy of this data shall be the responsibility of the contractor, who shall bear all expenses for any required corrections. As-builts shall be furnished on reproducible heavy bond paper and electronically in PDF ***and*** Autocad format (version selected by Architect). Obtain signed certification from an authorized Owner’s representative. All devices turned over without a signature and later lost, will be replaced at the contractors expense. Provide five (5) sets of as-built information and O&M Manuals including electronic version.

1.7 JOB REQUIREMENTS

A. The contractor shall keep himself informed as to the progress of the work and shall keep a sufficient force of workmen on the job so as not to delay the progress of the work.

B. The contractor shall be responsible for the exact location of all outlets, and shall be responsible for all cutting and patching. No cutting shall be done without approval.

C. The Owner reserves the right to change the position of outlets before the work is installed without extra charge. The contractor shall be responsible for determining exact locations in the field. In this sense the drawings are diagrammatic.

D. The contractor shall obtain all the necessary measurements in order that his work may fit all parts of the work. He shall further verify all the necessary measurements at the building in order that his work may fit that already in place.

1.8 CODE REQUIREMENTS AND INSPECTION AUTHORITIES

A. All work shall be installed according to the rules and regulations of the National Electrical Code, IBC, the Occupational Safety and Health Act, IAC and ADA regulations, and the local inspection authorities. This shall include all written provisions and amendments to the electrical code and all interpretive provisions and directives of the chief electrical inspector, which may be in effect or enacted and in force until the final acceptance of the work.

B. The quality and type of work referred to above shall be regarded as the minimum requirements, and shall be exceeded where required by this specification.

C. The contractor shall study the drawings and specifications prior to submitting his proposal and, if inspection authorities or labor conditions require work in addition to that specified or shown, the contractor shall state in his proposal the items involved and the additional amounts required for such items. After entering into a contract, the contractor agrees that all such items are included in his proposal and will not be cause for additional charges to the Owner.

1.9 DRAWINGS

A. The small scale of the drawings does not permit duplication of all panels, feeders, junction boxes and other equipment on all sheets. Drawings are, in essence, diagrammatic and it is the contractor’s responsibility to install a complete working system. Special care shall be exercised in the installation of the work to include all material and fittings necessary for a complete installation. Exact dimensions and locations of all outlets shall be verified on-the-job. Before preparing his proposal the contractor shall examine all architectural drawings and engineering drawings. If any discrepancies or details of the construction interfere with the work, he shall report the same and obtain written instructions as to the changes necessary. Should he neglect to do so, he shall make the necessary changes at his own expense. Modifications of drawings are permissible as long as coordinated with Engineer/Architect and allowed by Owner.

B. The drawings show only the general routing of the conduit. The scale of the drawing does not permit the indication of all junction boxes, pull boxes, and fittings that may be required. The cost of such work shall be considered as part of the contract and extra payment will not be made for such work.

C. Contractor shall refer to plans for the location of light fixtures, speakers, fire alarm devices, etc.

D. Refer to all architectural drawings including casework drawings during installation of all light switches, outlets, phone jacks, computer jacks, and devices so that no conflicts will be encountered. Inform architect of any conflicts that occur before the installation of above said devices.

1.10 COOPERATION AND COORDINATION

A. The contractor shall confer with other trades at the site, before installing his work, to avoid interferences so that maximum headroom and clearances may be maintained. In the event that interferences develop between work of various trades, the architect's decision will be final and additional compensation will not be allowed for moving of misplaced work.

B. Coordinate chases, slots, inserts, sleeves, and openings with general construction work and arrange in building structure during progress of construction to facilitate the electrical installations that follow.

1. Set inserts and sleeves in poured-in-place concrete, masonry work, and other structural components as they are constructed.

C. Sequence, coordinate, and integrate installing electrical materials and equipment for efficient flow of the Work. Coordinate installing large equipment requiring positioning before closing in the building.

D. Coordinate location of access panels and doors for electrical items that are concealed by finished surfaces. Access doors and panels are specified in Division 8 Section "Access Doors."

E. Where electrical identification devices are applied to field-finished surfaces, coordinate installation of identification devices with completion of finished surface.

F. Where electrical identification markings and devices will be concealed by acoustical ceilings and similar finishes, coordinate installation of these items before ceiling installation.

G. The contractor shall coordinate the location of all devices and fixed casework locations prior to installing each device. Additional compensation will not be granted for relocation due to interferences with casework.

H. Particular attention shall be paid to situations where recessed equipment, pipes and lights occur, or where work of several trades occurs together above suspended ceilings, in pipe shafts or in areas where space is limited.

I. All fixtures, equipment, devices, switches and outlets shall be positioned to avoid all interferences with and to assure proper coordination with work of all other trades, cases, partitions, wall, floor and ceiling patterns, architectural features, etc. All recessed devices, fixtures, etc. shall be coordinated to work out conflicts and adjustments where such adjustments are warranted.

J. The contractor shall provide and install junction box and conduit stubbed up above ceiling for mechanical contractor's thermostat and all other associated sleeves to accommodate thermostat cabling. Mount at 56-1/2" to center. Refer to mechanical drawings and coordinate with temperature control contractor for all thermostat locations.

1.11 TEST REQUIRED

A. Any wiring devices, lighting fixtures or electrical apparatus in the contract, if grounded or shorted, shall be corrected or replaced at the contractor’s expense.

B. The contractor will be responsible for inspecting all existing systems that will be worked on (during the course of the construction project) before touching them. This shall cover, but not limited to the following systems: fire alarm system, paging/clock system, security camera system, local area network, local audio/video distribution system, etc.).This inspection will need to document any issues with the existing systems that are affecting their proper operation. If this report is not provided, the contractor is attesting that all systems were functional and properly operating before the start of the construction and will be responsible for all repairs. The onus is on the contractor to identify problems with any of the systems to the Owner prior to construction.

1.12 DEFECTIVE WORK AND MATERIAL

A. All material or work found to be defective or not in strict conformity with drawings or different from requirements of drawings and specifications or defaced or injured through negligence of the contractor or his employees, through damage in shipments, or through action of fire or weather will be rejected and shall be immediately removed from premises by the contractor and satisfactory material and work substituted without delay.

B. Any defective work or imperfect work shall be corrected immediately on notice from the architect. No previous inspection or certificate on account shall be held to relieve the contractor from his obligation to furnish sound material and to perform good and satisfactory work.

1.13 CUTTING, DRILLING, PATCHING AND PAINTING

A. All cutting, drilling, patching and painting of wood construction, masonry, steel or iron work belonging to the building shall be done by the contractor in order that his work may be properly installed, and all disturbed construction or finish must be made good, but under no conditions must structural work be cut except upon approval by the architect.

B. Cutting, patching and painting for electrical work shall be performed by this contractor unless noted otherwise. This contractor shall coordinate his work with the other trades for completing the work satisfactorily. Contractor is responsible for refinishing areas cut or patched by the execution of this work so as to match existing surrounding area. Trimmed cuts will be acceptable when approved by the architect.

C. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces required to permit electrical installations. Perform cutting by skilled mechanics of trades involved.

D. Repair and refinish disturbed finish materials and other surfaces to match adjacent undisturbed surfaces. Install new fireproofing where existing firestopping has been disturbed. Repair and refinish materials and other surfaces by skilled mechanics of trades involved.

1.14 DEMOLITION AND REMODELING

A. Work included:

1. The work involved includes modifications, additions, and deletions to an existing electrical system. Contractor shall furnish all labor, equipment, supplies and incidentals necessary to alter the existing system to produce the desired result shown on the drawing and specified in the project manual.
2. Protect equipment and installations and maintain conditions to ensure that coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

B. Existing conditions:

1. Building plans shown are compiled from sources believed to be accurate. However, the information shown on these plans is conceptual and the contractor shall be responsible for field verification of all dimensions, sizes, system voltages, quantities and extent of work. The contractor shall carefully examine the premises in order familiarize himself with existing conditions and fully understand the nature and scope of work.
2. Drawings are strictly schematic and a complete coordinated, functional and code approved system is intended.

C. Electrical demolition work shall include removal of all equipment, fixtures, piping, wire, receptacles and other electrical equipment and materials as shown on the drawings or necessary for the modification shown. Disconnect and remove all power wiring to mechanical equipment being removed.

1. Contractor shall bear all expenses for legally disposing of all light fixtures and their related ballasts, lamps and battery packs. Follow all EPA (Environmental Protection agency) guidelines and submit proper paperwork with certification of above.
2. Provide the Owner with the option to keep all light fixtures, exit signs, smoke detectors, ballasts, lamps, ADA notification devices, etc., removed and not reused as part of this work. If Owner decides to keep any item in whole or

part, deliver to location designated by Owner. Contractor shall properly dispose of all declined items.

D. Materials:

1. Requirements for equipment, supplies, and accessories that are to be added to the electrical system are specified in other sections.
2. Materials shall be new unless otherwise indicated. When so indicated existing equipment, supplies and accessories may be reused (sometimes relocated). Contractor must verify that existing materials are sound and fully functional for the design intended. Maintaining the condition of relocated materials is the responsibility of the contractor.

E. Conduit and wire:

1. At contractor's option, existing raceway may be reused if not removed and meets new application. Existing wiring for receptacle and lighting circuits may be reused if not removed and meets new application, unless otherwise indicated elsewhere. Wire and cable that has been removed shall not be reinstalled. Raceway that is in like-new condition may be reused if not removed. Raceway and power/lighting wire that is being reused shall be tested for continuity of conduction and ground for insulation resistance of conductor and splices. Contractor shall remove and replace all wiring which is defective at contractor's expense.

F. Existing service:

1. Existing building services shall be maintained and temporary services shall be provided when required at the contractor's expense. In the event that a shutdown cannot be avoided, the service interruption shall be with the minimum inconvenience to the occupants and with the approval of and under the supervision of the architect. In no case will the contractor interrupt service without the permission of the Owner or architect.
2. **Existing Building Systems: Contractor shall provide all temporary services required to maintain all building systems in working order during construction. Temporary interruption of building systems shall only occur during non-school/business hours. Contractor shall be solely responsible for determining construction sequencing and shall include all costs required for maintaining all mechanical, plumbing, and electrical systems throughout the entire facility.**

G. Revisions to the building:

1. Refer to the architectural drawings and details for exact locations of existing partitions to be remodeled, existing partitions to remain and new partitions. This contractor shall repair all damages to existing construction due to his demolition operation or installation of new work.

H. Abandoned equipment and materials:

1. Switches and Outlets: When noted on drawings, the contractor shall abandon switches and outlets by removing them and providing solid cover plates.

Electrical service to these devices shall be disconnected and/or spliced for resumption of service to devices not removed. Paint cover plate to match surrounding area. If box is prefinished material, install stainless steel cover plate.

2. Raceways and Wire: Cut and removed buried raceway and wiring, indicated to be abandoned in place, 2 inches below the surface of adjacent construction. Cap raceways and patch surface to match existing finish.

I. Installation:

1. Remove electrical equipment and installations, indicated to be demolished.
2. Protect existing electrical equipment and installations indicated to remain. If damaged or disturbed in the course of the work, remove damaged portions and install new products of equal capacity, quality, and functionality.
3. All materials, such as light fixtures, that are to be removed, are the property of the Owner. Contractor shall store material as directed by the Owner, or at Owner's direction, the contractor shall assume responsibility for legal disposal per EPA requirements.
4. When removal of existing materials causes voids in existing cover plates or uncovered junction boxes, etc, provide solid finished covers that protect the void or opening and match surrounding area as closely as possible.
5. Remove demolished material from project site. Coordinate with drawing for disposal of removed materials.
6. Remove, store, clean, reinstall, reconnect, and make operational components indicated for relocation.
7. All raceways and conduit shall be run concealed. Fish through existing walls and ceilings as required. In the event concealed conduit is impossible, surface mounted metallic raceways shall be used with the approval of the architect. Surface mounted conduit shall also be used when specifically designated on the drawings in locations where exposed conduit is the predominant wiring method currently in use. Contractor may modify or add to that system with exposed conduit necessary to achieve design results. Exposed conduit in finished areas shall not be installed unless approved by the architect. Conduit installation shall be accomplished in a neat workmanlike manner. Run tight to walls at ceiling edge. Coordinate final routings in the field with the architect prior to installation. All exposed conduits shall be painted to match surrounding area.
8. Existing lay in ceiling tiles shall be removed and reinstalled as required for the installation of new electrical work. Tiles damaged by this work shall be replaced with identical materials at the contractor's expense.
9. Where the work of one trade will interfere with the work of other trades, all trades shall assist in working out space conditions, make satisfactory adjustments and shall be prepared to submit and revise coordinated shop drawings.
10. With the approval of the architect/engineer and without additional cost to the Owner, make minor modifications in the work, including rerouting as required by interferences with structural general and work of other trades or for the proper execution of the work.
11. Work installed before coordinating with other trades so as to cause interference with their work shall be reworked, without additional cost to the Owner, as directed by the architect. The contractors shall make all necessary provisions to pursue their work in a manner which will assure that the

operation of the building is minimally impaired. This shall include, but not be limited to, delivery of supplies, temporary utility connections, etc. Storage of materials must be at locations approved by the Owner.

12. Circuits shown to the panels for load and wiring are diagrammatic. The contractor shall have the option on conduit fill and runs in accordance with local municipal code for rewiring on the revision portion and standard conduit fill for new work. Final decisions for revision and connection to the new and existing system will have to be made in the field. Circuits shall be picked up overhead or through the floor to existing and new panels. Verify in the field.

1.15 CHASES AND OPENINGS

A. Provide to masonry or concrete trades, templates or details for chases and openings to be left in floors, walls and partitions to accommodate work for each trade.

1.16 CLEANING UP

A. After the completion of the electrical installation, the entire system shall be thoroughly cleaned. Clean all foreign matter from all fixtures, equipment, and exterior of conduits. Remove all rubbish, debris, etc. accumulated from this operation during the course of the work and at the completion of the project. Legally dispose of same off-the-site.

1.17 REFINISHING AND TOUCHUP PAINTING

A. Refinish and touch up paint. Paint materials and application requirements are specified in Division 9.

1. Clean damaged and disturbed areas and apply primer, intermediate, and finish coats to suit the degree of damage at each location.
2. Follow paint manufacturer's written instructions for surface preparation and for timing and application of successive coats.
3. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
4. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

1.18 FIRE-STOPS

A. Penetrations through fire rated walls and floors shall be sealed to the original hourly fire rating with a fire-stop system capable of preventing the passage of flames and hot gases when subject to the requirements of the test standards specific for Fire-Stops ASTM E119 and E814 (UL 1479). Refer to Division 7 for additional information and requirements. Utilize 3M, General Electric, Metalines Inc., Nelson Electric or Hilti products. The fire stop system installation must meet requirements of ASTM E-814, UL 1479 or UL 2079 tested assemblies that provide a fire rating equal to that of construction being penetrated.

1.19 CONCRETE BASES

A. Concrete Forms and Reinforcement Materials: As specified in Division 3 Section "Cast-in-Place Concrete."

B. Concrete: 3000-psi, 28-day compressive strength as specified in Division 3 Section "Cast-in-Place Concrete."

C. Construct concrete bases of dimensions indicated, but not less than 4 inches larger, in both directions, than supported unit. Follow supported equipment manufacturer's anchorage recommendations and setting templates for anchor-bolt and tie locations, unless otherwise indicated.

1.20 TOUCHUP PAINT

A. For Equipment: Equipment manufacturer's paint selected to match installed equipment finish.

B. Galvanized Surfaces: Zinc-rich paint recommended by item manufacturer.

1.21 SUBSTANTIAL AND FINAL COMPLETION

A. The contractor shall provide written notification to the engineer that the project is substantially complete. The engineer will accomplish a substantial completion inspection and provide the contractor with a list of work requiring corrective action. Upon completion of the corrective work, the contractor shall provide written notice that all corrective work has been completed. The engineer will conduct an inspection of the corrective work. The contractor shall bear costs of correcting such work, including additional testing and inspections, and compensation for the engineer's services and expenses made necessary thereby.

B. One final inspection will be conducted for completion of work after written notification from the contractor. Additional inspections will be conducted at the expense of the contractor.

PART 2 - PRODUCTS

2.1 MATERIALS

A. See subsequent sections of the electrical division of these specifications for information.

2.2 GUARANTEE

A. Electrical work shall be guaranteed for both materials and labor for a period of one year in accordance with the general conditions and Division 1.

B. Manufacturer's equipment guarantees or warranties for periods of more than one year shall be included in the maintenance manuals.

PART 3 - EXECUTION

3.1 PREPARATION/INSTALLATION/APPLICATION

A. Adapt the work to the job conditions and make such changes as required and authorized by the architect, such as moving to clear beams and joists, adjusting at columns, avoiding interference with windows, raising or lowering conduits, outlets and fixtures to permit the proper installation of other mechanical or electrical equipment.

B. All work shall be performed by trained mechanics of the particular trade involved in a neat and workmanlike manner as approved by the architect.

3.2 PROTECTION

A. Protect the materials and work of other trades from damage during installation of the work provided under Divisions 26, 27 and 28.

B. Pay particular attention to the limited space available in certain locations of the project so that equipment may be installed without any interference.

C. In all rooms with exposed or concealed ductwork or piping, the exact locations of lighting fixtures shall be coordinated so as to clear all ducts and piping and obtain uniform light distribution.

END OF SECTION

SECTION 26 05 00
COMMON WORK RESULTS FOR ELECTRICAL

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.

1.2 SUMMARY

A. Section Includes:

1. Electrical equipment coordination and installation.
2. Sleeves for raceways and cables.
3. Sleeve seals.
4. Grout.
5. Common electrical installation requirements.

1.3 DEFINITIONS

A. EPDM: Ethylene-propylene-diene terpolymer rubber.

1.4 SUBMITTALS

A. Product Data: For sleeve seals.

1.5 COORDINATION

A. Coordinate arrangement, mounting, and support of electrical equipment:

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 right of way for piping and conduit installed at required slope.
4. So connecting raceways, 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 electrical 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."

PART 2 - PRODUCTS

2.1 SLEEVES FOR RACEWAYS AND CABLES

A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.

2.2 SLEEVE SEALS

A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Advance Products & Systems, Inc.
    b. Calpico, Inc.
    c. Metraflex Co.
    d. Pipeline Seal and Insulator, Inc.

2. Sealing Elements: EPDM interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
3. Pressure Plates: Stainless steel. Include two for each sealing element.
4. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.3 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.

PART 3 - EXECUTION

3.1 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION

A. Comply with NECA 1.

B. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounted items.

C. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.

D. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.

E. Right of Way: Give to piping systems installed at a required slope.

3.2 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Electrical penetrations occur when raceways, cables, wireways, cable trays, or busways penetrate concrete slabs, concrete or masonry walls, or fire-rated floor and wall assemblies.

B. Concrete Slabs and Walls: Install sleeves for all penetrations. Install sleeves during erection of slabs and walls.

C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.

D. 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.

E. Cut sleeves to length for mounting flush with both surfaces of walls. If above accessible ceiling, sleeves can extend 1 inch out of wall.

F. Extend sleeves installed in floors 2 inches above finished floor level or to above ceiling when concealing communication technology cabling.

G. Size pipe sleeves to provide 1/4-inchannular clear space between sleeve and raceway. All other sleeves for cabling shall be sized based upon 40 percent NEC fill rate and allow for minimum of 50 percent expansion for future cables. Utilize multiple sleeves as required.

H. Seal space outside of sleeves with grout for penetrations of concrete and masonry

1. Promptly pack grout solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect grout while curing.

I. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Division 07 Section "Joint Sealants."

J. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at raceway and cable penetrations. Install sleeves and seal raceway and cable penetration sleeves with firestop materials. Comply with requirements in Division 07 Section "Penetration Firestopping."

K. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.

L. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

M. Furnish and install sleeves for all low voltage cabling, including Data, Voice, Video, Paging, Clock, Thermostat, Fire Alarm, Security, etc. All sleeves shall be provided with end bushing/fitting to protect cabling. Sleeves shall be sized based upon 40 percent NEC fill rate and allow for minimum of 50 percent expansion for future cables. Utilize multiple sleeves as required. Minimum sleeve size is 3/4 inch conduit.

3.3 SLEEVE-SEAL INSTALLATION

A. Install to seal exterior wall penetrations.

B. Use type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.4 FIRESTOPPING

A. Apply firestopping to penetrations of fire-rated floor and wall assemblies for electrical installations to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 07 Section "Penetration Firestopping."

END OF SECTION

SECTION 26 05 19
LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

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.

1.2 SUMMARY

A. This Section includes the following:

1. Building wires and cables rated 600 V and less.
2. Connectors, splices, and terminations rated 600 V and less.
3. Sleeves and sleeve seals for cables.

B. Related Sections include the following:

1. Division 26 Section "Identification for Electrical Systems."
2. Division 27 Section "Communications Horizontal Cabling" for cabling used for voice and data circuits.

1.3 DEFINITIONS

A. EPDM: Ethylene-propylene-diene terpolymer rubber.

1.4 REFERENCE STANDARDS

A. ASTM B3 - Standard Specification for Soft or Annealed Copper Wire; 2001 (Reapproved 2007).

B. ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft; 2011.

C. ASTM B33 - Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes; 2010.

D. ASTM B787/B787M - Standard Specification for 19 Wire Combination Unilay-Stranded Copper Conductors for Subsequent Insulation; 2004 (Reapproved 2009).

E. ASTM D3005 - Standard Specification for Low-Temperature Resistant Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape; 2010.

F. ASTM D4388 - Standard Specification for Nonmetallic Semi-Conducting and Electrically Insulating Rubber Tapes; 2008.

G. NECA 1 - Standard for Good Workmanship in Electrical Construction; National Electrical Contractors Association; 2010.

H. NEMA WC 70 - Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy; National Electrical Manufacturers Association; 2009 (ANSI/NEMA WC 70/ICEA S-95-658).

I. NETA STD ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems; International Electrical Testing Association; 2009.

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

K. UL 44 – Thermoset-Insulated Wires and Cables; Current Edition, Including All Revisions.

L. UL 83 - Thermoplastic-Insulated Wires and Cables; Current Edition, Including All Revisions.

M. UL 486A-486B - Wire Connectors; Current Edition, Including All Revisions.

N. UL 486C - Splicing Wire Connectors; Current Edition, Including All Revisions.

O. UL 486D - Sealed Wire Connector Systems; Current Edition, Including All Revisions.

P. UL 510 - Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape; Current Edition, Including All Revisions.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Qualification Data: For testing agency.

C. Field quality-control test reports.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a member company of the InterNational Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

1. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association or the National Institute for

Certification in Engineering Technologies to supervise on-site testing specified in Part 3.

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.

C. Comply with NFPA 70.

D. All devices and wiring shall be U.L. listed.

1.7 COORDINATION

A. Set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Southwire Company.
2. Triangle Wire and Cable.
3. Cerro Wire, LLC.
4. Encore Wire Corp.

B. Copper Conductors: Comply with NEMA WC 70, 98 percent conductivity.

C. Conductor Insulation: Comply with NEMA WC 70 for Types THHN/THWN-2, 75 deg C wet/90 deg C dry, XHHW-2, 90 deg C wet/dry and SO, minimum 600 V.

2.2 CONNECTORS AND SPLICES AND TERMINAL BLOCKS

A. Manufacturers (for Connectors): Subject to compliance with requirements, provide products by one of the following:

1. AFC Cable Systems, Inc.
2. AMP Incorporated/Tyco International.
3. Buchanan/Tyco.
4. FCI-Burndy.
5. Hubbell Power Systems, Inc.
6. Ideal Industries, Inc.
7. O-Z/Gedney; EGS Electrical Group LLC.
8. 3M; Electrical Products Division.
9. Thomas & Beits Corp.
10. Tyco Electronics Corp.

B. Manufacturers (for Terminal Blocks): Subject to compliance with requirements, provide products by one of the following:

1. Burndy Products/FCI.
2. General Electric Co.
3. Ilsco.
4. Pass & Seymour.
5. Polaris.
6. Square D Co.
7. 3M Company.

C. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

1. Bolted or screwed mechanical pressure/connector block type (insulated), size 8 AWG and larger.
2. Compression/crimped pressure type, size 8 AWG and larger.
3. Twist-on pressure type plastic or nylon insulator cap with internal threaded core and spring insert, size 6 AWG and smaller.

D. Terminal blocks: NEMA ICS4; modular, channel (rail) mounted with end-stops; solderless, box/clamp type terminals; 300 volt rated for control conductors, 600 volt rated for power conductors; wire size (cross-section) rated for applicable conductors; suitable for connection of copper conductors; with marking strips.

2.3 WIRING ACCESSORIES

A. Electrical Tape:

1. Manufacturers:

a. 3M: www.3m.com.
b. Plymouth Rubber Europa: www.plymouthrubber.com.

2. Vinyl Insulating Electrical Tape: Complying with ASTM D3005 and listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; conformable for application down to 0 degrees F and suitable for continuous temperature environment up to 221 degrees F.
3. Rubber Splicing Electrical Tape: Ethylene Propylene Rubber (EPR) tape, complying with ASTM D4388; minimum thickness of 30 mil; suitable for continuous temperature environment up to 194 degrees F and short-term 266 degrees F overload service.
4. Electrical Filler Tape: Rubber-based insulating moldable putty, minimum thickness of 125 mil; suitable for continuous temperature environment up to 176 degrees F.
5. Moisture Sealing Electrical Tape: Insulating mastic compound laminated to flexible, all-weather vinyl backing; minimum thickness of 90 mil.

B. Heat Shrink Tubing: Heavy-wall, split-resistant, with factory-applied adhesive; rated 600 V; suitable for direct burial applications; listed as complying with UL 486D.

C. Wire Pulling Lubricant: Listed; suitable for use with the conductors or cables to be installed and suitable for use at the installation temperature.

D. Use mechanical compression for 6 AWG or larger or any connection made within any type of exterior junction box or device to include. Cover connector with insulating tape or heat shrinkable insulation equivalent to 150% conductor insulation.

E. Outdoor boxes (Including building mounted boxes used for outdoor devices) and underground connections of any type #12 to #6 AWG.

1. Ideal Weatherproof wire connectors or equal.

a. Silicon filled wire connectors designed to meet UL 486D standards
b. Size per manufacturer for number and wire sizes

2.4 SLEEVES FOR CABLES

A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.

B. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping."

C. Coordinate with Section 26 05 00 "Common Work Results for Electrical" for additional requirements.

2.5 SLEEVE SEALS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Advance Products & Systems, Inc.
2. Calpico, Inc.
3. Metraflex Co.
4. Pipeline Seal and Insulator, Inc.

B. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and cable.

1. Sealing Elements: EPDM interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
2. Pressure Plates: Stainless steel. Include two for each sealing element.
3. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

PART 3 - EXECUTION

3.1 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Feeders Concealed in Ceilings, Walls, and Partitions: Type THHN/THWN-2, single conductors in raceway.

B. Feeders Concealed below Slabs-on-Grade, and in Crawlspaces: Type THWN-2, single conductors in raceway.

C. Exposed Branch Circuits, including in Crawlspaces: Type THWN-2, single conductors in raceway.

D. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN/THWN-2, single conductors in raceway.

E. Branch Circuits Concealed below Slabs-on-Grade: Type THWN-2, single conductors in raceway.

F. Cord Drops and Portable Appliance Connections: Type SO, hard service cord.

G. Fire Alarm Circuits: Refer to drawings for requirements.

H. Remote Control and Signal Cable:

1. Control cable for Class I remote control and Signal circuits: Copper conductor, 600 volt THHN/THWN-2 insulation, rated 60 deg C, installed in raceway.
2. Control cable for Class 2 or Class 3 remote control and Signal circuits: Copper conductor, 300 volt insulation, rated 60 deg C, individual conductors twisted together, shielded and covered with a PVC bracket; UL listed. Use plenum rated cable in plenum environments.
3. Plenum cable for Class 2 or Class 3 remote control and Signal circuits: Copper conductor, 300 volt insulation, rated 60 deg C, individual conductors twisted together, shielded and covered with a nonmetallic jacket; UL listed for use in air handling ducts, hollow spaces used as ducts and plenums.
4. Coordinate open cabling requirements with local jurisdiction prior to bidding.

I. Connections to removal light fixtures in grid ceilings: FMC with THHN/THWN-2, maximum length 6’-0” whips, with ground wire. Provide plenum rated raceways when required by local codes.

J. Utilize type THWN-2 for underground feeders or branch circuits subject to becoming wet.

3.2 INSTALLATION OF CONDUCTORS AND CABLES

A. Install copper conductors:

1. Install minimum #12 AWG conductors, except install minimum #14 AWG conductors for control circuits.
2. Install stranded conductors for #8 AWG and larger, and solid conductors for #10 AWG and smaller.
3. Use minimum of #10 AWG conductor for 20 ampere, 120 Volt branch circuit home runs longer than 75 feet.

B. Install a separate dedicated neutral conductor for each phase of both lighting and power multi-wire branch circuits. If a multi-wire branch circuit contains three phase wires, the circuit will require three dedicated neutrals. The use of multi-pole branch breakers to eliminate neutral conductors is not allowed.

C. 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.

D. Completely and thoroughly swab raceway system before installing conductors.

E. Provide protection for exposed cables where subject to damage.

F. Install all power conductors in raceways. Install low voltage wiring in conduit unless otherwise indicated on drawings.

G. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

H. Use U.L. listed pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

I. Pull conductors together where more than one is being installed in conduit. Place an equal number of conductors for each phase of a circuit in same raceway or cable. Make conductor lengths equal for all parallel circuits. Size conductors and raceways per NEC. Derate conductor ampacities per NEC.

J. Install control conductors in conduit runs separate from power conductors.

K. Install cables in conduits parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

L. Support according to Division 26 Section “Hangers and Supports for Electrical Systems,” and as noted on drawings, above accessible ceiling; do not rest on ceiling tiles.

M. Seal wall/floor penetrations according to Division 7 Section “Penetration Firestopping.”

N. Identify and color-code conductors and cables according to Division 26 Section "Identification for Electrical Systems."

3.3 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B. Thoroughly clean wires before installing lugs and connectors.

B. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

1. Tape uninsulated connectors with electrical tape to 150 percent of the insulating rating of conductor.

C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.

D. Splice conductors only in accessible pull and junction boxes or outlet boxes. Neatly train and lace wiring inside boxes, equipment, and panelboards.

E. Install block connectors with insulating covers for copper conductor splices or taps, #8 AWG and larger.

F. Install compression/crimped connectors for copper conductor control circuits terminal.

G. Install twist-on connectors for copper conductor splices, #6 AWG and smaller, except install terminal blocks for connectors in pull and junction boxes containing 20 or more splices.

H. Terminate spare conductors with electrical tape.

3.4 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping."

B. Coordinate with Section 26 05 00 "Common Work Results for Electrical" for additional requirements.

C. Concrete Slabs and Walls: Install sleeves for all penetrations. Install sleeves during erection of slabs and walls.

D. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.

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 wall surfaces. If above accessible ceiling, sleeves can extend 1 inch out of wall.

G. Extend sleeves installed in floors 2 inches above finished floor level.

H. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and cable unless sleeve seal is to be installed. All other sleeves for cabling shall be sized based upon 40 percent NEC fill rate and allow for minimum of 50 percent expansion for future cables. Utilize multiple sleeves as required.

I. Seal space outside of sleeves with grout for penetrations of concrete and masonry and with approved joint compound for gypsum board assemblies.

J. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and cable, using joint sealant appropriate for size, depth, and location of joint according to Division 07 Section "Joint Sealants."

K. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at cable penetrations. Install sleeves and seal with firestop materials according to Division 07 Section "Penetration Firestopping."

L. Roof-Penetration Sleeves: Seal penetration of individual cables with flexible boot-type flashing units applied in coordination with roofing work.

M. Aboveground Exterior-Wall Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Size sleeves to allow for 1-inchannular clear space between pipe and sleeve for installing mechanical sleeve seals.

N. Furnish and install sleeves for all low voltage cabling, including Data, Voice, Video, Paging, Clock, Thermostat, Fire Alarm, Security, etc. All sleeves shall be provided with end bushing/fitting to protect cabling. Sleeves shall be sized based upon 40 percent NEC fill rate and allow for minimum of 50 percent expansion for future cables. Utilize multiple sleeves as required. Minimum sleeve size is 3/4 inch conduit.

3.5 SLEEVE-SEAL INSTALLATION

A. Install to seal underground exterior-wall penetrations.

B. Use type and number of sealing elements recommended by manufacturer for cable material and size. Position cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.6 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Division 07 Section "Penetration Firestopping."

3.7 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections and prepare test reports.

B. Perform tests and inspections and prepare test reports.

C. Tests and Inspections:

1. After installing conductors and cables and before electrical circuitry has been energized, test conductors for compliance with requirements.
2. Perform each visual (for physical damage and proper connection) and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
3. Torque test conductor connections and terminations to manufacturer's recommended values.
4. Perform continuity test on power and equipment branch circuit conductors. Verify proper phasing connection.
5. Megger test all wiring #8 AWG and larger, regardless of voltage.

D. Test Reports: Prepare a written report to record the following:

1. Test procedures used.
2. Test results that comply with requirements.
3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

E. Remove and replace malfunctioning units and retest as specified above.

END OF SECTION

SECTION 26 05 23
CONTROL-VOLTAGE ELECTRICAL POWER CABLES

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.

1.2 SUMMARY

A. Section Includes:

1. UTP Cabling – Refer to Specification Section 27 15 00, "Communication Horizontal Cabling."
2. RS-232 cabling.
3. RS-485 cabling.
4. Low-voltage control cabling.
5. Control-circuit conductors.
6. Identification products.

1.3 DEFINITIONS

A. Basket Cable Tray: A fabricated structure consisting of galvanized steel wire mesh bottom and side rails.

B. EMI: Electromagnetic interference.

C. IDC: Insulation displacement connector.

D. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control and signaling power-limited circuits.

E. Open Cabling: Passing telecommunications cabling through open space (e.g., between the studs of a wall cavity).

F. RCDD: Registered Communications Distribution Designer.

G. UTP: Unshielded twisted pair.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For cable routing, showing cable route with relationship between the adjacent structural, electrical, and mechanical elements. Include the following:

1. Vertical and horizontal offsets and transitions.
2. Floor penetrations.
3. Termination poinits.

C. Qualification Data: For qualified layout technician, installation supervisor, and field inspector.

D. Source quality-control reports.

E. Field quality-control reports.

F. Maintenance Data: For wire and cable to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: Member company of an NRTL.

1. Testing Agency's Field Supervisor: Currently certified by BICSI as an RCDD to supervise on-site testing.

B. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 50 or less.

C. 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.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Test cables upon receipt at Project site.

1. Test each pair of cables for open and short circuits.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install UTP and connecting materials until 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.

PART 2 - PRODUCTS

2.1 PATHWAYS

A. Support of Open Cabling: U.L. labeled for support of low voltage cabling, designed to prevent degradation of cable performance and pinch points that could damage cable.

1. Support brackets with cable tie slots for fastening cable ties to brackets.
2. Lacing bars, spools, J-hooks, and D-rings.
3. Straps and other devices.
4. Cable trays.

B. Conduit and Boxes: Comply with requirements in Division 26 Section "Raceway and Boxes for Electrical Systems."

1. Outlet boxes shall be no smaller than 2 inches wide, 3 inches high, and 2-1/2 inches deep.

2.2 BACKBOARDS

A. Description: Plywood, fire-retardant treated, 3/4 inches thick and sized as required for equipment. Comply with requirements for plywood backing panels in Division 06 Section "Rough Carpentry."

2.3 RS-232 CABLE

A. Plenum-Rated Cable: NFPA 70, Type CMP.

1. Paired, two pairs, No. 22 AWG, stranded (7x30) tinned-copper conductors.
2. Fluorinated ethylene propylene insulation.
3. Individual aluminum foil-polyester tape shielded pairs with 100 percent shield coverage.
4. Fluorinated ethylene propylene jacket.
5. Pairs are cabled on common axis with No. 24 AWG, stranded (7x32) tinned-copper drain wire.
6. Flame Resistance: Comply with NFPA 262.

2.4 RS-485 CABLE

A. Plenum-Rated Cable: NFPA 70, Type CMP.

1. Paired, two pairs, No. 22 AWG, stranded (7x30) tinned-copper conductors.
2. Fluorinated ethylene propylene insulation.
3. Unshielded.
4. Fluorinated ethylene propylene jacket.
5. Flame Resistance: NFPA 262, Flame Test.

2.5 LOW-VOLTAGE CONTROL CABLE

A. Plenum-Rated, Paired Cable: NFPA 70, Type CMP.

1. One pair, twisted, No. 16 AWG, stranded (19x29) tinned-copper conductors.
2. Fluorinated ethylene propylene insulation.
3. Unshielded.
4. Fluorinated ethylene propylene jacket.
5. Flame Resistance: Comply with NFPA 262.

B. Plenum-Rated, Paired Cable: NFPA 70, Type CMP.

1. One pair, twisted, No. 18 AWG, stranded (19x30) tinned-copper conductors.
2. Fluorinated ethylene propylene insulation.
3. Unshielded.
4. Fluorinated ethylene propylene jacket.
5. Flame Resistance: NFPA 262, Flame Test.

2.6 CONTROL-CIRCUIT CONDUCTORS

A. Class 1 Control Circuits: Stranded copper, Type THHN-THWN, in raceway, complying with UL 83.

B. Class 2 Control Circuits: Stranded copper, Type THHN-THWN, in raceway or power-limited cable, concealed in building finishes, complying with UL 83.

C. Class 3 Remote-Control and Signal Circuits: Stranded copper, Type TW or Type TF, complying with UL 83.

D. All cables installed in plenum environments shall be plenum rated.

2.7 IDENTIFICATION PRODUCTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Brady Corporation.
2. HellermannTyton.
3. Kroy LLC.
4. Panduit Corp.

B. Comply with UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

C. Comply with requirements in Division 26 Section "Identification for Electrical Systems."

2.8 SOURCE QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to evaluate cables.

B. Factory test cables according to TIA/EIA-568-C.

C. Cable will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 INSTALLATION OF PATHWAYS

A. Cable Trays: Comply with NEMA VE 2 and TIA/EIA-569-A-7.

B. Comply with TIA/EIA-569-B for pull-box sizing and length of conduit and number of bends between pull points.

C. Comply with requirements in Division 26 Section "Raceway and Boxes for Electrical Systems" for installation of conduits and wireways.

D. Install manufactured conduit sweeps and long-radius elbows if possible.

E. Pathway Installation in Equipment Rooms:

1. Position conduit ends adjacent to a corner on backboard if a single piece of plywood is installed or in the corner of room if multiple sheets of plywood are installed around perimeter walls of room.
2. Install cable trays to route cables if conduits cannot be located in these positions.
3. Secure conduits to backboard if entering room from overhead.
4. Extend conduits 3 inches above finished floor or to above ceiling if entering top of racks.
5. Install metal conduits with grounding bushings and connect with grounding conductor to grounding system.

F. Backboards: Install backboards. Butt adjacent sheets tightly and form smooth gap-free corners and joints.

G. Furnish and install sleeves through walls and floors where exposed cabling is allowed. Refer to Division 26 Section 26 05 00 "Common Work Results for Electrical" for additional information.

3.2 INSTALLATION OF CONDUCTORS AND CABLES

A. Comply with NECA 1.

B. General Requirements for Cabling:

1. Comply with TIA/EIA-568-C.
2. Comply with BICSI ITSIM, Ch. 6, "Cable Termination Practices."
3. Terminate all conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, and cross-connect and patch panels.
4. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
5. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIM, "Cabling Termination Practices" Chapter. Install lacing bars and distribution spools.
6. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
7. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.
8. Pulling Cable: Comply with BICSI ITSIM, Ch. 4, "Pulling Cable." Monitor cable pull tensions.
9. Install end bushing/fittings on all conduit sleeves/stubs to protect cabling.

C. UTP Cable Installation:

1. Comply with TIA/EIA-568-C.
2. Install 110-style IDC termination hardware unless otherwise indicated.
3. Do not untwist UTP cables more than 1/2 inch from the point of termination to maintain cable geometry.

D. Installation of Control-Circuit Conductors:

1. Install wiring in raceways. Comply with requirements specified in Division 26 Section "Raceway and Boxes for Electrical Systems."

E. Open-Cable Installation:

1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
2. Suspend copper cable not in a wireway or pathway a minimum of 8 inches above ceilings by cable supports not more than 48 inches apart.
3. Cable shall not be run through structural members or in contact with pipes, ducts, or other potentially damaging items.
4. Do not route cabling above top chord of bar joists or within 6 inches of roof deck to prevent damage caused by roofing nails.

F. Installation of Cable Routed Exposed under Raised Floors:

1. Install plenum-rated cable only.
2. Install cabling after the flooring system has been installed in raised floor areas.
3. Coil cable 72 inches long shall be neatly coiled not less than 12 inches in diameter below each feed point.

G. Separation from EMI Sources:

1. Comply with BICSI TDMM and TIA/EIA-569-D recommendations for separating unshielded copper voice and data communication cable from potential EMI sources, including electrical power lines and equipment.
2. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:

    a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 5 inches.
    b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches.
    c. Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches.

3. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:

    a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 2-1/2 inches.
    b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches.
    c. Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches.

4. 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:

    a. Electrical Equipment Rating Less Than 2 kVA: No requirement.
    b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches.
    c. Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches.

5. Separation between Cables and Electrical Motors and Transformers, 5 kVA or HP and Larger: A minimum of 48 inches.
6. Separation between Cables and Fluorescent Fixtures: A minimum of 5 inches.

3.3 REMOVAL OF CONDUCTORS AND CABLES

A. Remove abandoned conductors and cables.

3.4 CONTROL-CIRCUIT CONDUCTORS

A. Minimum Conductor Sizes:

1. Class 1 remote-control and signal circuits, No 14 AWG.
2. Class 2 low-energy, remote-control, and signal circuits, No. 16 AWG.
3. Class 3 low-energy, remote-control, alarm, and signal circuits, No. 12 AWG.

3.5 FIRESTOPPING

A. Comply with requirements in Division 07 Section "Penetration Firestopping."

B. Comply with TIA/EIA-569-A, Annex A, "Firestopping."

C. Comply with BICSI TDMM, "Firestopping Systems" Article.

3.6 GROUNDING

A. For data communication wiring, comply with ANSI-J-STD-607-A and with BICSI TDMM, "Grounding, Bonding, and Electrical Protection" Chapter.

B. For low-voltage wiring and cabling, comply with requirements in Division 26 Section "Grounding and Bonding for Electrical Systems."

3.7 IDENTIFICATION

A. Identify system components, wiring, and cabling according to TIA/EIA-606-C. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

3.8 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Perform tests and inspections.

C. Tests and Inspections:

1. Visually inspect cable jacket materials for UL or third-party certification markings. Inspect cabling terminations to confirm color-coding for pin assignments, and inspect cabling connections to confirm compliance with TIA/EIA-568-C.
2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
3. Test cabling for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination but not after cross connection.

    a. Test instruments shall meet or exceed applicable requirements in TIA/EIA-568-C. Perform tests with a tester that complies with performance requirements in "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in "Measurement Accuracy (Informative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.

D. Document data for each measurement. Print data for submittals in a summary report that is formatted using Table 10.1 in BICSI TDMM as a guide, or transfer the data from the instrument to the computer, save as text files, print, and submit.

E. End-to-end cabling will be considered defective if it does not pass tests and inspections.

F. Prepare test and inspection reports.

END OF SECTION

SECTION 26 05 26
GROUNDING AND BONDING FOR ELECTRICAL 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.

1.2 SUMMARY

A. This Section includes methods and materials for grounding systems and equipment.

B. Related Sections, Include the Following:

1. Division 26 "Low-Voltage Electrical Power Conductors and Cables."

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Other Informational Submittals: Plans showing dimensioned as-built locations of grounding features specified in Part 3 "Field Quality Control" Article, including the following:

1. Grounding arrangements and connections for separately derived systems.
2. Grounding for sensitive electronic equipment.
3. Grounding devices.

C. Qualification Data: For testing agency and testing agency's field supervisor.

D. Field quality-control test reports. Submit written test reports to include the following:

1. Test procedures used.
2. Test results that comply with requirements.
3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

E. Operation and Maintenance Data: For grounding to include the following in emergency, operation, and maintenance manuals:

1. Instructions for periodic testing and inspection of grounding features at test wells, ground rings and grounding connections for separately derived systems based on NETA MTS and NFPA 70B.

a. Tests shall be to determine if ground resistance or impedance values remain within specified maximums, and instructions shall recommend corrective action if they do not.
b. Include recommended testing intervals.

1.4 QUALITY ASSURANCE

A. ANSI/IEEE 32 – Requirements, terms, and test procedures for neutral grounding devices.

B. ANSI/IEEE C2 – National Electrical Safety Code.

C. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a member company of the InterNational Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

1. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association to supervise on-site testing specified in Part 3.

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. Comply with UL 467 for grounding and bonding materials and equipment.

F. Comply with NEC Article 250 and local code requirements.

G. Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Grounding Conductors, Cables, Connectors, and Rods:

a. Apache Grounding/Erico Inc.
b. Boggs, Inc.
c. Chance/Hubbell.
d. Copperweld Corp.
e. Erico Inc.; Electrical Products Group.
f. Framatome Connectors/Burndy Electrical.
g. Harger Lightning Protection, Inc.

h. Ideal Industries, Inc.
i. ILSCO.
j. Kearney/Cooper Power Systems.
k. O-Z/Gedney Co.; a business of the EGS Electrical Group.
l. Raco, Inc.; Division of Hubbell.
m. Robbins Lightning, Inc.
n. Superior Grounding Systems, Inc.
o. Thomas & Betts, Electrical.
p. Thompson Lightning Protection.

2.2 CONDUCTORS

A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction, green insulation.

B. Bare Copper Conductors:

1. Solid Conductors: ASTM B 3.
2. Stranded Conductors: ASTM B 8.
3. Tinned Conductors: ASTM B 33.
4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch in diameter.
5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
6. Bonding Jumper: Copper tape, braided conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

C. Grounding Electrode Conductor: Stranded cable.

D. Grounding Bus: Rectangular bars of annealed copper, 1/4 by 2 inches in cross section, unless otherwise indicated; with insulators.

2.3 CONNECTORS

A. Comply with IEEE 837 and UL 467.

B. Listed and labeled by a nationally recognized testing laboratory acceptable to authorities having jurisdiction for applications in which used, and for specific types, sizes, and combinations of conductors and other items connected.

C. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, bolted pressure-type, with at least two bolts, or compression type.

1. Pipe Connectors: Clamp type, sized for pipe.

D. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Conductors: Install solid copper conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger, unless otherwise indicated.

B. Grounding Bus: Install in electrical and telephone equipment rooms, in rooms housing service equipment, and elsewhere as indicated.

1. Install bus on insulated spacers 1 inch, minimum, from wall 6 inches above finished floor, unless otherwise indicated.
2. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, down to specified height above floor, and connect to horizontal bus.

C. Conductor Terminations and Connections:

1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
2. Underground Connections: Welded connectors, except at test wells and as otherwise indicated.
3. Connections to Ground Rods at Test Wells: Bolted connectors.
4. Connections to Structural Steel: Welded connectors.

D. Use only copper conductors for both insulated and bare grounding conductors in direct contact with earth, concrete, masonry, crushed stone, and similar materials.

E. In raceways, use insulated equipment grounding conductors.

F. Bond conductors together using thermoweld process.

3.2 EQUIPMENT GROUNDING

A. Comply with NFPA 70, Article 250, for types, sizes, and quantities of equipment grounding conductors, unless specific types, larger sizes, or more conductors than required by NFPA 70 are indicated.

B. Install insulated equipment grounding conductors with all feeders and branch circuits.

C. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:

1. Feeders and branch circuits.
2. Lighting circuits.
3. Receptacle circuits.
4. Single-phase motor and appliance branch circuits.
5. Three-phase motor and appliance branch circuits.
6. Flexible raceway runs.

7. Computer and Rack-Mounted Electronic Equipment Circuits: Install insulated equipment grounding conductor in branch-circuit runs from equipment-area power panels and power-distribution units.

D. Nonmetallic Raceways: Install an equipment grounding conductor in nonmetallic raceways unless they are designated for telephone or data cables.

E. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.

F. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.

G. Signal and Communication Equipment: For telephone, alarm, voice and data, and other communication equipment, provide No. 4 AWG minimum insulated grounding conductor in raceway from grounding electrode system to each service location, terminal cabinet, wiring closet, and central equipment location (when noted on drawings).

1. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on a 1/4-by-2-by-12-inch grounding bus.
2. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.

3.3 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance, except where routed through short lengths of conduit.

1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install so vibration is not transmitted to rigidly mounted equipment.
3. Use exothermic-welded connectors for outdoor locations, but if a disconnect-type connection is required, use a bolted clamp.

C. Grounding and Bonding for Piping:

1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes, using a bolted clamp connector or by bolting a lug-type connector to a pipe flange, using one of the lug bolts of the flange.

Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.

2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

D. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install tinned bonding jumper to bond across flexible duct connections to achieve continuity.

E. Grounding for Steel Building Structure: Install a driven ground rod at base of each corner column and at intermediate exterior columns at distances not more than 60 feetapart.

3.4 CONNECTIONS

A. General: Make connections so galvanic action or electrolysis possibility is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.

1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer to order of galvanic series.
2. Make connections with clean, bare metal at points of contact.
3. Make aluminum-to-steel connections with stainless-steel separators and mechanical clamps.
4. Make aluminum-to-galvanized steel connections with tin-plated copper jumpers and mechanical clamps.
5. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.

B. Exothermic-Welded Connections: Comply with manufacturer's written instructions. Welds that are puffed up or that show convex surfaces indicating improper cleaning are not acceptable.

C. Equipment Grounding Conductor Terminations: For No. 8 AWG and larger, use pressure-type grounding lugs. No. 10 AWG and smaller grounding conductors may be terminated with winged pressure-type connectors.

D. Noncontact Metal Raceway Terminations: If metallic raceways terminate at metal housings without mechanical and electrical connection to housing, terminate each conduit with a grounding bushing. Connect grounding bushings with a bare grounding conductor to grounding bus or terminal in housing. Bond electrically noncontinuous conduits at entrances and exits with grounding bushings and bare grounding conductors, unless otherwise indicated.

E. Tighten screws and bolts for grounding and bonding connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A.

F. Compression-Type Connections: Use hydraulic compression tools to provide correct circumferential pressure for compression connectors. Use tools and dies recommended by connector manufacturer. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on grounding conductor.

G. Moisture Protection: If insulated grounding conductors are connected to ground rods or grounding buses, insulate entire area of connection and seal against moisture penetration of insulation and cable.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing and inspecting agency to perform the following field tests and inspections and prepare test reports:

B. Perform the following tests and inspections and prepare test reports:

1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
2. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, at ground test wells, and at individual ground rods. Make tests at ground rods before any conductors are connected.

    a. Measure ground resistance not less than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
    b. Perform tests by fall-of-potential method according to IEEE 81.

3. Prepare dimensioned drawings locating each test well, ground rod and ground rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location, and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

C. Report measured ground resistances that exceed the following values:

1. Power and Lighting Equipment or System with Capacity 500 kVA and Less: 10 ohms.
2. Power Distribution Units or Panelboards Serving Electronic Equipment: 1 ohm.

D. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION

SECTION 26 05 29
HANGERS AND SUPPORTS FOR ELECTRICAL 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.

1.2 SUMMARY

A. This Section includes the following:

1. Hangers and supports for electrical equipment and systems.
2. Construction requirements for concrete bases.
3. Requirements when devices are installed in corrosive atmospheres.

1.3 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. IMC: Intermediate metal conduit.

C. RMC: Rigid metal conduit.

D. Corrosive Environment: Any area subject to chlorine, salt water, or other corrosive agent that causes deterioration and fatigue of materials.

1.4 REFERENCE STANDARDS

A. ICC-ES AC01 - Acceptance Criteria for Expansion Anchors in Masonry Elements; 2009.

B. ICC-ES AC106 - Acceptance Criteria for Predrilled Fasteners (Screw Anchors) in Masonry Elements; 2006.

C. ICC-ES AC193 - Acceptance Criteria for Mechanical Anchors in Concrete Elements; 2010.

D. ICC-ES AC308 - Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements; 2009.

E. NECA 1 - Standard for Good Workmanship in Electrical Construction; National Electrical Contractors Association; 2010.

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

1.5 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design supports for multiple raceways, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.

C. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

D. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor of five times the applied force.

E. Hot Dipped Galvanized Surfaces: Clean welds, bolted connections, cut and abraded areas and apply zinc rich galvanizing-repair paint to comply with ASTM A 780. Comply with manufacturers recommendations for hot dipped galvanized coating repair.

F. Duplex Coating Surfaces: Clean welds, bolted connections, cut and abraded areas and apply zinc rich galvanizing-repair paint to comply with ASTM A 780. Finish with provided paint. Comply with manufacturers recommendations for hot dipped galvanized coating repair.

1.6 SUBMITTALS

A. Product Data: For the following:

1. Steel slotted support systems.

B. Shop Drawings: Show fabrication and installation details and include calculations for the following:

1. Trapeze hangers. Include Product Data for components.
2. Steel slotted channel systems. Include Product Data for components.
3. Equipment supports.

C. Welding certificates.

1.7 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Comply with NFPA 70.

C. Hot Dipped Galvanized Coating: After fabrication, minimum 3 mil thickness; ASTM A123.

1.8 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 roof curbs, equipment supports, and roof penetrations. These items are specified in Division 07 Section "Roof Accessories."

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Allied Tube & Conduit.
b. Cooper B-Line, Inc.; a division of Cooper Industries.
c. ERICO International Corporation.
d. GS Metals Corp.
e. Thomas & Betts Corporation.
f. Unistrut; Tyco International, Ltd.
g. Wesanco, Inc.

2. Metallic Coatings: Hot-dip galvanized steel after fabrication and applied according to MFMA-4. To be used in all exterior, damp, wet locations.
3. Nonmetallic Coatings: Manufacturer's standard corrosion-resistant coating with electro-deposition AC04416 coating with rust protection and fade resistant finish, acceptable to authority having jurisdiction. Applied according to MFMA-4.
4. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4, unless used in corrosive environment; see Notes 6 and 7 as follows.
5. Channel Dimensions: Selected for applicable load criteria.
6. Hot Dipped Galvanized Coating (For Corrosive Environment): After fabrication, minimum 3 mil thickness; ASTM A123.

B. Raceway and Cable Supports: As described in NECA 1 and NECA 101.

C. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

D. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.

E. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

F. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.

    a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

        1) Hilti Inc.
        2) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
        3) MKT Fastening, LLC.
        4) Simpson Strong-Tie Co., Inc.; Masterset Fastening Systems Unit.

2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.

    a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

        1) Cooper B-Line, Inc.; a division of Cooper Industries.
        2) Empire Tool and Manufacturing Co., Inc.
        3) Hilti Inc.
        4) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
        5) MKT Fastening, LLC.

3. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
6. Toggle Bolts: All-steel springhead type.
7. Hanger Rods: Threaded steel.
8. Utilize anchoring devices suitable for corrosive environments when identified or encountered.
9. Tapcons not allowed for mounting of large equipment, including cameras and light fixtures.

2.2 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

A. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.

B. Materials: Comply with requirements in Division 05 Section "Metal Fabrications" for steel shapes and plates.

PART 3 - EXECUTION

3.1 APPLICATION

A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.

B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch in diameter. Maximum spacing for supports shall be 8 feet-0 inches on center and within 3 feet-0 inches of each junction box unless code requires more stringent spacing. Support wireways at intervals not to exceed 5 feet-0 inches.

C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.

1. Secure raceways and cables to these supports with two-bolt conduit clamps.

D. All materials installed in corrosive environments shall follow hot dipped galvanized process.

3.2 SUPPORT INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.

B. Raceway Support Methods: In addition to methods described in NECA 1, EMT, IMC, and RMC may be supported by openings through structure members, as permitted in NFPA 70. Requirements must be coordinate with structural engineer prior to installation.

1. Conduit Supports:

a. Single run hangers: Conduit straps or clamps.
b. Group run hangers: Performed U-channel rack with conduit fittings, provide 25 percent spare capacity.
c. Hanger rods: Threaded steel, 1/4 inch diameter minimum.
d. Vertical run supports: Preformed U-channel struts with conduit fittings.
e. Perforated straps and spring steel clips and clamps will not be permitted.

C. Equipment and Lighting Supports:

1. U-channel: Preformed U-channel struts with fixture and conduit fittings, as applicable.
2. Loose steel angles, channels, plates and tubing.

D. For exterior roof applications utilize B-line C-port series supporting devices so as not to damage roof system.

E. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 25 percent.

F. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:

1. To Wood: Fasten with lag screws or through bolts.
2. To New Concrete: Bolt to concrete inserts.
3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
4. To Existing Concrete: Expansion anchor fasteners.
5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches thick.
6. To Steel: Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69.
7. To Light Steel: Sheet metal screws.
8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate.

G. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

H. Install supports, anchors, sleeves and seals to rigidly fastened conduit, wireway and equipment.

I. Welding supports to building structural members or fastening supports to roof deck or other conduit or pipe will not be permitted.

J. Fabricate supports from structural steel or steel channel, rigidly welded or bolted to present a neat appearance. Use hexagon head bolts with spring lock washers under all nuts.

K. Install individual and multiple raceway hangers and riser clamps to support raceways. Provide U-bolts, clamps, attachments, and other hardware necessary for hanger assemblies and for securing hanger rods and conduits.

L. Support parallel runs of horizontal raceways together on trapeze- or bracket-type hangers.

M. Size supports for multiple raceway installations so capacity can be increased by a 25 percent minimum in the future.

N. Support individual horizontal raceways with separate hangers or clamps.

O. Fasten hanger rods, conduit clamps, outlets and junction boxes to building structure using beam clamps.

P. Do not fasten supports to piping, ductwork, mechanical equipment or conduit.

Q. In wet locations, install free-standing electrical equipment on concrete pads.

R. Install surface mounted cabinets and panelboards with minimum of four anchors. Provide steel channel supports to stand cabinet one inch off wall.

S. Bridge studs top and bottom with channels in support flush mounted cabinets and panelboards in stud walls.

T. Paint out systems where exposed in finished areas as directed by Architect.

U. **Do not install conduits above top chord of bar joists, in web of roof decking, or within 6" of deck. This is to prevent roofing nails from puncturing conduits.**

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

A. Comply with installation requirements in Division 05 Section "Metal Fabrications" for site-fabricated metal supports.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

C. Field Welding: Comply with AWS D1.1/D1.1M.

3.4 CONCRETE BASES

A. Construct concrete bases of dimensions indicated but not less than 4 inches larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.

B. Use 3000-psi, 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements are specified in Division 03 Section "Cast-in-Place Concrete."

C. Anchor equipment to concrete base.

1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
2. Install anchor bolts to elevations required for proper attachment to supported equipment.
3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

3.5 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.

B. Hot Dipped Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780. Comply with manufacturers recommendations for hot dipped galvanized coating repair.

END OF SECTION

SECTION 26 05 33
RACEWAY AND BOXES FOR ELECTRICAL 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.

1.2 SUMMARY

A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

B. Related Sections include the following:

1. Division 7 Section "Penetration Firestopping" for firestopping materials and installation at penetrations through walls, floors, ceiling, and other fire-rated elements.
2. Division 26 Section "Wiring Devices" for devices installed in boxes.
3. Division 26 Section "Identification for Electrical Systems" for identification requirements and products.
4. Division 26 Section "Hangers and Supports for Electrical Systems."

1.3 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. EPDM: Ethylene-propylene-diene terpolymer rubber.

C. FMC: Flexible metal conduit.

D. IMC: Intermediate metal conduit.

E. LFMC: Liquidtight flexible metal conduit.

F. RGS: Rigid galvanized steel.

1.4 REFERENCE STANDARDS

A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC); 2005.

B. ANSI C80.3 - American National Standard for Steel Electrical Metallic Tubing (EMT); 2005.

C. ANSI C80.6 - American National Standard for Electrical Intermediate Metal Conduit (EIMC); 2005.

D. NECA 1 - Standard for Good Workmanship in Electrical Construction; National Electrical Contractors Association; 2010.

E. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT); National Electrical Contractors Association; 2006.

F. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; National Electrical Manufacturers Association; 2007.

G. NEMA RN 1 - Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit; National Electrical Manufacturers Association; 2005.

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

I. UL 1 - Flexible Metal Conduit; Current Edition, Including All Revisions.

J. UL 6 - Electrical Rigid Metal Conduit-Steel; Current Edition, Including All Revisions.

K. UL 360 - Liquid-Tight Flexible Steel Conduit; Current Edition, Including All Revisions.

L. UL 514B - Conduit, Tubing, and Cable Fittings; Current Edition, Including All Revisions.

M. UL 797 - Electrical Metallic Tubing-Steel; Current Edition, Including All Revisions.

N. UL 1242 - Electrical Intermediate Metal Conduit-Steel; Current Edition, Including All Revisions.

1.5 SUBMITTALS

A. Product Data: For surface raceways, wireways and fittings, junction boxes, floor boxes, hinged-cover enclosures, and cabinets.

B. Shop Drawings: For the following raceway components. Include plans, elevations, sections, details, and attachments to other work.

1. Custom raceways.
2. Custom enclosures and cabinets.

C. Coordination Drawings: Conduit routing plans, 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. Structural members in the paths of conduit groups with common supports.

2. HVAC and plumbing items and architectural features in the paths of conduit groups with common supports.

D. Qualification Data: For professional engineer and testing agency.

E. Source quality-control test reports.

1.6 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: UL 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. UL 870 electrical wireways, auxiliary gutters and associated fittings.

C. Comply with NFPA 70 and local code requirements for electrical materials and components.

D. Federal Specifications:

1. W-F406b fittings for cable, power, electrical and conduit, metal flexible.
2. W-F408c fittings for conduit, metal, rigid thick wall and thin wall (EMT) type.
3. WW-C-563A conduit, metal rigid: Electrical thin wall steel type (EMT); straight lengths, elbows and bends.
4. WW-C-566C conduit, metal flexible.
5. WW-C-581E conduit, metal, rigid and intermediate; and coupling, elbow, and nipple, electrical conduit: Steel zinc coated.
6. W-C-582 conduit, raceway, metal and fitting: Surface.

E. National Electrical Manufacturer Association NEMA:

1. VE 1 1984 – Metallic cable tray system.
2. NEMA 250 – 1985 enclose for electrical equipment (1000 V maximum).

F. American National Standard Institute (ANSI):

1. ANSI C80.1 – Rigid steel conduit zinc coated.
2. ANSI C80.3 – Electrical metallic tubing (EMT), zinc coated.
3. ANSI C80.6 – Intermediate metal conduit (IMC).
4. ANSI/MEMA OS – Sheet steel galvanized boxes, device boxes, covers and box supports.

1.7 COORDINATION

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

PART 2 - PRODUCTS

2.1 METAL CONDUIT, TUBING AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Available metal conduit and tubing manufacturers::

a. RGS, IMC, and EMT:

1) Allied Tube and Conduit Co.
2) Republic Steel Corp.
3) Triangle PWC, Inc.
4) Wheatland Tube Co.

b. FMC:

1) Alflex Corp.
2) American Flexible Conduit Co.
3) Anaconda Metal Hose, Anamet, Inc.
4) Electric Flex Co.
5) Grinnel Co./Tyco International; Allied Tube and Conduit Division.

2. Available metal conduit and tubing fittings manufacturers:

a. RGS, IMC, EMT, and FMC Fittings:

1) Appleton Electric Co.
2) Cooper/Crouse-Hinds Co.
3) O-Z/Gedney Co.
4) Raco, Inc.
5) Regal Manufacturing Co.
6) Ilsco
7) Allied
8) Wheatland

b. Expansion Fittings:

1) Appleton Electric Co.
2) Cooper/Crouse-Hinds Co.
3) O-Z/Gedney Co.
4) Regal Manufacturing Co.
5) Spring City Electrical Manufacturing Co.
6) Thomas & Betts

c. Smoke and Fire-Stop Fittings:

1) O-Z/Gedney Co.
2) Spring City Electrical Manufacturing Co.
3) Thunderline Corp.

4) Anixter.

d. Sealing and Drainage Fittings:

1) Appleton Electric Co.
2) Cooper/Crouse-Hinds Co.
3) O-Z/Gedney Co.
4) Thomas & Betts
5) 3M

e. Wall and Floor Seals:

1) O-Z/Gedney Co.
2) Spring City Electrical Manufacturing Co.
3) Thomas & Betts
4) Appleton
5) Cooper/Crouse-Hinds
6) Anixter.

B. Aluminum Rigid Conduit: Not allowed.

C. Minimum conduit size: 3/4 inch Trade Size except minimum 1 inch Trade Size for underground conduit; 1/2 inch Trade Size conduit will not be allowed unless approved by Owner in writing. Utilize red conduit for fire alarm conduit. Utilize green conduit for all raceways for dedicated grounding conductors. 3/8 inch Trade Size flexible metal conduit can be used for final connection to light fixtures.

D. Rigid galvanized steel conduit (RGS) and intermediate metal conduit (IMC): FS WW-C-581; hot dip galvanized; ANSI C80.1, ANSI C80.6 zinc coated, standard threaded conduit couplings.

E. RGS and IMC fittings: FS W-F-408; hot dip galvanized. Utilize insulated throat connectors/bushings where raceway enters box or other fitting to protect wires. Utilize case hardened lock nuts.

F. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit.

1. Comply with NEMA RN 1.
2. Coating Thickness: 0.040 inch, minimum.

G. Electrical Metallic Tubing (EMT): FS WW-C-563; ANSI C80.3 zinc coated, electro-galvanized. Utilize red conduit for fire alarm conduit.

H. EMT Fittings: FS W-F-408; electro-galvanized; steel compression type; rain and concrete tight; insulated throat connectors and case hardened locknuts. Set screws not allowed. Utilize insulated throat connectors/bushings where raceway enters box or other fitting to protect wires. Utilize case hardened lock nuts.

I. Flexible metal conduit (FMC): FS WW-C-566; hot dip galvanized steel.

J. FMS Fittings: FS W-F-406, Type 1, Class 1, Style A; hot dip galvanized or zinc or cadmium electro-plated; connectors compatible with conduit. Utilize insulated

throat connectors/bushings where raceway enters box or other fitting to protect wires. Utilize case hardened lock nuts.

K. LFMC: Constructed of single strip, flexible continuous, interlocked, and double-wrapped steel; hot dip galvanized inside and outside; coated with liquid-tight jacket of flexible polyvinyl chloride.

L. LFMC Fittings: FS W-F-406, Type 1 Class 3, Style G; hot dip galvanized or zinc or cadmium electroplated; connectors compatible with conduit. Utilize insulated throat connectors/bushings where raceway enters box or other fitting to protect wires. Utilize case hardened lock nuts.

M. Provide plenum rated FMC for all plenum environments required per local codes.

N. Fittings: NEMA FB 1, compatible with conduit and tubing materials. Utilize insulated throat connectors/bushings where raceway enters box or other fitting to protect wires. Utilize case hardened lock nuts.

O. Joint Compound for Rigid Steel Conduit or IMC: Listed for use in cable connector assemblies, and compounded for use to lubricate and protect threaded raceway joints from corrosion and enhance their conductivity.

P. Expansion Fittings: Specifically designed to permit 4 inches linear movement in conduit runs, and to make with adjoining conduit; iron or steel body, hot dip galvanized or zinc electroplated; with bonding jumper.

Q. Sealing and Drainage Fittings: Corrosion resistant case metal body with openings for filling, inspection and drainage; corrosion resistant opening plugs; female hub, top and bottom; specifically designed for sealing vertical runs of conduit to restrict the passage of gases, vapors, and flames and to limit explosions; sealing compound as required and recommended by fitting manufacturer to provide a complete seal.

R. Wall and Floor Seals: Factory assembled watertight seals suitable for sealing around conduit passing through concrete foundations, walls and floors; constructed with steel sleeves, iron body, neoprene sealing grommets and rings, metal pressure rings, pressure clamps and cap screws.

S. Concrete: As specified in Division 3.

2.2 METAL WIREWAYS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cooper B-Line, Inc.
2. Hoffman.
3. Square D; Schneider Electric.
4. Wiremold.

B. Description: Sheet metal sized and shaped as indicated, NEMA 250, Type 1, unless otherwise indicated. Use NEMA Type 3R for wet locations.

C. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

D. Wireway Covers: Screw-cover type for interior and flanged-and-gasketed type for wet locations.

E. Finish: Manufacturer's standard enamel finish.

F. Construction: In accordance with UL 870.

2.3 SURFACE RACEWAYS

A. Surface Metal Raceways: Galvanized steel with snap-on covers. Manufacturer's standard enamel finish (IVORY unless otherwise noted). Coordinate final color with Architect prior to ordering.

B. Description: FS W-C-582; sheet metal channel with fitted cover, suitable for use as surface metal raceway.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Walker Systems, Inc.; Wiremold Company (The).

C. Types, sizes, and channels as indicated and required for each application, with fittings that match and mate with raceways. Minimum size WM 700 Series for power and data use. When multi-channel is required, use WM 4000 Series.

D. Fittings: Couplings, elbows, and connectors designed for use with raceway system.

E. Boxes and Extension Rings: Designed for use with raceway systems.

F. Do not use wiremold raceway on exterior of buildings.

G. Refer to drawings for additional information.

H. Where it is impossible to conceal conduit or where specifically called for on the drawings furnish and install surface raceway. surface raceway will be continuous from wall to wall or from wall to equipment. Raceway will be run at wall at ceilings and all drops will be at corners, no drops will be run in the center of walls. Route at base, door or building trim to best fit into building lines.

2.4 BOXES, ENCLOSURES, AND CABINETS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cooper Crouse-Hinds; Div. of Cooper Industries, Inc.
2. EGS/Appleton Electric.
3. Erickson Electrical Equipment Company.
4. Hoffman.
5. Hubbell Incorporated; Killark Electric Manufacturing Co. Division.
6. O-Z/Gedney; a unit of General Signal.
7. RACO; a Hubbell Company.
8. Robroy Industries, Inc.; Enclosure Division.
9. Scott Fetzer Co.; Adalet Division.
10. Spring City Electrical Manufacturing Company.
11. Thomas & Betts Corporation.
12. Walker Systems, Inc.; Wiremold Company (The).
13. Woodhead, Daniel Company; Woodhead Industries, Inc. Subsidiary.

B. Reference Standards:

1. NECA 1 - Standard for Good Workmanship in Electrical Construction; National Electrical Contractors Association; 2010.
2. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; National Electrical Manufacturers Association; 2007.
3. NEMA OS 1 - Sheet Steel Outlet Boxes, Device Boxes, Covers, and Box Supports; National Electrical Manufacturers Association; 2008.
4. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); National Electrical Manufacturers Association; 2008.
5. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

C. Provide boxes compatible with conduit and of types, shapes, and sizes including box depths, to suit each respective location. Use 4 inch square by 2-1/2 inch deep boxes to accommodate wiring devices and technology cabling.

D. Provide box covers of same material as box, unless otherwise indicated, and of types, shapes, and sizes to suit each respective location. Utilize non-magnetic stainless steel brushed satin finish Type 302/304 (0.040 inch thick) in all finished areas.

E. Provide box accessories as required for mounting at each respective location including mounting brackets, wallboard hangers, extension rings, fixture studs, clamps, and straps.

F. Provide boxes equipped with plaster rings where applicable to accommodate devices and associated faceplate. Provide access panels in all concealed junction box locations.

G. Pull and Junction Boxes: Galvanized sheet steel; NEMA OS 1; welded seams; screw-on covers; equipped with stainless steel nuts, bolts, screws, and washers.

H. Floor Boxes: Cast metal, concrete tight fully adjustable type; vertical adjusting rings; gasketed; brass floor plates, slush screw-on covers (refer to drawings for requirements).

I. Receptacle Floor Fitting: Aluminum floor plates for standard duplex flush receptacles or telephone. Furnish with stainless steel screws. Provide carpet or tile rings as required (refer to drawings for requirements).

J. Interior Outlet Boxes: Galvanized sheet steel; NEMA OS 1; stamped concentric knockouts in back and sides; threaded screw holes with corrosion resistant screws for securing box covers and wiring devices.

K. Exterior Outlet Boxes: Corrosion resistant cast metal; NEMA FB 1 threaded conduit ends; weatherproof/gasketed.

L. Conduit Bodies (Condulets): Galvanized cast metal; threaded conduit entrance ends; removable covers, corrosion resistant screws.

M. Bushings, Knockout Closures and Locknuts: corrosion resistant punched steel box knockout closures and conduit locknuts; 150 deg C plastic bushings.

N. Strain Relief Grip: Woven steel mesh with connection fitting, designed to absorb pull, flexure and vibration exerted on cord or cable and prevent disconnection at wired terminals.

O. Cast Metal Boxes for Outdoor and Wet Location Installations: NEMA 250; Type 4 and Type 6, flat flanged, surface mounted junction box, UL listed as rain-tight. Cast aluminum box and cover with ground flange, neoprene gasket and stainless steel cover screws.

P. Provide plenum rated/listed boxes for all plenum rated areas required by local code.

Q. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous hinge cover and flush latch.

1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.

R. Cabinets: NEMA 250, Type 1, galvanized steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel. Hinged door in front cover with flush latch and concealed hinge. Key latch to match panelboards. Include metal barriers to separate wiring of different systems and voltage and include accessory feet where required for freestanding equipment.

S. Provide enclosures for terminal blocks, motor starters, switches, contactors, relays, control stations, controllers, transformers, and panel boards complying NEMA 250 and suitable for surface mounting, as follows:

1. Exterior Locations: NEMA Type 3R
2. All Other Locations: NEMA Type 1, unless otherwise indicated.

2.5 TECHNOLOGY SYSTEMS BOXES

A. Manufacturer:

1. The new construction box specified herein shall be the WallSource Multi Service Box as manufactured by the Wiremold Company. Systems of other manufacturers may be considered. Written request for approval must be submitted to the engineer at least ten days prior to bid date. Each request shall include the name of the materials and a complete description of the proposed substitute.
2. Hubbell shall be considered equal.

B. Materials:

1. Box:

   a. The box shall include the box, dividers and mounting brackets. The dimensions of each shall be a minimum of 32 cubic inches per gang and shall be manufactured of 16 gauge min. thick steel. The box shall accommodate standard power and communication devices.
   b. The box shall have knockouts located on top and bottom, 2-1/4 inch from the face to accommodate combinations of 1/2 inch, 3/4 inch and 1 inch trade size conduits. Boxes of 4- or 6-gangs shall have knockouts to accommodate 1-1/2 inch trade size conduit.
   c. The box shall have a separate ground terminal provided for each gang.
   d. The box shall adjust for a flush installation with the finished wall. There shall be positive stops for surface mounting to 1/2 inch, 5/8 inch, 1 inch and 1-1/4 inch thick wallboard. Adjusting screws are located outside the box for adjustment prior to installation.

2. Device Mounting Bracket:

   a. The self-leveling device mounting bracket shall accommodate standard power devices, connectivity inserts, and Wiremold 5507 Series faceplates. A mounting bracket designed to accept other manufacturer's devices shall be available. The bracket accommodates up to six power devices or 18 communications inserts. All Wiremold standard faceplates, mounting brackets and trim rings shall be color matched.

3. Fiber Optic/Category 6 Radius:

   a. The depth of the box shall accommodate a 1-1/4 inch cable bend radius, which meets or exceeds the specifications for Fiber Optic and Category 6 cabling and TIA/EIA-569A requirements for communications pathways. A 1 inch controlled radius storage loop shall be available.

4. Device Covers:

   a. Device cover plates in the following configurations must be available: duplex device cover plates, single 1.40 inch and 1.59 inch diameter receptacle cover plates, switch plates, GFCI cover plates, Sentrex® surge receptacle cover plates and other rectangular faced plates. Single-gang cover plates shall be of modular design and shall be compatible with Wiremold wire and cable management systems.

5. Communication Devices and Accessories:

a. The box manufacturer will provide a complete line of connectivity outlets and modular multi-media inserts for voice, data, video, audio, etc. with faceplates and bezels to facilitate mounting.
b. A complete line of preprinted station and port identification labels, snap-in icon buttons and write-on station identification labels shall be available.

6. Support Bracket:

a. A support bracket for mounting on 16 inch center studs must be provided on boxes more than two gangs.

7. Dividers:

a. Dividers must be removable without any tools

2.6 SLEEVES FOR RACEWAYS

A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.

B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

C. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping" and Section 26 05 00 "Common Work Results for Electrical."

2.7 SLEEVE SEALS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Advance Products & Systems, Inc.
2. Calpico, Inc.
3. Metraflex Co.
4. Pipeline Seal and Insulator, Inc.

B. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and cable.

1. Sealing Elements: EPDM interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
2. Pressure Plates: Stainless steel. Include two for each sealing element.
3. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

C. Refer to Section 26 05 00 "Common Work Results for Electrical" for additional information and requirements.

PART 3 - EXECUTION

3.1 GENERAL

A. Determine exact route and location of all electrical materials prior to installation.

B. Verify exact locations and elevations of electrical materials with project and field engineer prior to installation, where dimensions are not indicated.

C. Install electrical materials as indicated with offsets, fittings and changes in elevations as required to make adjustments for obstacles or interferences.

D. Do not allow electrical materials installation to cause any equipment to be unserviceable or inoperable.

3.2 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below, unless otherwise indicated:

1. Exposed Conduit: Rigid steel conduit.
2. Concealed Conduit, Aboveground: Rigid steel conduit.
3. Underground Conduit: Rigid steel conduit or as indicated on drawings.
4. In Slab Aboveground: Not allowed.
5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
6. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.

B. Comply with the following indoor applications, unless otherwise indicated:

1. Exposed, Not Subject to Physical Damage: EMT or IMC or RGS.
2. Exposed, Not Subject to Severe Physical Damage: EMT or IMC or RGS.
3. Exposed and Subject to Severe Physical Damage: Rigid steel conduit. Includes raceways in the following locations:

    a. Loading dock.
    b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
    c. Mechanical rooms.

4. Installed Indoor, but Underground in Gravel Base Below Floor Slabs: RGS, as noted on drawings.
5. Concealed in Ceilings and Interior Walls and Partitions: EMT or IMC or RGS.
6. Install IMC and fittings except as follows:

    a. Install EMT conduit and fittings if conduit size is 2 inches or smaller, unless another type of conduit and fittings are indicated.
    b. Install RGS and fittings where noted or required by NFPA 70 or by federal state, and local governments or agencies having jurisdiction.

7. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations (Boiler Rooms).
8. Damp or Wet Locations: Rigid steel conduit.
9. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 3R in damp or wet locations. Use NEMA Type 4x in Kitchens and areas subject to corrosion.

C. Minimum Raceway Size: 3/4-inch trade size. Size conduit for conductors installed per NEC fill requirements. 3/8-inch trade size flexible metal conduit can be used for light fixtures, not to exceed 6 feet in length.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.
2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with that material. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer.
3. EMT: Use compression fittings. Set screw type not allowed.

E. **Aluminum conduits not allowed.**

3.3 INSTALLATION

A. Comply with NECA 1 for installation requirements applicable to products specified in Part 2 except where requirements on Drawings or in this Article are stricter.

B. Route all exposed conduit parallel or perpendicular to building lines and above accessible ceiling as required. Exposed conduit shall not be installed in finished areas unless permitted by the Owner and architect

1. Run parallel or banked raceways together on common supports.
2. Make parallel bends in parallel or banked runs. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for parallel raceways.
3. All raceways and conduit shall be run concealed. Fish through existing walls and ceilings as required. In the event concealed conduit is impossible, surface mounted metallic raceways (wiremold) shall be used with the approval of the architect. Surface mounted conduit shall also be used when specifically designated on the drawings in locations where exposed conduit is the predominant wiring method currently in use. Contractor may modify or add to that system with exposed conduit necessary to achieve design results. Exposed conduit in finished areas shall not be installed unless approved by the architect. Conduit installation shall be accomplished in a neat workmanlike manner. Run tight to walls at ceiling edge. Coordinate final routings in the field with the architect prior to installation. All exposed conduits shall be painted to match surrounding area. See **Paragraph 3.6 – SURFACE RACEWAY** for additional information.

C. Route conduit runs above the bottom chords of steel roof support joists. **Do not install conduits above top chord of bar joists, in web of roof decking, or within 6 inches of deck. This is to prevent roofing nails from puncturing conduits.**

D. Maintain minimum of 6 inches clearance between conduit and piping. Maintain 12 inch clearance between conduit and heat sources such as flues, steam pipes, and heating appliances. Install horizontal raceway runs above water and steam piping.

E. Complete raceway installation before starting conductor installation.

F. Support raceways as specified in Division 26 Section "Hangers and Supports for Electrical Systems."

G. Ensure conduit is aligned in a neat, uniform manner and arranged to maintain headroom

H. Arrange conduit supports to prevent distortion of alignment by wire pulling operations. Fasten conduit using galvanized straps, lay-in adjustable hangers, clevis hangers, or bolted split stamped galvanized hangers.

I. Group conduit in parallel runs where practical and use conduit rack constructed of steel channel with conduit straps or clamps. Provide space for 25 percent addition conduit.

J. Do not fasten conduit with wire, perforated pipe straps or from ceiling grid support wires. Remove all wire used for temporary conduit support during construction, before conductors are pulled.

K. Install conduit free from dents and bruises. Plug ends to prevent entry of dirt, debris, and moisture during installation.

L. Make bends and offsets so ID is not reduced. Keep legs of bends in the same plan and keep straight legs of offsets parallel, unless otherwise indicated.

M. Install raceways with a minimum of bends in the shortest practical distance, considering type of building construction and obstructions, unless otherwise indicated.

N. Arrange stub-ups so curved portions of bends are not visible above the finished slab. Protect stub-ups from damage where conduits rise through floor slabs.

O. Install no more than the equivalent of three 90-degree bends in any conduit run except for communications conduits, for which fewer bends are allowed.

P. Conceal conduit and EMT within finished walls and ceilings, unless otherwise indicated.

Q. Cut ends of conduit square. Ream ends of field-cut conduit and remove burrs.

R. Join raceways with fittings designed and approved for that purpose and make joints tight.

1. Join conduit butt-tight in couplings.
2. Use insulating bushings to protect conductors.

S. Tighten nuts of threadless fittings/compression fittings with suitable tools.

T. Use conduit bodies to make sharp changes in direction, around beams.

U. Use hydraulic one-shot conduit bender or factory elbows for bends in conduit larger than 2-inch size.

V. Avoid moisture traps where possible; where unavoidable, provide junction box with drain fitting at conduit low point.

W. Raceways Embedded in Slabs: Not allowed.

X. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

Y. Terminations:

1. Where raceways are terminated with locknuts and bushings, align raceways to enter squarely and install locknuts with dished part against box. Use two locknuts, one inside and one outside box.
2. Use conduit hubs or sealing locknuts for fastening conduit to cast boxes and for fastening conduit to sheet metal boxes in damp or wet locations.
3. Where raceways are terminated with threaded hubs, screw raceways or fittings tightly into hub so end bears against wire protection shoulder. Where chase nipples are used, align raceways so coupling is square to box; tighten chase nipple so no threads are exposed.

Z. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors, including conductors smaller than No. 4 AWG.

AA. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lbtensile strength. Leave at least 12 inches of slack at each end of pull wire.

BB. Raceways for Optical Fiber and Communications Cable: Install raceways, metallic, rigid and flexible, as follows:

1. 3/4-Inch Trade Size and Smaller: Install raceways in maximum lengths of 50 feet.
2. 1-Inch Trade Size and Larger: Install raceways in maximum lengths of 75 feet
3. Install with a maximum of two 90-degree bends or equivalent for each length of raceway unless Drawings show stricter requirements. Separate lengths with pull or junction boxes or terminations at distribution frames or cabinets where necessary to comply with these requirements.

CC. Install raceway sealing fittings at suitable, approved, and accessible locations and fill them with listed sealing compound. For concealed raceways, install each fitting

in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points:

1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
2. Where otherwise required by NFPA 70.
3. Where conduit passes through concrete foundations, walls, and floors, to prevent the passage of water by hydrostatic pressure.

    a. Tighten wall and floor sleeve seal nuts until sealing grommets have expanded to form watertight seal.

DD. Where conduit penetrates fire-rated walls and floors, provide pipe sleeve two sizes larger than conduit; and fill sleeve with fire-resistive intumescent compound. Fire-stop installation shall be UL listed equal to or exceeding rating of wall, floor, or ceiling.

EE. Route conduit through roof opening for piping and ductwork where possible; otherwise, route through roof jack with pitch pocket.

FF. Install expansion fittings complete with boding jumpers where conduits cross building expansion joints.

GG. Install smoke and fire-stop fittings where required by code.

HH. Stub-up Connections: Extend conduits through concrete floor for connection to freestanding equipment. Install with an adjustable top or coupling threaded inside for plugs set flush with finished floor. Extend conductors to equipment with rigid steel conduit; FMC may be used 6 inches above the floor. Install screwdriver-operated, threaded plugs flush with floor for future equipment connections.

II. All conduit stubs installed for communication cabling/technology cabling shall have bushing and end fittings installed so as to protect cables from being damaged when being pulled.

JJ. Install conduit sleeves, J-hooks and other supports for communication/technology cabling contractor.

KK. Flexible Connections: Use maximum of 72 inches of flexible conduit for recessed and semirecessed lighting fixtures; for equipment subject to vibration, noise transmission, or movement; and for all motors. Use LFMC in damp or wet locations. Install separate ground conductor across flexible connections. Utilize plenum rated raceways when required by local codes.

LL. For exterior roof applications utilize B-line C-port series supporting devices so as not to damage roof system.

3.4 BOXES INSTALLATION

A. Rigidly fasten boxes or solidly embed boxes in concrete or masonry as applicable.

B. Do not install round boxes where conduit must enter side of box.

C. Install knockout closure to cap unused knockout holes where blanks have been removed.

D. Provide electrical boxes as shown on drawings, and as required for splices, taps, wire pulling, equipment connection and code compliance.

E. 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.

F. Locate and install boxes to allow access. Where installation is inaccessible, coordinate locations and sizes of required access doors with general contractor.

G. Locate and install to maintain headroom and to present a neat appearance.

H. **Do not install boxes back-to-back in walls.** Provide minimum 6-inch separation, except provide minimum 24-inch separation in acoustic-rated walls. Fill conduit openings with "duct seal" in acoustic-rated walls.

I. Locate boxes in masonry walls, at center of cell, and install box flush with surface of wall. Coordinate masonry, cutting to achieve neat openings for boxes. Patch all over-cuts.

J. Support junction boxes and pull boxes independently of conduit. Utilize junction boxes listed for ceiling fans/supporting method where ceiling fans are indicated. Support per manufacturer's direction.

K. **Use multiple-gang boxes where more than one device is mounted together; do not use sectional boxes. Provide barriers to separate wiring of different voltage systems and where 277 volt light switches are used. Provide separate conduit feeds for each gang section.**

L. Install boxes in walls without damaging wall insulation.

M. Coordinate mounting heights and locations of outlets mounted above counters, benches, and backsplashes.

N. Position junction boxes to located luminaires as shown on reflected ceiling plans.

O. In accessible ceiling areas, position outlets and junction boxes within 6 inches of recessed luminaire, to be accessible through luminaire ceiling opening.

P. Provide recessed outlet boxes in finished areas; secure boxes to interior wall and partition studs, accurately positioning to allow for surface finish thickness. Use stamped steel stud bridges for flush outlets in hollow stud wall, and adjustable steel channel fasteners for flush ceiling outlet boxes.

Q. Align wall mounted outlet boxes for switches and similar devices.

R. Provide cast outlet boxes in exterior locations exposed to the weather and wet locations.

S. Set floor boxes level and flush with finish flooring material.

T. Locate pull boxes and junction boxes above accessible ceilings or in unfinished areas.

3.5 WIREWAY INSTALLATION

A. Install wireway at lighting transformers and panel boards to allow for the neat and workmanlike arrangement of conduits.

B. Install wireway system in accordance with manufacturer's installation instructions.

C. Route wireway parallel or perpendicular to building lines.

D. Maintain minimum of 12 inches clearance at flues and heat sources.

E. Install wireway system with allowance for expansion and contraction.

F. Ensure wireway is aligned in a neat uniform manner.

3.6 SURFACE RACEWAY (*ONLY WITH APPROVAL OF ARCHITECT*)

A. Use in finished areas where exposed conduit is not acceptable.

B. Use flat-head screws to fasten channel to surfaces, mount plumb and level.

C. Use suitable insulating bushings and inserts at connections to outlets and corner fittings.

D. Maintain grounding continuity between raceway components to provide a continuous grounding patch.

E. Fastener Option: Use clips and straps suitable for the purpose.

3.7 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping" and Division 26 Section "Common Work Results for Electrical."

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. 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.

E. Cut sleeves to length for mounting flush with both surfaces of walls. If above accessible ceiling, sleeves can extend 1 inch out of wall.

F. Extend sleeves installed in floors 2 inches above finished floor level. Extend to top of data racks when cables enter top of rack.

G. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway unless sleeve seal is to be installed or unless seismic criteria require different clearance.

H. Seal space outside of sleeves with grout for penetrations of concrete and masonry and with approved joint compound for gypsum board assemblies.

I. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway, using joint sealant appropriate for size, depth, and location of joint. Refer to Division 07 Section "Joint Sealants" for materials and installation.

J. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at raceway penetrations. Install sleeves and seal with firestop materials. Comply with Division 07 Section "Penetration Firestopping."

K. Roof-Penetration Sleeves: Seal penetration of individual raceways with flexible, boot-type flashing units applied in coordination with roofing work.

L. Aboveground, Exterior-Wall Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

M. Furnish and install sleeves for all low voltage cabling, including Data, Voice, Video, Paging, Clock, Thermostat, Fire Alarm, Security, etc. All sleeves shall be provided with end bushing/fitting to protect cabling. Sleeves shall be sized based upon 40 percent NEC fill rate and allow for minimum of 50 percent expansion for future cables. Utilize multiple sleeves as required. Minimum sleeve size is 3/4 inch conduit.

3.8 SLEEVE-SEAL INSTALLATION

A. Install to seal underground, exterior wall penetrations.

B. Use type and number of sealing elements recommended by manufacturer for raceway material and size. Position raceway in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.9 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 07 Section "Penetration Firestopping."

3.10 PROTECTION

A. Provide final protection and maintain conditions that ensure coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

3.11 CLEANING

A. After completing installation of exposed, factory-finished raceways and boxes, inspect exposed finishes and repair damaged finishes.

END OF SECTION

SECTION 26 05 53
IDENTIFICATION FOR ELECTRICAL 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.

1.2 SUMMARY

A. Section Includes:

1. Identification for raceways.
2. Identification of power and control cables.
3. Identification for conductors.
4. Warning labels and signs.
5. Instruction signs.
6. Equipment identification labels.
7. Miscellaneous identification products.

B. Match Owner's existing system identification standard. Utilize same type, size, color, text format used on existing systems. Field verify prior to ordering.

1.3 SUBMITTALS

A. Product Data: For each electrical identification product indicated.

B. Identification Schedule: An index of nomenclature of electrical equipment and system components used in identification signs and labels.

C. Submit a complete nameplate listing for Owner approval.

1.4 QUALITY ASSURANCE

A. Comply with ANSI A13.1 and IEEE C2.

B. Comply with NFPA 70.

C. Comply with NFPA 70E – Standard for Electrical Safety in the Workplace: 2009.

D. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.

E. Comply with ANSI Z535.4 for safety signs and labels.

F. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

1.5 COORDINATION

A. Coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual; and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.

B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

C. Coordinate installation of identifying devices with location of access panels and doors.

D. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 POWER RACEWAY IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway size.

B. Colors for Raceways Carrying Circuits at 600 V or Less:

1. BLUE – Power.
2. YELLOW – Lighting.
3. ORANGE – EM Circuits.
4. RED – Fire Alarm.

C. Use manufacturer colored raceways, True Color.

2.2 POWER AND CONTROL CABLE IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.

B. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

C. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

2.3 CONDUCTOR IDENTIFICATION MATERIALS

A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.

B. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

C. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

2.4 FLOOR MARKING TAPE

A. 2-inch-wide, 5-milpressure-sensitive vinyl tape, with black and white stripes and clear vinyl overlay.

2.5 WARNING LABELS AND SIGNS

A. Comply with NFPA 70 and 29 CFR 1910.145.

B. Self-Adhesive Warning Labels: Factory-printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment unless otherwise indicated. Minimum size 7 inch by 10 inch unless noted otherwise.

C. Warning label and sign shall include, but are not limited to, the following legends:

1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES."
3. Arc Flash Warning Labels: Use warning labels to identify arc flash hazards for electrical equipment, such as switchboards, panelboards, industrial control panels, meter socket enclosures, and motor control centers that are likely to require examination, adjustment, servicing, or maintenance while energized.

    a. Legend: Provide custom legend in accordance with NFPA 70E based on equipment-specific data:

        1) Include orange header that reads "WARNING" where calculated incident energy is less than 40 calories per square cm.
        2) Include red header that reads "DANGER" where calculated incident energy is 40 calories per square cm or greater.
        3) Include the text "Arc Flash and Shock Hazard; Appropriate PPE Required" or approved equivalent.

2.6 INSTRUCTION SIGNS

A. Engraved, laminated acrylic or melamine plastic, minimum 1/16 inch thick for signs up to 20 sq. inches and 1/8 inch thick for larger sizes.

1. Engraved legend with black letters on white face.
2. Punched or drilled for mechanical fasteners.
3. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

2.7 EQUIPMENT IDENTIFICATION LABELS

A. Engraved, Laminated Acrylic or Melamine Label: Punched or drilled for screw mounting. White letters on a BLACK background; use RED background for Emergency Systems. Minimum letter height shall be 3/8 inch.

B. Fasteners for Nameplates and Signs: Self-tapping, rivets, stainless steel screws or No. 10/32, stainless steel machine screws with nuts and flat and lock washers (for NEMA-1 locations only). Utilize appropriate fixtures for wet locations.

2.8 CABLE TIES

A. Plenum-Rated Cable Ties: Self extinguishing, UV stabilized, one piece, self locking.

1. Minimum Width: 3/16 inch.
2. Tensile Strength at 73 deg F, According to ASTM D 638: 7000 psi.
3. UL 94 Flame Rating: 94V-0.
4. Temperature Range: Minus 50 to plus 284 deg F.
5. Color: Black.

2.9 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Paint: Comply with requirements in Division 09 painting Sections for paint materials and application requirements. Select paint system applicable for surface material and location (exterior or interior). All paint types to be reviewed/approved by the Architect before use.

1. Exterior Concrete, Stucco, and Masonry (Other Than Concrete Unit Masonry):

a. Semigloss Acrylic-Enamel Finish: Two finish coat(s) over a primer.

1) Primer: Exterior concrete and masonry primer.
2) Finish Coats: Exterior semigloss acrylic enamel.

2. Exterior Concrete Unit Masonry:

a. Semigloss Acrylic-Enamel Finish: Two finish coat(s) over a block filler.

1) Block Filler: Concrete unit masonry block filler.

2) Finish Coats: Exterior semigloss acrylic enamel.

3. Exterior Ferrous Metal:

a. Semigloss Alkyd-Enamel Finish: Two finish coat(s) over a primer.

1) Primer: Exterior ferrous-metal primer.
2) Finish Coats: Exterior semigloss alkyd enamel.

4. Exterior Zinc-Coated Metal (except Raceways):

a. Semigloss Alkyd-Enamel Finish: Two finish coat(s) over a primer.

1) Primer: Exterior zinc-coated metal primer.
2) Finish Coats: Exterior semigloss alkyd enamel.

5. Interior Concrete and Masonry (Other Than Concrete Unit Masonry):

a. Semigloss Alkyd-Enamel Finish: Two finish coat(s) over a primer.

1) Primer: Interior concrete and masonry primer.
2) Finish Coats: Interior semigloss alkyd enamel.

6. Interior Concrete Unit Masonry:

a. Semigloss Acrylic-Enamel Finish: Two finish coat(s) over a block filler.

1) Block Filler: Concrete unit masonry block filler.
2) Finish Coats: Interior semigloss acrylic enamel.

7. Interior Gypsum Board:

a. Semigloss Acrylic-Enamel Finish: Two finish coat(s) over a primer.

1) Primer: Interior gypsum board primer.
2) Finish Coats: Interior semigloss acrylic enamel.

8. Interior Ferrous Metal:

a. Semigloss Acrylic-Enamel Finish: Two finish coat(s) over a primer.

1) Primer: Interior ferrous-metal primer.
2) Finish Coats: Interior semigloss acrylic enamel.

9. Interior Zinc-Coated Metal (except Raceways):

a. Semigloss Acrylic-Enamel Finish: Two finish coat(s) over a primer.

1) Primer: Interior zinc-coated metal primer.
2) Finish Coats: Interior semigloss acrylic enamel.

B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Verify identity of each item before installing identification products.

B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.

C. Apply identification devices to surfaces that require finish after completing finish work.

D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.

E. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.

F. System Identification Color-Coding Bands for Raceways and Cables: Each color-coding band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.

G. Cable Ties: For attaching tags. Use general-purpose type, except as listed below:

1. Outdoors: UV-stabilized nylon.
2. In Spaces Handling Environmental Air: Plenum rated.

H. Painted Identification: Comply with requirements in Division 09 painting Sections for surface preparation and paint application.

3.2 IDENTIFICATION SCHEDULE

A. Accessible Raceways, 600 V or Less, for Service, Feeder, and Branch Circuits More Than 30 A, and 120 V to ground: Identify with self-adhesive vinyl tape applied in bands. Install labels at 30-foot maximum intervals.

B. Accessible Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive vinyl labels with the wiring system legend and system voltage. System legends shall be as follows:

1. Power: Blue.
2. Lighting: Yellow.
3. EM Circuits: Orange.

4. Fire Alarm: Red.

C. Power-Circuit Conductor Identification, 600 V or Less: For conductors in pull and junction boxes, use color-coding conductor tape to identify the phase.

1. Color-Coding for Phase and Voltage Level Identification, 600 V or Less: Use colors listed below for ungrounded feeder and branch-circuit conductors.

a. Color shall be factory applied or field applied for sizes larger than No. 8 AWG, if authorities having jurisdiction permit.
b. Colors for 208/120-V Circuits:

1) Phase A: Black.
2) Phase B: Red.
3) Phase C: Blue.

c. Colors for 480/277-V Circuits:

1) Phase A: Brown.
2) Phase B: Orange.
3) Phase C: Yellow.

d. When wiring lighting switches for 3-way and 4-way travelers, use colors other than those specified above; i.e., pink, purple, etc.
e. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.

D. Power-Circuit Conductor Identification: For conductors in vaults, pull and junction boxes, manholes, and handholes, use nonmetallic plastic tag holder with adhesive-backed phase tags, and a separate tag with the circuit designation.

E. Branch-Circuit Conductor Identification: Label outside of all junction boxes above ceiling with panel and circuit information. Where there are conductors for more than three branch circuits in same junction or pull box, use marker tape. Identify each ungrounded conductor according to source and circuit number.

F. Install instructional sign including the color-code for grounded and ungrounded conductors using adhesive-film-type labels.

G. Conductors to Be Extended in the Future: Attach marker tape to conductors and list source.

H. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.

1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.

3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual.

I. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable.

1. Limit use of underground-line warning tape to direct-buried cables.
2. Install underground-line warning tape for both direct-buried cables and cables in raceway.

J. Workspace Indication: Install floor marking tape to show working clearances in the direction of access to live parts. Workspace shall be as required by NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.

K. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive warning labels.

1. Comply with 29 CFR 1910.145.
2. Identify system voltage with black letters on an orange background.
3. Apply to exterior of door, cover, or other access.
4. For equipment with multiple power or control sources, apply to door or cover of equipment including, but not limited to, the following:

a. Power transfer switches.
b. Controls with external control power connections.

L. Operating Instruction Signs: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.

M. Emergency Operating Instruction Signs: Install instruction signs with white legend on a red background with minimum 3/8-inch-high letters for emergency instructions at equipment.

N. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.

1. Labeling Instructions:

a. Indoor Equipment: Engraved, laminated acrylic or melamine label. Unless otherwise indicated, provide a single line of text with 1/2-inch-high letters on 1-1/2-inch-high label; where two lines of text are required, use labels 2 inches high.
b. Outdoor Equipment: Engraved, laminated acrylic or melamine label, 4 inches high.

c. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
d. Unless provided with self-adhesive means of attachment, fasten labels with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.

2. Equipment to Be Labeled:

a. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be self-adhesive, engraved or engraved, laminated acrylic or melamine label.
b. Enclosures and electrical cabinets.
c. Access doors and panels for concealed electrical items.
d. Switchboards.
e. Transformers: Label that includes tag designation shown on Drawings for the transformer, feeder, and panelboards or equipment supplied by the secondary.
f. Emergency system boxes and enclosures.
g. Motor-control centers.
h. Enclosed switches.
i. Enclosed circuit breakers.
j. Enclosed controllers.
k. Variable-speed controllers.
l. Push-button stations.
m. Remote-controlled switches, dimmer modules, and control devices.
n. Monitoring and control equipment.
o. UPS equipment.
p. Voice and data cable terminal equipment.
q. Master clock and program equipment.
r. Paging systems.
s. Audio/Video components, racks, and controls.
t. Fire-alarm control panel and annunciators.
u. Security and intrusion-detection control stations, control panels, terminal cabinets, and racks.
v. Terminals, racks, and patch panels for voice and data communication and for signal and control functions.

END OF SECTION

SECTION 26 09 23
LIGHTING CONTROL DEVICES

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.

1.2 SUMMARY

A. This Section includes the following lighting control devices:

1. Indoor occupancy sensors and power packs.
2. Emergency control relays.

B. Related Sections include the following:

1. Division 26 Section "Wiring Devices" for wall-box dimmers and manual light switches.

1.3 DEFINITIONS

A. DT: Dual technology.

B. LED: Light-emitting diode.

C. PIR: Passive infrared.

1.4 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

B. NECA 130 - Standard for Installing and Maintaining Wiring Devices; National Electrical Contractors Association; 2010.

C. NEMA 410 - Performance Testing for Lighting Controls and Switching Devices with Electronic Fluorescent Ballasts; National Electrical Manufacturers Association; 2004.

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

E. FCC Standards.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show installation details for occupancy and light-level sensors.

1. Interconnection diagrams showing field-installed wiring.

C. Field quality-control test reports.

D. Operation and Maintenance Data: For each type of product to include in emergency, operation, and maintenance manuals.

1.6 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. All sensors must be NEMA WD-7 listed; otherwise the manufacturer and contractor will be liable for all expenses associated with the installation of additional sensors, power packs, conduit and wiring to provide adequate coverage of area identified.

B. All sensor manufacturers need to provide certification that their products (microphonic/ultrasonic sensors) do not interfere with hearing aids and are A.D.A. compliant.

C. All sensor manufacturers need to provide certification that their products (ultrasonic sensors) do not interfere with Smart Board or other Media type electronic devices. Contractor is responsible for replacing all devices (at their expense) to conform to these requirements. Coordinate devices with Owner's Information Services Department prior to ordering.

1.7 COORDINATION

A. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, smoke detectors, fire-suppression system, and partition assemblies.

1.8 EXTRA MATERIALS

A. Furnish extra materials described as follows:

1. One (1) occupancy sensor of each type and size used.
2. One (1) power pack of each type and size used.
3. One (1) emergency lighting control relay used.

1.9 WARRANTY

A. Provide a five (5) year comprehensive warranty. Warranty shall cover all parts and labor.

PART 2 - PRODUCTS

2.1 GENERAL LIGHTING CONTROL DEVICE REQUIREMENTS

A. Line-Voltage Surge Protection: An integral part of the devices for 120- and 277-V solid-state equipment. For devices without integral line-voltage surge protection, field-mounting surge protection shall comply with IEEE C62.41 and with UL 1449.

2.2 SWITCH-BOX OCCUPANCY SENSORS (*SEE DRAWINGS FOR ADDITIONAL INFORMATION AND MODEL TYPE*)

A. Available Manufacturers:

1. Leviton Mfg. Company Inc., to match existing system devices.

B. Description: PIR and dual tech type with integral power-switching contacts rated for 800 W at 120-V ac, suitable for incandescent light fixtures, flourescent light fixtures with magnetic or electronic ballasts, or 1/6-hp motors; and rated for 1200 W at 277-V ac, suitable for incandescent light fixtures, flourescent light fixtures with magnetic or electronic ballasts, or 1/3-hp motors, minimum.

1. Include ground wire.
2. Time Delay, Selectable: Automatic adjust and fixed adjustable in steps from 5 to 30 minutes.
3. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc; keeps lighting off when selected lighting level is present.
4. Color selected by architect.

2.3 INDOOR OCCUPANCY SENSORS (*SEE DRAWINGS FOR ADDITIONAL INFORMATION, INCLUDING MODEL TYPE*)

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Leviton Mfg. Company Inc., to match existing system devices.

B. General Description: Wall- or ceiling-mounting, solid-state units with a separate relay unit.

1. Operation: Unless otherwise indicated, turn lights on when covered area is occupied and off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 30 seconds to 20 minutes.

2. Sensor Output: Contacts rated to operate the connected relay, complying with UL 773A. Sensor shall be powered from the relay unit.
3. Relay Unit: Dry contacts rated for 20-A ballast load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Power supply to sensor shall be 24-V dc, 150-mA, Class 2 power source as defined by NFPA 70.
4. Mounting:

    a. Sensor: Suitable for mounting in any position on a standard outlet box.
    b. Relay: Externally mounted through a 1/2-inch knockout in a standard electrical enclosure.
    c. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.

5. Indicator: LED, to show when motion is being detected during testing and normal operation of the sensor.
6. Bypass Switch: Override the on function in case of sensor failure.
7. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc; keep lighting off when selected lighting level is present.
8. Color selected by Architect.
9. **All sensor manufacturers need to provide certification that their products (microphonic/ultrasonic sensors) do not interfere with hearing aids and are A.D.A. compliant.**
10. **All sensor manufacturers need to provide certification that their products (ultrasonic sensors) do not interfere with Smart Board or other Media type electronic devices. Contractor is responsible for replacing all devices (at their expense) to conform to these requirements. Coordinate devices with Owner's Information Services Department prior to ordering.**

C. PIR Type: Ceiling mounting; detect occupancy by sensing a combination of heat and movement in area of coverage.

1. Detector Sensitivity: Detect occurrences of 6-inch-minimum movement of any portion of a human body that presents a target of not less than 36 sq. in.
2. Detection Coverage (Room): Detect occupancy anywhere in a circular area of 1000 sq. ft. when mounted on a 96-inch-high ceiling.
3. Detection Coverage (Corridor): Detect occupancy within 90 feet when mounted on a 10-foot-high ceiling.

D. Ultrasonic Type: Ceiling mounting; detect occupancy by sensing a change in pattern of reflected ultrasonic energy in area of coverage.

1. Detector Sensitivity: Detect a person of average size and weight moving not less than 12 inches in either a horizontal or a vertical manner at an approximate speed of 12 inches/s.
2. Detection Coverage (Small Room): Detect occupancy anywhere within a circular area of 600 sq. ft. when mounted on a 96-inch-high ceiling.
3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. when mounted on a 96-inch-high ceiling.
4. Detection Coverage (Large Room): Detect occupancy anywhere within a circular area of 2000 sq. ft. when mounted on a 96-inch-high ceiling.

5. Detection Coverage (Corridor): Detect occupancy anywhere within 90 feet when mounted on a 10-foot-high ceiling in a corridor not wider than 14 feet.

E. Dual-Technology Type: Ceiling mounting; detect occupancy by using a combination of PIR and ultrasonic detection methods in area of coverage. Particular technology or combination of technologies that controls on-off functions shall be selectable in the field by operating controls on unit.

1. Sensitivity Adjustment: Separate for each sensing technology.
2. Detector Sensitivity: Detect occurrences of 6-inch-minimum movement of any portion of a human body that presents a target of not less than 36 sq. in., and detect a person of average size and weight moving not less than 12 inches in either a horizontal or a vertical manner at an approximate speed of 12 inches/s.
3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. when mounted on a 96-inch-high ceiling.

2.4 POWER PACKS FOR LOW VOLTAGE OCCUPANCY SENSORS

A. Description: Plenum rated, self-contained low voltage class 2 transformer and relay compatible with specified low voltage occupancy sensors for switching of line voltage loads.

B. Provide quantity and configuration of power and slave packs with all associated wiring and accessories as required to control the load indicated on the drawings.

C. Input Supply Voltage: Dual rated for 120/277 V ac.

D. Zero-crossing switching.

E. Load Rating:

1. Incandescent Load: Not less than 20A.
2. Fluorescent Load: Not less than 20 A.
3. Motor Load: Not less than 1 HP.
4. Leviton OSP20-XXX.

2.5 EMERGENCY CONTROL RELAY

A. Electrical Specifications:

1. The EPC shall automatically illuminate connected emergency loads upon utility power interruption, regardless of room switch position. (NEC 700.24)
2. The EPC shall include an automatic diagnostic which is initiated when the room switch is turned off. This test procedure will turn the emergency luminaires on for at least 2 seconds, indicating that an emergency power source is available & that the device, ballast, & lamp are all functioning correctly.
3. Automatic diagnostic shall be approved to meet periodic testing requirements (NEC 700.3 NFPA 101 7.9.3)

4. Local room switch or lighting control shall turn both regular & emergency luminaires on at the same time (no dedicated emergency room switch required).
5. The EPC shall have a minimum load rating of 20 Amps at 120V or 277V.
6. The EPC shall accept 120V & 277V 60 Hz Input & Output (voltage tolerance +/- 15 percent).
7. The EPC shall include a regular power indicator LED indicating utility power status.
8. The EPC shall accept separate phases on the constant hot & switched hot inputs.
9. The EPC shall include high voltage input surge protection up to 50,000V.
10. Load contacts shall be able to withstand 10 direct shorts while connected to 20 Amp breaker without permanent damage.
11. The EPC shall not generate any objectionable electrical or mechanical noise.

B. Mechanical Specifications:

1. The EPC shall mount inside a 4-11/16 inches junction box with an extension and blank cover.
2. The EPC shall include mounting ears for mounting inside a light fixture ballast channel.
3. The EPC shall have UL94-V0 or UL94-5VA flame rating & be approved for installation above the suspended ceiling
4. Enclosure shall be black
5. Dimensions: 3-3/4 inches x 1-3/4 inches x 1-1/2 inches

C. General Specifications

1. The EPC shall be UL924 listed.
2. Warranty shall be 5 year replacement warranty
3. The EPC shall comply with all N.E.C., N.F.P.A, OSHA, & local safety codes.

D. Emergency Power Control shall be model EPC-A-1 by LVS, Inc. 800-982-4587

2.6 CONDUCTORS AND CABLES

A. Power Wiring to Supply Side of Remote-Control Power Sources: Not smaller than No. 12 AWG. Comply with requirements in Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

B. Classes 2 and 3 Control Cable: Multiconductor plenum cable with stranded-copper conductors not smaller than No. 22 AWG. Comply with requirements in Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

C. Class 1 Control Cable: Multiconductor plenum cable with stranded-copper conductors not smaller than No. 16 AWG. Comply with requirements in Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

PART 3 - EXECUTION

3.1 SENSOR INSTALLATION

A. Install and aim sensors in locations to achieve not less than 90 percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's written instructions. Install additional sensors as required to meet coverage requirements at no additional cost to the Owner.

3.2 CONTACTOR INSTALLATION

A. Mount electrically held lighting contactors with elastomeric isolator pads, to eliminate structure-borne vibration, unless contactors are installed in an enclosure with factory-installed vibration isolators.

3.3 POWER PACK AND EMERGENCY RELAY INSTALLATION

A. Mount all devices in junction box for containment of device and associated wiring. Nipple into adjacent power junction box for lighting control switch legs.

3.4 WIRING INSTALLATION

A. Wiring Method: Comply with Division 26 Section "Low-Voltage Electrical Power Conductors and Cables." Minimum conduit size shall be 1/2 inch. All exposed wiring in finished spaces shall be installed in metallic wiremold raceway.

B. Wiring within Enclosures: Comply with NECA 1. Separate power-limited and nonpower-limited conductors according to conductor manufacturer's written instructions.

C. Size conductors according to lighting control device manufacturer's written instructions, unless otherwise indicated.

D. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

E. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

F. Install field-mounting transient voltage suppressors for lighting control devices in Category A locations that do not have integral line-voltage surge protection.

G. Unless otherwise indicated, connect lighting control device grounding terminal or conductor to branch circuit equipment grounding conductor and to outlet box with bonding jumper.

3.5 IDENTIFICATION

A. Identify components and power and control wiring according to Division 26 Section "Identification for Electrical Systems."

1. Identify controlled circuits in lighting contactors.
2. Identify circuits or luminaries controlled by photoelectric and occupancy sensors at each sensor.

3.6 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:

1. After installing sensors, and after electrical circuitry has been energized, adjust and test for compliance with requirements.
2. Operational Test: Verify operation of each lighting control device, and adjust time delays.
3. Mask off sensor lens internally as required to not detect traffic from directions causing false turn-ons.
4. Adjust all classroom/office sensors so not to detect corridor traffic.

B. Lighting control devices that fail tests and inspections are defective work.

3.7 ADJUSTING

A. Manufacturer’s Representative shall be on site to work with contractor in setting up and adjusting all sensors prior to completion of project. Manufacturer’s Representative will certify in writing that work was performed for each device installed.

B. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting sensors to suit occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

3.8 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain lighting control devices. Refer to Division 01 Section "Demonstration and Training."

B. Provide four hour training session for Owner’s personnel. Provide Operation and Maintenance Manuals for each person. Training to be video recorded and saved to DVD compatible with Owner’s PC/DVD player. Coordinate exact format with Owner. At completion of training, provide certification letter to Owner stating completion of training and attach copy of sign-in sheet showing all personnel present.

END OF SECTION

SECTION 26 27 26
WIRING DEVICES

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.

1.2 SUMMARY

A. This Section includes the following:

1. Receptacles, receptacles with integral GFCI, and associated device plates.
2. Twist-locking receptacles.
3. Snap switches.
4. Pendant cord-connector devices.
5. Cord and plug sets.
6. Floor service outlets and poke-through assemblies.

B. Related Sections include the following:

1. Division 27 Section "Communications Horizontal Cabling" for workstation outlets.

1.3 DEFINITIONS

A. EMI: Electromagnetic interference.

B. GFCI: Ground-fault circuit interrupter.

C. Pigtail: Short lead used to connect a device to a branch-circuit conductor.

D. RFI: Radio-frequency interference.

1.4 REFERENCE STANDARDS

A. A. FS W-C-596 - Connector, Electrical, Power, General Specification for; Federal Specification; Revision G, 2001.

B. FS W-S-896 - Switches, Toggle (Toggle and Lock), Flush-mounted (General Specification); Federal Specification; Revision F, 1999.

C. NECA 1 - Standard for Good Workmanship in Electrical Construction; National Electrical Contractors Association; 2010.

D. NEMA WD 1 - General Color Requirements for Wiring Devices; National Electrical Manufacturers Association; 1999 (R 2005).

E. NEMA WD 6 - Wiring Device -- Dimensional Requirements; National Electrical Manufacturers Association; 2002 (R2008).

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

G. UL 20 - General-Use Snap Switches; Current Edition, Including All Revisions.

H. UL 498 - Attachment Plugs and Receptacles; Current Edition, Including All Revisions.

I. UL 514D - Cover Plates for Flush-Mounted Wiring Devices; Current Edition, Including All Revisions.

J. UL 943 - Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.

C. Field quality-control test reports.

D. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing label warnings and instruction manuals that include labeling conditions.

1.6 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of wiring device and associated wall plate through one source from a single manufacturer. Insofar as they are available, obtain all wiring devices and associated wall plates from a single manufacturer and one source.

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.

C. Comply with NFPA 70.

D. WD 1-1979 general-purpose wiring devices.

E. WD 5 specific-purpose wiring devices.

F. W-C-596 electrical power connector, plug, receptacle and cable outlet.

G. W-S-896 switch, toggle.

1.7 COORDINATION

A. Receptacles for Owner-Furnished Equipment: Match plug configurations.

1. Cord and Plug Sets: Match equipment requirements.

1.8 EXTRA MATERIALS

A. Furnish extra materials described in subparagraphs below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Switches: Two of each type, size.
2. Receptacles: Two of each type, size.
3. Keys: Minimum of 10 percent, but no fewer than ten (10).

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:

1. Hubbell Incorporated; Wiring Device-Kellems (Hubbell).
2. Leviton Mfg. Company Inc. (Leviton).
3. Pass & Seymour/Legrand; Wiring Devices & Accessories (Pass & Seymour).

2.2 STRAIGHT BLADE RECEPTACLES

A. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, DSCC W-C-596G and UL 498, NEMA industrial heavy duty spec grade class (federal specification listed); 2-pole, 3-wire one piece integral grounding strap with green hexagonal equipment ground screw; ground terminal and poles internally connected to mounting yoke; rated at 20 amperes, 125 volts; back and side wiring, metal plaster ears; NEMA configuration 5-20R, unless otherwise indicated. Terminals must accept #10 AWG wire.

1. Hubbell HBL 5362
2. Leviton 5362
3. Pass and Seymour 5362A

B. Tamper-Resistant Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, DSCC W-C-596G and UL 498,

industrial heavy duty spec grade similar to convenience receptacle, but with T.R. feature.

1. Description: Labeled to comply with NFPA 70, "Health Care Facilities" Article, "Pediatric Locations" Section.

C. Switched type receptacles for energy control.

1. ASHRAE Energy Efficiency Standard 90.1: Standard 90.1 requires that 50 percent of all 125V, 20A receptacles in private offices, open offices, and computer classrooms be controlled by an automatic control device. Controlled receptacles need to be marked to differentiate them from non-controlled receptacles.
2. Permanent power symbol remains clearly visible on front face of device after installation.
3. Duplex, smooth nylon face, back and side wired. Hubbell #BR20C1.xx series, 125V, 20A.

2.3 GFCI RECEPTACLES

A. General Description: Straight blade, industrial heavy duty spec grade, feed-through type. Comply with NEMA WD 1, NEMA WD 6, UL 498, and UL 943, Class A, and include indicator light that is lighted when device is tripped, and meeting UL GFCI July 28, 2006, lock-out requirements and incorporates automatic self testing. Provide appropriate junction box size to fit receptacles.

B. Duplex GFCI Convenience Receptacles, 125 V, 20 A.

1. Hubbell GFR5352A
2. Leviton 7899
3. Pass and Seymour 2094

2.4 PENDANT CORD-CONNECTOR DEVICES

A. Description: Matching, locking-type plug and receptacle body connector; NEMA WD 6 configurations L5-20P and L5-20R, heavy-duty grade.

1. Body: Nylon with screw-open cable-gripping jaws and provision for attaching external cable grip.
2. External Cable Grip: Woven wire-mesh type made of high-strength galvanized-steel wire strand, matched to cable diameter, and with attachment provision designed for corresponding connector.

2.5 CORD AND PLUG SETS

A. Description: Match voltage and current ratings and number of conductors to requirements of equipment being connected.

1. Cord: Rubber-insulated, stranded-copper conductors, with Type SOW-A jacket; with green-insulated grounding conductor and equipment-rating ampacity plus a minimum of 30 percent.
2. Plug: Nylon body and integral cable-clamping jaws. Match cord and receptacle type for connection.

2.6 SNAP SWITCHES

A. Comply with NEMA WD 1, W-C-896F and UL 20.

B. Wall switches: NEMA industrial heavy-duty spec grade class (federal specification listed); rated at 20 amperes, 120/277 volts; AC quiet quick make, quick break design; toggle handle with totally enclosed case; mounting yoke insulated from mechanism with stainless steel grounding clip; single pole, side wiring, metal plaster ears. Terminals must accept #10 AWG wire. Motor rating – 80%, tungsten rating – 100%.

1. Single pole:

    a. Hubbell HBL1221
    b. Leviton 1221 – 2
    c. Pass and Seymour PS20AC1I

2. Two pole

    a. Hubbell HBL 1222
    b. Leviton 1222-2
    c. Pass and Seymour PS20AC2I

3. Three way

    a. Hubbell 1223
    b. Levition 1223-2
    c. Pass and Seymour PS20AC3I

C. Pilot light switches: NEMA industrial heavy-duty spec grade class (federal specification listed); rated at 20 amperes, 120/277 volts, AC quiet quick make, quick break design; lighted red polycarbonate toggle handle, when switch in on position; neon lamp; mounting yoke insulated from mechanism with stainless steel group clip; single pole; side wring. Terminals must accept #10 AWG wire. Motor rating – 80%, tungsten rating – 100%:

1. Description: Single pole, with neon-lighted handle, illuminated when switch is "ON."

D. Key-Operated Switches, 120/277 V, 20 A: NEMA industrial heavy-duty spec grade class (federal specification listed); rated at 20 amperes, 120/277 volts; AC quiet quick make, quick break design; toggle handle with totally enclosed case; mounting yoke insulated from mechanism with stainless steel grounding clip; single pole, side wiring, metal plaster ears. Terminals must accept #10 AWG wire. Motor rating – 80%, tungsten rating – 100%.

1. Description: Single pole, with factory-supplied key in lieu of switch handle.

E. Single-Pole, Double-Throw, Momentary Contact, Center-Off Switches, 120/277 V, 20 A; for use with mechanically held lighting contactors.

F. Key-Operated, Single-Pole, Double-Throw, Momentary Contact, Center-Off Switches, 120/277 V, 20 A; for use with mechanically held lighting contactors, with factory-supplied key in lieu of switch handle.

2.7 WALL PLATES

A. Single and combination types to match corresponding wiring devices.

1. Plate-Securing Screws: Metal with head color to match plate finish.
2. Material for Finished Spaces: Type 302/304, 0.040 inch thick, satin-finished stainless steel, non-magnetic. Coordinate exact finish with architect prior to ordering.
3. Material for Unfinished Spaces: Galvanized steel.
4. Material for Damp Locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for use in "wet locations."

B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with type 3R weather-resistant, die-cast aluminum with lockable cover. Receptacle covers to be of the “in-use” type.

2.8 FLOOR SERVICE FITTINGS (*REFER TO DRAWINGS FOR ADDITIONAL INFORMATION*)

A. Type: Modular, flush-type, dual-service units suitable for wiring method used.

B. Compartments: Barrier separates power from voice and data communication cabling.

C. Service Plate: As noted on drawings.

D. Power Receptacle: NEMA WD 6 configuration 5-20R, unless otherwise indicated.

E. Voice and Data Communication Outlet: As noted on drawings.

2.9 POKE-THROUGH ASSEMBLIES (*REFER TO DRAWINGS FOR ADDITIONAL INFORMATION*)

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Hubbell Incorporated; Wiring Device-Kellems.
2. Wiremold Company (The).

B. Description: Factory-fabricated and -wired assembly of below-floor junction box with multichanneled, through-floor raceway/firestop unit and detachable matching floor service outlet assembly.

1. Service Outlet Assembly: Flush type with receptacles and space for RJ-45 jacks and A/V devices..
2. Size: As required based on devices.
3. Fire Rating: Unit is listed and labeled for fire rating of floor-ceiling assembly.
4. Closure Plug: Arranged to close unused cored openings and reestablish fire rating of floor.
5. Wiring Raceways and Compartments: For a minimum of four No. 12 AWG conductors and a minimum of four, 4-pair, Category-5e/-6e voice data communication and A/V cables.
6. Core floor at each location, size to be determined with manufacturer prior to coring holes. (Refer to drawings for additional information.) Protect all furnishings and area below from debris during coring.

2.10 FINISHES

A. Color: Wiring device catalog numbers in Section Text do not designate device color.

1. Wiring Devices Connected to Normal Power System:

a. Ivory – For receptacles and switches.
b. Gray – For receptacles serving computers and adjacent data jacks.
c. Coordinate with Architect prior to ordering.

2. Wiring Devices Connected to Emergency Power System: Red.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1, including the mounting heights listed in that standard, unless otherwise noted.

B. Coordination with Other Trades:

1. Take steps to insure that devices and their boxes are protected. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of the boxes.
2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
4. Install wiring devices after all wall preparation, including painting, is complete.

5. Install devices and assemblies level, plumb, and square with building lines.
6. Install wall dimmers 48 inches to top of cover plate above floor, derate ganged dimmers as instructed by manufacturer; do not use common neutral.
7. Mount receptacles horizontally with bottom of plate cover 16 inches above floor, unless otherwise indicated. Install ground pin to the right side.
8. Mount wall switches vertically with top of plate cover 48 inches above floor, unless otherwise indicated.

C. Conductors:

1. Do not strip insulation from conductors until just before they are spliced or terminated on devices.
2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
4. Existing Conductors:

    a. Cut back and pigtail, or replace all damaged conductors.
    b. Straighten conductors that remain and remove corrosion and foreign matter.
    c. Pigtailing existing conductors is permitted provided the outlet box is large enough.

D. Device Installation:

1. Clean dirt and debris from electrical boxes and remove moisture prior to installing wiring devices.
2. Replace all devices that have been in temporary use during construction or that show signs that they were installed before building finishing operations were complete.
3. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
4. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
5. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.
6. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, 2/3 to 3/4 of the way around terminal screw.
7. Use a torque screwdriver when a torque is recommended or required by the manufacturer.
8. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections, unless device is rated for #10 wire.
9. Tighten unused terminal screws on the device.
10. When mounting into metal boxes, remove the fiber or plastic washers used to hold device mounting screws in yokes, allowing metal-to-metal contact.
11. When using stranded wires (when allowed) on receptacles and light switches, avoid fraying of wires around terminals. Wrap sides of devices with electrical tape when complete.

E. Device Plates:

1. Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.
2. Remove wall plates and protect devices and assemblies during painting.
3. Install blank finished coverplates over all abandoned openings in finished areas.
4. Install blank finished coverplates over all telecommunication (voice data), video and other technology related junction boxes that are not activated with cabling.

F. Arrangement of Devices: Unless otherwise indicated, mount flush. Group adjacent switches under single, multigang wall plates.

G. Adjust locations of floor service outlets to suit arrangement of partitions and furnishings.

3.2 IDENTIFICATION

A. Comply with Division 26 Section "Identification for Electrical Systems."

1. Receptacles: Identify panelboard and circuit number from which served. Use hot, stamped or engraved machine printing with black-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes. Coordinate with Owner prior to making up labels.
2. Identify all circuitry information on all above ceiling junction boxes and within outlet and switch boxes. Black permanent marker labeling is acceptable.

3.3 CONNECTIONS

A. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

B. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

C. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

1. Test Instruments: Use instruments that comply with UL 1436.
2. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated LED indicators of measurement.

B. Tests for Convenience Receptacles:

1. Line Voltage: Acceptable range is 105 to 132 V.
2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is not acceptable.
3. Ground Impedance: Values of up to 2 ohms are acceptable.
4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
5. Using the test plug, verify that the device and its outlet box are securely mounted.
6. The tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.

END OF SECTION

SECTION 26 28 16
ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Fusible switches.
2. Nonfusible switches.
3. Molded-case circuit breakers (MCCBs).
4. Molded-case switches.
5. Enclosures.

1.3 DEFINITIONS

A. NC: Normally closed.

B. NO: Normally open.

C. SPDT: Single pole, double throw.

1.4 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; National Electrical Contractors Association; 2010.

B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2008.

C. NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum); National Electrical Manufacturers Association; 2001 (R2006).

D. NETA STD ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems; International Electrical Testing Association; 2009.

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

F. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

G. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

H. UL 98 - Enclosed and Dead-Front Switches; Current Edition, Including All Revisions.

1.5 SUBMITTALS

A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.

1. Enclosure types and details for types other than NEMA 250, Type 1.
2. Current and voltage ratings.
3. Short-circuit current ratings (interrupting and withstand, as appropriate).
4. Include evidence of U.L. listing for series rating of installed devices.
5. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.
6. Include time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device. Submit on translucent log-log graph paper.

B. Shop Drawings: For enclosed switches and circuit breakers. Include plans, elevations, sections, details, and attachments to other work.

1. Wiring Diagrams: For power, signal, and control wiring.

C. Qualification Data: For qualified testing agency.

D. Field quality-control reports.

1. Test procedures used.
2. Test results that comply with requirements.
3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

E. Manufacturer's field service report.

F. Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:

1. Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.

2. Time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device. Submit on translucent log-log graph paper.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: Member company of NETA or an NRTL, such as UL.

1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.

B. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single source from single manufacturer.

C. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.

D. 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.

E. Comply with NFPA 70.

F. All devices shall be U.L. listed.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:

1. Ambient Temperature: Not less than minus 22 deg F and not exceeding 104 deg F.
2. Altitude: Not exceeding 6600 feet.

B. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:

1. Notify Architect, Construction Manager and Owner no fewer than seven days in advance of proposed interruption of electric service.
2. Indicate method of providing temporary electric service.
3. Do not proceed with interruption of electric service without Architect's, Construction Manager's and Owner's written permission.
4. Comply with NFPA 70E.

1.8 COORDINATION

A. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

B. Coordinate sizing of switches, breakers and fuses with mechanical contractor and other tradesman equipment shop drawings prior to ordering equipment.

1.9 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. Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than three (3) of each size and type.

1.10 WARRANTY

A. Provide one year warranty on all parts and labor.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. Siemens Energy & Automation, Inc.
3. Square D; a brand of Schneider Electric.

2.2 FUSIBLE SWITCHES

A. Type HD, Heavy Duty, Quick Make-Quick Break, Single Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate specified fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position, with load interrupter enclosed visible blade knife switch.

B. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.

3. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
4. Auxiliary Contact Kit: One NO/NC (Form "C") auxiliary contact(s), arranged to activate before switch blades open.
5. Hookstick Handle: Allows use of a hookstick to operate the handle.
6. Lugs: Mechanical type, suitable for number, size, and conductor material.
7. Service-Rated Switches: Labeled for use as service equipment.

2.3 NONFUSIBLE SWITCHES

A. Type HD, Heavy Duty, Quick Make-Quick Break, Single Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position, with load interrupter enclosed visible blade knife switch.

B. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Auxiliary Contact Kit: One NO/NC (Form "C") auxiliary contact(s), arranged to activate before switch blades open.
4. Hookstick Handle: Allows use of a hookstick to operate the handle.
5. Lugs: Mechanical type, suitable for number, size, and conductor material.

2.4 MOLDED-CASE CIRCUIT BREAKERS

A. General Requirements: Comply with UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents.

B. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.

C. Adjustable, Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.

D. Ground-Fault, Circuit-Interrupter (GFCI) Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip) for Life Safety protection.

E. Features and Accessories:

1. Standard frame sizes, trip ratings, and number of poles.
2. Lugs: Mechanical type, suitable for number, size, trip ratings, and conductor material.
3. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity

discharge lighting circuits. Type HACR for heating, air conditioning and refrigeration equipment.

2.5 MOLDED-CASE SWITCHES

A. General Requirements: MCCB with fixed, high-set instantaneous trip only, and short-circuit withstand rating equal to equivalent breaker frame size interrupting rating. To be used in motor starting devices with overload relays.

B. Features and Accessories:

1. Standard frame sizes and number of poles.
2. Lugs: Mechanical type, suitable for number, size, trip ratings, and conductor material.
3. Application Listing: Appropriate for application; Type HACR for heating, air conditioning and refrigeration equipment only and when used in conjunction with equipment provided with over-load protection.

2.6 ENCLOSURES

A. Enclosed Switches and Circuit Breakers: NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.

1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
2. Outdoor Locations: NEMA 250, Type 3R.
3. Kitchen and Wash-Down Areas: NEMA 250, Type 4X, stainless steel.
4. Other Wet or Damp, Indoor Locations: NEMA 250, Type 4.
5. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 12.

2.7 FUSES

A. Fuses 600 amperes and less: Dual element, current limiting, time delay, UL class RK 1, 600 volt Type LPS-RK or 250 volt type LPN-RK as required, UL listed, 200,000 AIC (RMS), Bussmann low-peak dual element fuses.

B. Fuses 601 amperes and larger: Current limiting, time delay, UL class L, 600 volt Type KRP-C, UL listed, 200,000 AIC (RMS), Bussmann hi-cap time delay fuses.

C. All fuses shall be of the same manufacturer.

D. The over current device coordination was based on the fuse sizes and types specified. Any substitution of brand, size or type of fuse from that specified, must be preceded by the submittal of a complete coordination study for the substitute over current protection scheme.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated. Provide concrete bases where required and anchor all equipment.

B. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

C. Install fuses in fusible devices.

D. Comply with NECA 1, NEMA PB 1.1 and PB 2.1.

3.3 IDENTIFICATION

A. Comply with requirements in Division 26 Section "Identification for Electrical Systems."

1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
2. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.4 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. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

C. Acceptance Testing Preparation:

1. Test insulation resistance for each enclosed switch and circuit breaker, component, connecting supply, feeder, and control circuit.

2. Test continuity of each circuit.

D. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

E. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.

F. Prepare test and inspection reports, including a certified report that identifies enclosed switches and circuit breakers and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.5 ADJUSTING

A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

B. Set field-adjustable circuit-breaker trip ranges as required. DO NOT EXCEED NEC REQUIREMENTS.

3.6 CLEANING

A. On completion of installation, vacuum dirt and debris from interiors; do not use compressed air to assist in cleaning.

B. Inspect exposed surfaces and repair damaged finishes.

3.7 TRAINING

A. Provide training session for Owner’s personnel. Provide Operation and Maintenance Manuals for each person. At completion of training, provide certification letter to Owner stating completion of training and attach copy of sign-in sheet showing all personnel present.

END OF SECTION

SECTION 26 51 00
INTERIOR LIGHTING

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.

1.2 SUMMARY

A. This Section includes the following:

1. Interior lighting fixtures.
2. Emergency lighting units.
3. Exit signs.
4. Lighting fixture supports.

B. Related Sections include the following:

1. Division 26 Section "Wiring Devices" for manual wall-box dimmers for incandescent lamps.

C. All systems must conform to IECC 2015 and ASHRAE 90.1 2013.

1.3 REFERENCE STANDARDS

A. ASHRAE – 90.1, 2013 – Energy standard for buildings except low rise residential buildings.

B. ANSI C78.379 - American National Standard for Electric Lamps -- Reflector Lamps -- Classification of Beam Patterns; 2006.

C. ANSI C82.11 - American National Standard for Lamp Ballasts - High Frequency Fluorescent Lamp Ballasts - Supplements; Consolidated-2002.

D. IECC – Illinois Energy Conservation Code 2015

E. IEEE C62.41.2 - Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and less) AC Power Circuits; 2002 (R2008).

F. NECA 1 - Standard for Good Workmanship in Electrical Construction; National Electrical Contractors Association; 2010.

G. NECA/IESNA 500 - Standard for Installing Indoor Commercial Lighting Systems; National Electrical Contractors Association; 2006.

H. NECA/IESNA 502 - Standard for Installing Industrial Lighting Systems; National Electrical Contractors Association; 2006.

I. NEMA WD 6 - Wiring Devices - Dimensional Requirements; National Electrical Manufacturers Association; 2002 (R2008).

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

K. NFPA 101 - Code for Safety to Life from Fire in Buildings and Structures; National Fire Protection Association; 2009.

L. UL 924 - Emergency Lighting and Power Equipment; Current Edition, Including All Revisions.

M. UL 935 - Fluorescent-Lamp Ballasts; Current Edition, Including All Revisions.

N. UL 1598 - Luminaires; Current Edition, Including All Revisions.

O. UL 8750 - LED Lighting; Current Edition, Including All Revisions.

1.4 DEFINITIONS

A. BF: Ballast factor.

B. CEE: Consortium for Energy Efficiency.

C. CRI: Color-rendering index.

D. CU: Coefficient of utilization.

E. DCEO: Department of Commerce and Economic Opportunity.

F. DLC: Design Lights Consortium.

G. EISA 2007: Energy Independence and Security Act of 2007.

H. HID: High-intensity discharge.

I. IESNA: Illuminating Engineering Society of North America.

J. LED: Light emitting diode.

K. LER: Luminaire efficacy rating.

L. Luminaire: Complete lighting fixture, including ballast housing if provided.

M. RCR: Room cavity ratio.

1.5 SUBMITTALS

A. Product Data: For each type of lighting fixture, arranged in order of fixture designation. Include data on features, accessories, finishes, and the following:

1. Physical description of lighting fixture including dimensions.
2. Emergency lighting units including battery and charger.
3. Ballast and/or electronic driver data.
4. Energy-efficiency data.
5. Life, output, and energy-efficiency data for lamps.
6. Photometric data, in IESNA format, based on laboratory tests of each lighting fixture type, outfitted with lamps, ballasts, and accessories identical to those indicated for the lighting fixture as applied in this Project.

    a. For specialized fixtures, photometric data shall be certified by a qualified independent testing agency. Photometric data for remaining fixtures shall be certified by the manufacturer.
    b. Photometric data shall be certified by a manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program (NVLAP) for Energy Efficient Lighting Products.

B. Shop Drawings: Show details for lighting fixtures. Indicate dimensions, weights, methods of field assembly, components, features, and accessories.

1. Wiring Diagrams: Power and control wiring.

C. Coordination Drawings: Reflected ceiling plan(s) 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. Lighting fixtures.
2. Suspended ceiling components.
3. Structural members to which suspension systems for lighting fixtures will be attached.
4. Other items in finished ceiling including the following:

    a. Air outlets and inlets.
    b. Speakers.
    c. Sprinklers.
    d. Smoke and fire detectors.
    e. Occupancy sensors.
    f. Access panels.

5. Perimeter moldings.

D. Product Certificates: For each type of ballast used in fixtures, signed by product manufacturer.

E. Qualification Data: For agencies providing photometric data for lighting fixtures.

F. Field quality-control test reports.

G. Operation and Maintenance Data: For lighting equipment and fixtures to include in emergency, operation, and maintenance manuals.

H. Warranties: Special warranties specified in this Section.

1.6 QUALITY ASSURANCE

A. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by manufacturers' laboratories that are accredited under the National Volunteer Laboratory Accreditation Program for Energy Efficient Lighting Products.

B. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.7.

C. LED fixtures must be certified by DLC (Design Lights Consortium).

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. All fixtures shall be U.L. listed.

E. Comply with NFPA 70 and local code requiements.

F. FMG Compliance: Lighting fixtures for hazardous locations shall be listed and labeled for indicated class and division of hazard by FMG.

G. NFPA 101 Compliance: Comply with visibility and luminance requirements for exit signs.

1.7 COORDINATION

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

1.8 WARRANTY

A. Standard Warranty: One year parts and labor on all fixtures unless manufacturer’s warranty is greater.

B. Special Warranty for Emergency Lighting Batteries: Manufacturer's standard form in which manufacturer of battery-powered emergency lighting unit agrees to repair or replace components of rechargeable batteries that fail in materials or workmanship within specified warranty period.

1. Warranty Period for Emergency Lighting Unit Batteries: Five (5) years from date of Substantial Completion. Full warranty shall apply for first year, and prorated warranty for the remaining four (4) years.

C. Special Warranty for LED Fixtures: Manufacturer's standard form, made out to Owner and signed by fixture manufacturer agreeing to replace LED modules and drivers that fail in materials or workmanship, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.

1. Warranty Period: Minimum five (5) years from date of Substantial Completion.

1.9 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. Lamps: 1 of each type and rating installed.
2. Plastic Diffusers and Lenses: 1 of each type.
3. Emergency Light Battery: One for each emergency lighting unit type.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 LIGHTING FIXTURES AND COMPONENTS, GENERAL REQUIREMENTS

A. Recessed Fixtures: Comply with NEMA LE 4 for ceiling compatibility for recessed fixtures.

B. LED Fixtures: Comply with UL 1598 and UL 8750. Test in accordance with IESNA LM-79 and LM-80 standards, and DLC certified.

C. Metal Parts: Free of burrs and sharp corners and edges.

D. Sheet Metal Components: Steel, unless otherwise indicated. Form and support to prevent warping and sagging.

E. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

F. Reflecting surfaces shall have minimum reflectance as follows, unless otherwise indicated:

1. White Surfaces: 85 percent.
2. Specular Surfaces: 83 percent.
3. Diffusing Specular Surfaces: 75 percent.
4. Laminated Silver Metallized Film: 90 percent.

G. Plastic Diffusers and Covers:

1. Acrylic Lighting Diffusers: 100 percent virgin acrylic plastic. High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.

a. Lens Thickness: At least 0.125 inch minimum unless different thickness is indicated.
b. UV stabilized.

H. Luminaire Accessories:

1. Luminaire disconnects:

a. Ideal PowerPlug or equal.

1) Meets CEC and NEC code changes for non-residential fluorescent luminaires with ballasts.
2) Perfect for OEM or retrofit lighting applications.
3) Patented push-in technology quickly locks wires in place.
4) Passes UL 2459 & CSA 182.3 finger probe requirements.
5) Fits through 1/2 inch knockout.
6) Pieces pull apart safely and easily.
7) 3/8 inch strip length indicator.
8) Thumb ridges provide superior grip.
9) Ideal two or three wire standard version.

2.3 LIGHTING FIXTURES (*TO MATCH EXISTING TYPES IN AREA OF WORK*)

A. Refer to drawings for lighting schedule.

B. Acceptable Manufacturer's – Fluorescent Luminaries

1. Focal Point.
2. Axis.

C. Acceptable Manufacturers – Recessed Fluorescent Down Lights.

1. Cooper/Portfolio.

D. Emergency Lights and Exit Signs

1. Philips - Chloride

2.4 LED FIXTURES

A. CRI of minimum 80, color temperature 4100 K. Refer to drawing schedule for additional information.

B. Rated life of 50,000 hours.

C. LEDs sources from one manufacturer.

D. Driver capable of dimming from 100 to 0 percent of maximum light outputs and compatible with dimmer switch or dimming system used.

E. Must be DLC compliant/approved.

F. Operating voltage universal 120/277 V.

G. Lens thickness at least 0.125 inch minimum unless otherwise indicated.

H. Efficacy minimum rating of 85 lumens per watt.

I. Include internal junction box.

J. U.L. listed.

2.5 EXIT SIGNS

A. Description: Comply with UL 924; for sign colors, visibility, luminance, and lettering size, comply with authorities having jurisdiction.

B. Internally Lighted Signs:

1. Lamps for AC Operation: LEDs, 70,000 hours minimum rated lamp life, 25 year.

a. Edge Glow type.
b. White Canopy.
c. With Support Kit.

2.6 EMERGENCY LIGHTING UNITS

A. Description: Self-contained units complying with UL 924.

1. Battery: Sealed, maintenance-free, lead-acid type, 5 year prorated warranty; nickel-cadmium type, 15 year prorated warranty. Full one year coverage warranty.
2. Charger: Fully automatic, solid-state type with sealed transfer relay.
3. Operation: Relay automatically turns lamp on when power supply circuit voltage drops to 80 percent of nominal voltage or below. Lamp automatically disconnects from battery when voltage approaches deep-discharge level.

When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.

4. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
5. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
6. Wire Guard: Heavy-chrome-plated wire guard, one piece construction, protects lamp heads or fixtures. Refer to drawings for additional information.
7. Integral Time-Delay Relay: Holds unit on for fixed interval of 15 minutes when power is restored after an outage. Required in all areas where normal lighting is provided by HID light fixtures.
8. Remote Test (When Indicated): Switch in hand-held remote device aimed in direction of tested unit initiates coded infrared signal. Signal reception by factory-installed infrared receiver in tested unit triggers simulation of loss of its normal power supply, providing visual confirmation of either proper or failed emergency response.
9. Integral Self-Test (When Indicated): Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and flashing red LED.

2.7 LED LAMPS

A. Acceptable Manufacturers:

1. CREE
2. G.E.
3. Lighting Science.

B. All lamps shall be from one manufacturer and shall be Energy Star listed.

C. Low-Temperature Driver Capability: Rated by its manufacturer for reliable starting and operation of indicated lamp(s) at temperatures minus 20 deg F and higher.

D. Driver/LED Characteristics:

1. Power- multitap voltage for LED Class-I drivers with high performance heat sinks.
2. Power Factor: > 0.9 at full load.
3. Total Harmonic Distortion: < 20% at full load.
4. Integral weathertight electrical box with terminal strips (12Ga–20Ga) for easy power hookup.
5. Integral 10kV surge suppression protection standard.
6. To address inrush current, slow blow fuse or type C / D breaker should be used.
7. Patented NanoOptic Product Technology
8. CCT 4000K (+/- 300) as selected by the Owner during shop drawing process.
9. CRI- Minimum 80.

2.8 LIGHTING FIXTURE SUPPORT COMPONENTS

A. Comply with Division 26 Section "Hangers and Supports for Electrical Systems" for channel- and angle-iron supports and nonmetallic channel and angle supports.

B. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fittings and ceiling canopy. Finish same as fixture.

C. Twin-Stem Hangers: Two, 1/2-inch steel tubes with single canopy designed to mount a single fixture. Finish same as fixture.

D. Wires: ASTM A 641/A 641M, Class 3, soft temper, zinc-coated steel, 12 gage.

E. Wires for Humid Spaces: ASTM A 580/A 580M, Composition 302 or 304, annealed stainless steel, 12 gage.

F. Rod Hangers: 3/16-inch minimum diameter, cadmium-plated, threaded steel rod.

G. Hook Hangers: Integrated assembly matched to fixture and line voltage and equipped with threaded attachment, cord, and locking-type plug.

H. Aircraft Cable Support: Use cable, anchorages, and intermediate supports recommended by fixture manufacturer and provided by manufacturer to support their fixture. Cable support shall be anchored to structural steel and not ceiling system.

I. Do not support fixtures from conduit or from ceiling grid system.

2.9 REQUIREMENTS FOR INDIVIDUAL LIGHTING FIXTURES

A. Refer to drawings for light fixture schedule.

2.10 FINISHES

A. Fixtures: Manufacturers' standard, unless otherwise indicated.

1. Paint Finish: Applied over corrosion-resistant treatment or primer, free of defects.
2. Troffers to be painted after fabrication.

2.11 SOURCE QUALITY CONTROL

A. Provide services of a qualified, independent testing and inspecting agency to factory test fixtures with ballasts and lamps; certify results for electrical ratings and photometric data.

B. Factory test fixtures with ballasts and lamps; certify results for electrical ratings and photometric data.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Lighting fixtures: Set level, plumb, and square with ceilings and walls. Install lamps in each fixture. Burn in all lamps per manufacturer's requirements to maintain warranty. Replace all failed lamps.

B. Support for Lighting Fixtures in or on Grid-Type Suspended Ceilings:

1. Install a minimum of four ceiling support system rods or wires for each fixture. Locate not more than 6 inches from lighting fixture corners. Rods/wire must be installed from structure and sized in order to support each fixture independently of grid. Wire shall have breaking strength of the weight of the fixture at a safety factor of 3 times units weight. Provide no more than 2" of slack in each fixture support cable after fixtures have been installed within grid.
2. Support Clips: Fasten to lighting fixtures and to ceiling grid members at or near each fixture corner with clips that are UL listed for the application, per NEC 410-16-C.
3. Fixtures of Sizes Less Than Ceiling Grid: Install as indicated on reflected ceiling plans or center in acoustical panel, and support fixtures independently with at least two 3/4-inch metal channels spanning and secured to ceiling tees. Install at least one independent support rod or wire from structure to a tab on each end of lighting fixture. Wire or rod shall have breaking strength of the weight of fixture at a safety factor of 3.

C. Suspended Lighting Fixture Support:

1. Pendants and Rods: Where longer than 48 inches, brace to limit swinging.
2. Stem-Mounted, Single-Unit Fixtures: Suspend with twin-stem hangers.
3. Continuous Rows: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of fixture chassis, including one at each end. Utilize uni-strut in order to keep individual fixtures in a row uniform in mounting heights. Refer to drawings for additional information. Paint out to match surrounding area.
4. Continuous Extruded Rows: Suspend from structure with aircraft cable listed by manufacturer for application. Do not fasten to grid ceiling.

D. Adjust aimable lighting fixtures to provide required light intensities.

E. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

F. All junction boxes used for supporting light fixtures will be heavy duty UL listed for the application. Do not support from ceiling grid. Support from structure and use grid to stabilize unit.

G. All flexible metal conduit connections shall be 6 feet 0 inches or less and contain quick disconnect plug on end. Utilize plenum rated raceways when required per

local code. All light fixtures to receive power plug style disconnects installed on line side of fixture. Match existing fixture plug types.

H. All conduit shall be supported from structure independently from grid ceiling and/or support wires. Do not anchor to ceiling or light fixture support wires.

I. Provide flange kits for all fixtures recessed mounted in gypsum ceilings.

J. Lock out all breakers serving Night Light/Emergency Lights and Exit Signs.

K. Clean all fixtures and lenses. Touch up all scratches. Replace broken lenses.

3.2 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.3 FIELD QUALITY CONTROL

A. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery and retransfer to normal.

B. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

C. Corroded Fixtures: During warranty period, replace fixtures that show any signs of corrosion.

D. Five (5) months and eleven (11) months after fixture installation, contractor shall walk the building and replace all failed lamps and ballasts. DO NOT USE OWNER'S ATTIC STOCK. Provide documentation to Owner showing all fixtures that were worked on for the Owner's records. This procedure does not relieve the contractor from performing warranty work that is brought to their attention by the Owner.

END OF SECTION

SECTION 27 05 00
COMMON WORK RESULTS FOR COMMUNICATIONS

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.

1.2 SUMMARY

A. Section Includes:

1. Communications equipment coordination and installation.
2. Sleeves for pathways and cables.
3. Sleeve seals.
4. Grout.
5. Common communications installation requirements.

1.3 DEFINITIONS

A. EPDM: Ethylene-propylene-diene terpolymer rubber.

1.4 SUBMITTALS

A. Product Data: For sleeve seals.

1.5 COORDINATION

A. Coordinate arrangement, mounting, and support of communications equipment:

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 right of way for piping and conduit installed at required slope.
4. So 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."

PART 2 - PRODUCTS

2.1 SLEEVES FOR PATHWAYS AND CABLES

A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.

2.2 SLEEVE SEALS

A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and pathway or cable.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Advance Products & Systems, Inc.
   b. Calpico, Inc.
   c. Metraflex Co.
   d. Pipeline Seal and Insulator, Inc.

2. Sealing Elements: EPDM interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of pathway or cable.
3. Pressure Plates: Stainless steel. Include two for each sealing element.
4. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.3 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.

PART 3 - EXECUTION

3.1 COMMON REQUIREMENTS FOR COMMUNICATIONS INSTALLATION

A. Comply with NECA 1.

B. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.

C. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.

D. Equipment: 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.

E. Right of Way: Give to piping systems installed at a required slope.

3.2 SLEEVE INSTALLATION FOR COMMUNICATIONS 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 all penetrations. Install sleeves during erection of slabs and walls.

C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.

D. 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.

E. Cut sleeves to length for mounting flush with both surfaces of walls. If above accessible ceiling, sleeves can extend 1 inch out of wall.

F. Extend sleeves installed in floors 2 inches above finished floor level. Stub to top of racks/cabinets when cables enter top of racks/cabinets.

G. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and pathway (and raceways). All other sleeves for cabling shall be sized based upon 40 percent NEC fill rate and allow for minimum of 50 percent expansion for future cables. Utilize multiple sleeves as required.

H. Seal space outside of sleeves with grout for penetrations of concrete and masonry

1. Promptly pack grout solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect grout while curing.

I. 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. Comply with requirements in Division 07 Section "Joint Sealants.".

J. 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."

K. Roof-Penetration Sleeves: Seal penetration of individual pathways and cables with flexible boot-type flashing units applied in coordination with roofing work.

L. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

M. Furnish and install sleeves for all low voltage cabling, including Data, Voice, Video, Paging, Clock, Thermostat, Fire Alarm, Security, etc. All sleeves shall be provided with end bushing/fitting to protect cabling. Sleeves shall be sized based upon 40 percent NEC fill rate and allow for minimum of 50 percent expansion for future cables. Utilize multiple sleeves as required. Minimum sleeve size is 3/4 inch conduit.

3.3 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.

3.4 FIRESTOPPING

A. Apply firestopping to penetrations of fire-rated floor and wall assemblies for communications installations to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 07 Section "Penetration Firestopping."

END OF SECTION

SECTION 27 11 00
COMMUNICATIONS EQUIPMENT ROOM FITTINGS

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.

1.2 SUMMARY

A. Section Includes:

1. Telecommunications mounting elements.
2. Backboards.
3. Telecommunications equipment racks and cabinets.
4. Grounding.

B. Related Sections:

1. Division 27 Section "Communications Horizontal Cabling" for voice and data cabling associated with system panels and devices.

1.3 DEFINITIONS

A. Basket Cable Tray: A fabricated structure consisting of wire mesh bottom and side rails.

B. BICSI: Building Industry Consulting Service International.

C. Ladder Cable Tray: A fabricated structure consisting of two longitudinal side rails connected by individual transverse members (rungs).

D. LAN: Local area network.

E. RCDD: Registered Communications Distribution Designer.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for equipment racks and cabinets. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings: For communications equipment room fittings. 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. Equipment Racks and Cabinets: Include workspace requirements and access for cable connections.
3. Grounding: Indicate location of grounding bus bar and its mounting detail showing standoff insulators and wall mounting brackets.

C. Qualification Data: For Installer, qualified layout technician, installation supervisor, and field inspector.

1.5 QUALITY ASSURANCE

A. Installer Qualifications (Minimum of Three Years Experience): Cabling Installer must have personnel certified by BICSI on staff.

1. Contractors Company must be licensed by the State of Illinois.
2. Layout Responsibility: Preparation of Shop Drawings shall be under the direct supervision of RCDD.
3. Installation Supervision: Installation shall be under the direct supervision of Level 2 Installer, who shall be present at all times when Work of this Section is performed at Project site.
4. Field Inspector: Currently registered by BICSI as Commercial Installer, Level 2 to perform the on-site inspection.

B. 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. All devices shall be U.L. listed.

C. Telecommunications Pathways and Spaces: Comply with TIA/EIA-569-B.

D. Grounding: Comply with ANSI-J-STD-607-A.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install equipment frames and cable trays until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and work above ceilings is complete.

1.7 COORDINATION

A. Coordinate layout and installation of communications equipment with Owner's telecommunications and LAN equipment and service suppliers. Coordinate service entrance arrangement with local exchange carrier.

1. Meet jointly with telecommunications and LAN equipment suppliers, local exchange carrier representatives, and Owner to exchange information and agree on details of equipment arrangements and installation interfaces.
2. Record agreements reached in meetings and distribute them to other participants.
3. Adjust arrangements and locations of equipment with distribution frames, cross-connects, and patch panels of cabling systems of other communications, electronic safety and security, telephone switch, LAN equipment and related systems that share space in the equipment room.

B. Coordinate location of power raceways and receptacles with locations of communications equipment requiring electrical power to operate.

1.8 WARRANTY

A. Provide a one year warranty on all equipment unless manufacturer provides additional coverage as part of their standard warranty.

PART 2 - PRODUCTS

2.1 PATHWAYS

A. General Requirements: Comply with TIA/EIA-569-B.

B. Cable Support: U.L. labeled. Cable support brackets shall be designed to prevent degradation of cable performance and pinch points that could damage cable. Cable tie slots fasten cable ties to brackets.

1. Comply with NFPA 70 and UL 2043 for fire-resistant and low-smoke-producing characteristics.
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.

C. Conduit and Boxes: Comply with requirements in Division 26 Section "Raceway and Boxes for Electrical Systems." Flexible metal conduit shall not be used.

1. Outlet boxes shall be no smaller than 2 inches wide, 3 inches high and 2-1/2 inches deep. Verify wall thickness and notify architect if problems encountered with installation of this box size.
2. Comply with TIA/EIA-569-A for maximum length of conduit and bends between pull points, and for pull-box sizing.
3. Use manufactured conduit sweeps and long-radius ells whenever possible.
4. In telecommunications rooms, position conduit ends adjacent to a corner on backboard (in case of a single piece of plywood) or in the corner of room (where multiple sheets of plywood are installed around perimeter walls of room). Use cable trays to route cables if conduits cannot be located in these positions. Secure conduits to backboard when entering room from overhead.

5. Install minimum 3/4-inch conduit stubs for all workstation devices. Stub out to above accessible corridor ceiling/to cable tray or J-hooks; otherwise, provide J-hooks and sleeves. Install end bushings and fittings for each stub.

2.2 BACKBOARDS

A. Backboards: Plywood, fire-retardant treated, 3/4 inches, sized as needed. Comply with requirements for plywood backing panels specified. Paint out white, but DO NOT COVER FIRE LABEL.

2.3 EQUIPMENT FRAMES (WHEN SPECIFIED ON DRAWINGS)

A. Manufacturers: Subject to compliance with requirements, provide products equivalent to the following, as approved by Owner.

1. Panduit.

B. General Frame Requirements:

1. Distribution Frames: Freestanding, modular-steel units designed for telecommunications terminal support and coordinated with dimensions of units to be supported.
2. Module Dimension: Width compatible with EIA 310 standard, 19-inch panel mounting.
3. Finish: Manufacturer's standard, black baked-polyester powder coat.

C. Floor-Mounted Racks: Modular-type, steel construction.

1. Vertical and horizontal cable management channels, top and bottom cable troughs, grounding lug, and a power strip.
2. Black, baked-polyester powder coat finish.

D. Cable Management for Equipment Frames:

1. Metal, with integral wire retaining fingers.
2. Baked-polyester powder coat finish.
3. Vertical cable management panels shall have front and rear channels, with covers. Mount to side rails with spacers. Do not mount directly to the rails.
4. Provide horizontal crossover cable manager at the top of each relay rack, with a minimum height of two rack units each. In addition, install horizontal managers above and below all patch panels.

2.4 POWER STRIPS

A. Power Strips: Comply with UL 1363.

1. Rack mounting.
2. Six, 20-A, 120-V ac, NEMA WD 6, Configuration 5-20R receptacles.
3. LED indicator lights for power and protection status.

4. Circuit Breaker and Thermal Fusing: Unit continues to supply power if protection is lost.
5. Cord connected with 15-foot line cord.
6. Rocker-type on-off switch, illuminated when in on position.
7. Peak Single-Impulse Surge Current Rating: 33 kA per phase.
8. Protection modes shall be line to neutral, line to ground, and neutral to ground. UL 1449 clamping voltage for all 3 modes shall be not more than 330 V.

B. Modular Wall Cabinets:

1. Wall mounting.
2. Steel or aluminum construction.
3. Threaded 19” rails at front and rear of cabinet.
4. Treated to resist corrosion.
5. Lockable front and rear doors.
6. Louvered side panels.
7. Cable access provisions top and bottom.
8. Grounding lug.
9. With low noise cooling fan with thermostat.
10. Power strip.
11. Black, baked-polyester powder coat finish.
12. All cabinets keyed alike with four (4) spare keys.

C. Cable Tray/Ladder Rack

1. Provide complete ladder rack system including metallic ladder rack, splice connectors, fastening hardware and other miscellaneous materials as required for a complete installation per manufacturer's recommendations.
2. Steel C-Channel Stringer Style Ladder Rack:

    a. Rolled steel siderail stringer, 2 inch stringer height, 9 inch spaced welded rungs.
    b. Steel shall meet the requirements of ASTM A1011 SS Grade 33.
    c. Loading limits shall be 292 lbs/ft for 4 foot spans.

3. Aluminum C-Channel Stringer Style Ladder Rack:

    a. Lightweight 6063-T6 aluminum, 2 inch stringer height, 9 inch rung spacing.
    b. Loading limits shall be 118 lbs/ft for 4 foot spans.

4. Ladder rack finish shall be flat black powder coat Telco gray powder coat.

2.5 GROUNDING

A. Comply with requirements in Division 26 Section "Grounding and Bonding for Electrical Systems." for grounding conductors and connectors.

B. Comply with ANSI-J-STD-607-A.

C. Grounding Points:

1. Locate grounding terminals in each data rack as shown.

D. Bonding Conductors:

1. Where a panelboard for telecommunications is located in same room or space as a grounding busbar, bond to equipment ground bus of electrical panelboard.
2. Extend from grounding busbars to ground terminals in equipment racks and cabinets.

E. Special Requirements:

1. Bonding conductors shall be insulated copper, No. 6 AWG minimum.
2. Install metallic conduit and conductors shall be bonded at each end of conduit.
3. Bonding conductors shall be installed without splices unless approved by Engineer because of special circumstances. Where splices are necessary, they shall be accessible and shall be located in telecommunications spaces. Splices shall be by irreversible compression connectors or by exothermic welding.

2.6 LABELING

A. Comply with TIA/EIA-606-A and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1.

B. Comply with BICSI TDMM for layout and installation of communications equipment rooms.

C. Bundle, lace, and train conductors and cables to terminal points without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.

D. **DO NOT INSTALL ABOVE TOP CHORD OF BAR JOISTS OR WITHIN 6 INCHES OF ROOF DECK DUE TO POTENTIAL ROOFING NAIL DAMAGE.**

3.2 FIRESTOPPING

A. Comply with requirements in Division 07 Section "Penetration Firestopping." Comply with TIA/EIA-569-A, Annex A, "Firestopping."

B. Comply with BICSI TDMM, "Firestopping Systems" Article.

3.3 GROUNDING

A. Install grounding according to BICSI TDMM, "Grounding, Bonding, and Electrical Protection" Chapter.

B. Comply with ANSI-J-STD-607-A.

C. Bond metallic equipment to the grounding bus bar, using not smaller than No. 6 AWG equipment grounding conductor.

1. Bond the shield of shielded cable to the grounding bus bar in communications rooms and spaces.

3.4 IDENTIFICATION

A. Identify system components, wiring, and cabling complying with TIA/EIA-606-A. Comply with requirements in Division 26 Section "Identification for Electrical Systems." Comply with requirements in Division 09 Section "Interior Painting" for painting backboards. For fire-resistant plywood, do not paint over manufacturer's label.

B. See Division 27 Section "Communications Horizontal Cabling" for additional identification requirements. See Evaluations for discussion of TIA/EIA standard as it applies to this Section. Paint and label colors for equipment identification shall comply with TIA/EIA-606-A for Class 2 level of administration including optional identification requirements of this standard.

C. Labels shall be preprinted or computer-printed type.

END OF SECTION

SECTION 27 15 00
COMMUNICATIONS HORIZONTAL CABLING

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.

1.2 SUMMARY

A. Section Includes:

1. Pathways.
2. UTP cabling, data Category-6.
3. Cable connecting hardware and patch panels.
4. Telecommunications outlet/connectors.
5. Cabling system identification products.
6. Cable management system.

B. System shall be a complete operational Category-6 local area network system, excluding active devices. System shall be certified to this degree. See drawings for exact part/model numbers.

1.3 DEFINITIONS

A. BICSI: Building Industry Consulting Service International.

B. Consolidation Point: A location for interconnection between horizontal cables extending from building pathways and horizontal cables extending into furniture pathways.

C. Cross-Connect: A facility enabling the termination of cable elements and their interconnection or cross-connection.

D. EMI: Electromagnetic interference.

E. IDC: Insulation displacement connector.

F. LAN: Local area network.

G. Outlet/Connectors: A connecting device in the work area on which horizontal cable or outlet cable terminates.

H. RCDD: Registered Communications Distribution Designer.

I. UTP: Unshielded twisted pair.

1.4 REFERENCE STANDARDS

A. TIA-455-21 - FOTP-21 - Mating Durability of Fiber Optic Interconnecting Devices; Rev A, 1988 (R 2002).

B. TIA-492AAAB-A - Detail Specification for 50-um Core Diameter/125-um Cladding Diameter Class Ia Graded-Index Multimode Optical Fibers; 2009.

C. TIA-492CAAA - Detail Specification for Class IVa Dispersion-Unshifted Single-Mode Optical Fibers; 1998 (R 2002).

D. TIA-526-7 - OFSTP-7 - Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant; 2002.

E. TIA-526-14 - OFSTP-14 - Optical Power Loss Measurements of Installed Multimode Fiber Cable Plant; Rev A, 1998(R2003).

F. TIA/EIA-568-D.1 - Commercial Building Telecommunications Cabling Standard - Part 1: General Requirements; Rev D, September 9, 2015.

G. TIA/EIA-568-C.2 - Commercial Building Telecommunications Cabling Standard - Part 2: Balanced Twisted Pair Cabling Components; Rev C, August 2009.

H. TIA/EIA-568-D.3 - Commercial Building Telecommunications Cabling Standard - Part 3: Optical Fiber Cabling Components Standard, with Additional Transmission Performance Specifications for 50/125 um Optical Fiber Cables; Rev D, October 25, 2016.

I. TIA-569 - Commercial Building Standard for Telecommunications Pathways and Spaces; 2009.

J. TIA/EIA-606 - Administration Standard for the Telecommunications Infrastructure; Rev A, 2002.

K. ANSI/J-STD-607 - Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications; Rev A, 2002.

L. UL 497 - Standard for Protectors for Paired-Conductor Communications Circuits; Current Edition, Including All Revisions.

M. UL 1581 - Reference Standard for Electrical Wires, Cables, and Flexible Cords; Current Edition, Including All Revisions.

N. UL 1863 - Standard for Communications-Circuit Accessories; Current Edition, Including All Revisions.

1.5 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 communications equipment room. This cabling and its

connecting hardware are called "permanent link," a term that is used in the testing protocols.

1. TIA/EIA-568-C.2-1 requires that a minimum of two telecommunications outlet/connectors be installed for each work area.
2. Horizontal cabling shall contain no transition points or consolidation points.
3. Bridged taps and splices shall not be installed in the horizontal cabling.

B. A work area is approximately 100 sq. ft., and includes the components that extend from the telecommunications outlet/connectors to the station equipment.

C. 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.

1.6 PERFORMANCE REQUIREMENTS

A. General Performance: Horizontal cabling system shall comply with transmission standards in TIA/EIA-568-C.2-1, when tested according to test procedures of this standard.

B. Manufacturer products must be ISO 9001 compliant.

1.7 SUBMITTALS

A. Product Data: For each type of product indicated.

1. For all cable, include the following installation data for each type used:

   a. Nominal OD.
   b. Minimum bending radius.
   c. Maximum pulling tension.
   d. Electrical characteristics.

B. Shop Drawings:

1. All shop drawings shall include Contractor Approval Stamp and RCDD Stamp on submittals.
2. System Labeling Schedules: Electronic copy of labeling schedules, in software and format selected by Owner.
3. Cabling administration drawings and printouts.
4. Wiring diagrams to show typical wiring schematics, including the following:

   a. Patch panels.
   b. Patch cords.
   c. Distribution racks.
   d. Workstation outlets.

5. Patch panels. Detail mounting assemblies, and show elevations and physical relationship between the installed components.
6. Cable route through building to each area's respective rack.
7. Include house count table in spreadsheet/tabular format with shop drawings. Include house count, room, drop number and other identification features.

C. Qualification Data: For Installer, qualified layout technician, installation supervisor, and field inspector. All must be BICSI Certified and listed as a Panduit Certified Installer.

D. Source quality-control reports.

E. Field quality-control reports.

F. Maintenance Data: For splices and connectors to include in maintenance manuals.

1.8 QUALITY ASSURANCE

A. Installer Qualifications (Minimum 3 Years Experience Required): Cabling Installer must have personnel certified by BICSI on staff and listed as a Panduit Certified Installer.

1. Layout Responsibility: Preparation of Shop Drawings, Cabling Administration Drawings, and field testing program development by an RCDD.
2. Installation Supervision: Installation shall be under the direct supervision of Level 2 Installer, who shall be present at all times when Work of this Section is performed at Project site.
3. Testing Supervisor: Currently certified by BICSI as an RCDD to supervise on-site testing.

B. Testing Agency Qualifications: An NRTL.

1. Testing Agency's Field Supervisor: Currently certified by BICSI as an RCDD to supervise on-site testing.

C. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 50 or less.

D. 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. All devices shall be U.L. listed.

E. Telecommunications Pathways and Spaces: Comply with TIA/EIA-569-D.

F. Grounding: Comply with ANSI-J-STD-607-A.

G. Source Limitations: Obtain all products through one source from single manufacturer.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Test cables upon receipt at Project site.

1. Test each pair of UTP cable for open and short circuits.
2. Store materials in a dry, environmentally controlled, secure space.

1.10 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install cables and connecting materials until 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.

B. DO NOT ALLOW CABLES TO BE PAINTED. All cables painted will be replaced at the Contractor’s expense.

1.11 COORDINATION

A. Coordinate layout and installation of telecommunications pathways and cabling with Owner's telecommunications and LAN equipment and service suppliers.

B. Coordinate telecommunications outlet/connector locations with location of power receptacles at each work area.

C. Coordinate work with the Owner’s Information Services Department.

1. Meet jointly with LAN equipment suppliers and Owner to exchange information and agree on details of equipment arrangements and installation interfaces.
2. Record agreements reached in meetings and distribute to other participants.
3. Adjust arrangements and locations of distribution frames and cross-connect and patch panels in equipment rooms and wiring closets to accommodate and optimize arrangement and space requirements of telephone switch and LAN equipment.

1.12 WARRANTY

A. Provide a comprehensive warranty from manufacturer of communication device system for no less than 25 years. This shall include a warranty on all parts and labor:

1. The warranty and system performance guarantee program shall warrant the structured cabling system is free from defects in material and workmanship and will support any current or future Category-6 applications ratified by

IEEE, ANSI or ISO that is developed for an ANSI/TIA/EIA-568-C.2-1 compliant structured cabling system for a 25-year period from date of registered installation. This warranty shall also include a channel warranty covering all components (work area outlets, horizontal cable, connecting hardware in the horizontal cross-connect, the equipment cord at the work area, and the patch cord in the horizontal cross-connect). All devices must be manufactured by warranty provider.

B. Provide a one-year warranty on all other associated equipment not covered under warranty indicated above.

PART 2 - PRODUCTS

2.1 PATHWAYS

A. General Requirements: Comply with TIA/EIA-569-D.

B. Cable Support: U.L. labeled for support of Category-6 cabling, designed to prevent degradation of cable performance and pinch points that could damage cable.

1. Support brackets with cable tie slots for fastening cable ties to brackets. Listed and labeled for Cat-6 cabling.
2. Lacing bars, spools, J-hooks, and D-rings (minimum of 1-5/8 inch bearing surface). Listed and labeled for Cat-6 cabling.
3. Straps and other devices. Listed and labeled for Cat-6 cabling.

C. Conduit and Boxes: Comply with requirements in Division 26 Section "Raceway and Boxes for Electrical Systems." Flexible metal conduit shall not be used.

1. Outlet boxes shall be no smaller than 2 inches wide, 3 inches high and 2-1/2 inches deep. Verify wall thickness and notify architect if problems encountered with installation of this box size. Include mud rings as required to match coverplates and drywall thickness.
2. Comply with TIA/EIA-569-D for maximum length of conduit and bends between pull points, and for pull-box sizing.
3. Use manufactured conduit sweeps and long-radius ells whenever possible.
4. In telecommunications rooms, position conduit ends adjacent to a corner on backboard (in case of a single piece of plywood) or in the corner of room (where multiple sheets of plywood are installed around perimeter walls of room). Use cable trays to route cables if conduits cannot be located in these positions. Secure conduits to backboard when entering room from overhead.
5. Install minimum 3/4-inch conduit stubs for all workstation devices. Stub out to above accessible corridor ceiling/to cable tray or J-hooks; otherwise, provide J-hooks and sleeves. Install end bushings and fittings for each stub.

2.2 UTP CABLE (*REFER TO DRAWINGS FOR ADDITIONAL INFORMATION*)

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Panduit, to match Owner's current connectivity system.

B. Description: Category-6 100-ohm, 4-pair UTP, covered with a plenum rated jacket. Color-blue for data. Final color to be selected by Owner.

1. Comply with ICEA S-90-661 for mechanical properties.
2. Comply with TIA/EIA-568-C.2-1 for performance specifications.
3. Comply with TIA/EIA-568-C.2-1, Category-6.
4. Listed and labeled by U.L. acceptable to authorities having jurisdiction as complying with UL 444 and NFPA 70 for the following types:

    a. Communications, Plenum Rated: Type CMP, complying with NFPA 262.

5. Operating Temperature Range: -20 deg C to 75 deg C.

C. Horizontal Cabling: Data, Category-6 (Panduit PUP 60004-BU-UY):

1. All cables shall be Category-6, four pair, unshielded twisted pair (UTP) 23 AWG, sweep rated for 250 Mhz. Provide plenum type cables in all plenum environments.
2. Cables shall be approved manufacturer (listed by the communication device manufacturer) to maintain the mission critical warranty requirement.
3. Cable shall be 23 AWG solid bare copper, FEP insulated and isolated pairs (flex web), twisted pairs, unshielded, ripcord, (**BLUE for data**) plenum rated jacket and third party verified to EIA/TIA 568 Category-6 standards.
4. Cable shall meet or exceed the following standards:

    a. EIA/TIA 568-C, Category-6 "commercial building wiring standard"
    b. IEEE 802.3ab (10 Base-T.100 Base T-4, 100 Base-X, 1000 Base-T), ATM up to 155 Mbps and ISDN.
    c. IEEE 802.12 (100 Base-VG)
    d. IEEE 802.5 (4/16 Mbps token ring)
    e. ATM PMD (155 Mpbs/550 MHz video)
    f. ANSI X3.263 (TP-PMD)
    g. NEMA WC-63
    h. UL
    i. NEC (CM or CMP)
    j. CEC – Canadian Electric Code (CM or CMP)
    k. Plenum Cable – NEC (CMP), CSA (CMP), certified type PCC FT4 FT6

5. The cable shall meet the following electrical transmission characteristics:

    a. Channel Requirements:

        1) Insertion Loss:

            a) 250 MHz
            b) 33 dB

        2) NEXT:

            a) 250 MHz

b) 35.6 dB

3) PS NEXT:

a) 250 MHz
b) 34.2 dB

4) ACR:

a) 250 MHz
b) 6.7 dB

5) PS ACR:

a) 250 MHz
b) 5.3 dB

6) ELFEXT

a) 250 MHz
b) 19.3 dB

7) PS ELFEXT:

a) 250 MHz
b) 19.3 dB

8) Return Loss:

a) 250 MHz
b) 12.0 Db

2.3 UTP CABLE HARDWARE (*REFER TO DRAWINGS FOR ADDITIONAL INFORMATION*)

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Panduit Corp.

NOTE: Manufacturer must be recognized member of communication device manufacturer's warranty program.

B. General Requirements for Cable Connecting Hardware: Comply with TIA/EIA-568-C, IDC type, with modules designed for punch-down caps or tools. Cables shall be terminated with connecting hardware of same category or higher and of type consistent throughout project.

C. Connecting Blocks: 110-style IDC for Category-6. Provide blocks for the number of cables terminated on the block, plus 25 percent spare. Integral with connector bodies, including plugs and jacks where indicated.

D. Patch Panel Panduit DP48688TGY: Category-6 modular patch panels housing multiple-numbered jack units with IDC-type connectors at each jack for permanent termination of pair groups of installed cables. Do not use more than 48 port patch panels.

1. Number of Jacks per Field: One for each four-pair UTP cable indicated (22-26 AWG), plus spares adequate to suit specified expansion criteria.
2. Mounting: Rack as noted on drawings.
3. Wire Managers to be installed above and below each patch panel, both on front and rear sides.

E. Jacks and Jack Assemblies Panduit CJ688TGBL: Modular, color-coded, eight-position modular receptacle units with integral IDC-type terminals.

1. All jacks (for data and voice) shall be eight position, high density Category-6, RJ-45 modular jacks with 110 terminations with T568B (AT&T) wiring configuration (**BLUE for Data**).
2. Jack shall have the ability to accept color coded icons and include color coded wiring instructions on label.
3. Jacks shall be UL 1863 listed and CSA certified. File numbers shall be made available.
4. Jack contacts shall be beryllium copper with a minimum of 50 micro-inch gold plating.
5. 110 contacts shall be tin lead plated IDC.
6. Jacks shall meet FCC part 68.5
7. Jacks shall meet TIA/EIA-568-C.2-1 and TSB40 standards.
8. Jack housing shall be high impact 94 V-0 rated thermoplastic.
9. Jack shall be suitable for wire sizes ranging from 22 – 26 AWG.
10. Insulation on conductors shall be no larger than 0.050 inches O.D.
11. Provide dust covers on all jacks.
12. Jacks shall be stamped Category-6 on face and be visible once installed in coverplate.
13. Category-6 ETL verified maximum useable bandwidth beyond 300 MHz with approved cable. ETL verified PSACR of 13.7 dB at 250 MHz.

F. Patch Cords: Factory-made, four-pair cables in length and color selected by Owner; terminated with eight-position modular plug at each end. COLOR – BLACK for Data/Voice Workstations.

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. Patch cords above ceilings shall be plenum rated.
4. Patch cords will be provided by the Owner**.**

2.4 TELECOMMUNICATIONS WORKSTATION PLATES (*REFER TO DRAWINGS FOR ADDITIONAL INFORMATION*)

A. Jacks: 100-ohm, balanced, twisted-pair connector; four-pair, eight-position modular. Comply with TIA/EIA-568-C-2.1. (Panduit Mini-Com)

B. Workstation Outlets: Quantity as noted on drawings, -port-connector assemblies mounted in single or multigang faceplate. (See Drawings for additional information and details.)

1. Metal Faceplate (When Identified): Stainless steel, complying with requirements in Division 26 Section "Wiring Devices," for use above ceilings for WAP and security cameras.
2. Non-metallic Faceplates: For use at Desk Workstations (Panduit - Classic Series to match Owner's existing plates).
3. For use with snap-in jacks.

a. Flush mounting jacks as noted on drawings.

4. Legend: Snap-in, clear-label covers and machine-printed paper inserts.

2.5 RGBHV DISTRIBUTION SYSTEM

A. Final wall mounted connector shall be female to female 15-pin pass through type.

B. VGA cable shall be field terminated at each end to male HD15 connectors.

1. Terminations shall be gold pin HD15 solder-type pin body

C. Cable shall be 5-coax shielded type, plenum rated. Cable shall include:

1. Red, blue, green, sync, and hold signals

a. Coax 1 – Red
b. Coax 2 – Green
c. Coax 3 – Blue
d. Coax 4 – White
e. Coax 5 – Yellow

2. Belden 1522A Series (or equal) plenum rated version of this shall be used.

D. Verify connection type/method and raceway capacity based upon submitted cables and jacks.

2.6 S-VIDEO DISTRIBUTION SYSTEM

A. Final wall mounted connector shall be female to female pass through type.

B. S-Video cable shall be field terminated at each end to male S-video connectors.

1. Terminations shall be solder type

C. S-Video cable shall be 2-coax shielded type. Cable shall include:

1. 1 Coax for Luminance
2. 1 Coax for Chrominance

3. Cable shall be plenum rated, siamese constructed
4. Belden 1808A Series (or equal) plenum rated version of this shall be used.

D. Verify connection type/method and raceway capacity based upon submitted cables and jacks.

2.7 COMPOSITE-VIDEO (RCA) CABLE

A. Final wall mounted connector shall be female to female pass through type.

B. Audio cable shall be field terminated at each end to male RCA connectors.

1. Terminations shall be solder type.

C. Cable shall be 18 AWG shielded composite video connecting plenum rated cable

1. Belden 1694A Series (or equal) plenum rated version of this shall be used.

D. Verify connection type/method and raceway capacity based upon submitted cables and jacks.

2.8 HDMI CABLE

A. Supports Ultra HD resolutions up to 4K x 2K.

B. Cable Jacket Type: PVC – Polyvinyl Chloride Low Emitting Smoke.

C. Cable Shield Type: Aluminum-Mylar Foil with Braid.

D. Conductor: Minimum 24 AWG.

E. Connector Plating: Gold.

F. Fire Rating: CMP Rated (Plenum).

G. Connector A: 1 – HDMI (19 pin) Male.

H. Connector B: 1 – HDMI (19 pin) Male.

I. Cable Length: As required.

J. Color: Black.

K. Connector Style: Straight.

L. Warranty: Lifetime.

M. Manufacturer: Belden or equivalent.

2.9 AUDIO (RCA) CABLE

A. Final wall mounted connector shall be female to female pass through type.

1. Stereo pair connectors shall be Red for right channel and White for left channel.

B. Audio cables shall be field terminated at each end to male RCA connectors.

1. Terminations shall be solder type.

C. Cable shall be 25 AWG shielded low capacitance audio connecting plenum rated cable.

1. Single Channel Audio: Belden 8421 Series (or equal) plenum rated version of this shall be used.
2. Two Channel Audio: Belden 8416 audio Series (or equal) plenum rated version of this shall be used.

D. Verify connection type/method and raceway capacity based upon submitted cables and jacks.

2.10 SURFACE RACEWAY

A. The installation of surface mounted outlets and surface mounted station cable is anticipated at some locations where solid walls inhibit the installation of cable behind the wall. Nonmetallic surface raceway shall be used - no exposed cable shall be permitted.

B. The surface raceway shall have a screw-applied base and have a snap on cover. The use of double-sided tape to anchor the raceways will not be permitted.

C. Both the base and cover shall be manufactured of rigid PVC compounds and be suitable for painting.

D. The raceway shall be of a color fitting the decor of the area and be paintable (by others). Approval of samples by the Engineer prior to installation is required (Upon request by Owner). All fittings including, but not limited to, extension boxes, elbows, tees, fixture boxes and fittings shall match the color of the raceway.

E. Fittings and couplings shall be sized to insure that Category-6 and fiber optic cables that are routed through them do not exceed their recommended minimum bend radius requirements.

F. The raceway and all system devices must be UL Listed and exhibit nonflammable self-extinguishing characteristics, tested to specifications of the UL94V-0.

G. Raceway shall be sized to accommodate a 50% increase in the number of cables initially installed while maintaining a fill (ratio of cable area vs. raceway area) no greater than 60%. A nominal cable diameter of 0.2" (Voice and Data Cables) should be assumed.

H. The non-metallic raceway shall be Panduit Pan-way L Series.

2.11 GROUNDING

A. Comply with requirements in Division 26 Section "Grounding and Bonding for Electrical Systems" for grounding conductors and connectors.

B. Comply with ANSI-J-STD-607-A.

2.12 IDENTIFICATION PRODUCTS

A. Comply with TIA/EIA-606-A and UL 969 for labeling materials, including label stocks, laminating adhesives, and inks used by label printers. Handwriting is NOT allowed.

B. Comply with requirements in Division 26 Section "Identification for Electrical Systems."

2.13 SOURCE QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to evaluate cables.

B. Factory test UTP cables on reels according to TIA/EIA-568-C.2-1 and TIA/EIA-568.3-D.

C. Cable will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 INSTALLATION OF PATHWAYS

A. Examine pathway elements intended for cables.

1. Verify proposed routes of pathways. Check raceways and other elements for compliance with space allocations, clearances, installation tolerances, hazards to cable installation, and other conditions affecting installation. Verify that cabling can be installed complying with EMI clearance requirements. Proceed with installation only after unsatisfactory conditions have been corrected.
2. Prepare wall penetrations and verify that penetrations of rated fire walls are made using products labeled for type of wall penetrated.
3. Identify plan to support cables and raceways in suspended ceilings. Verify weight of individual types and sizes of cables. Verify that load capacity of cable support structures is adequate for each pathway.
4. Proceed with installation only after unsatisfactory conditions have been corrected.

B. Verify that surfaces are ready and clean to receive work.

C. Verify that quantity and sizes of boxes/conduit are acceptable for installation of jacks and cabling.

D. Make general contractor and architect aware of any condition on-site that may interfere or cause damage to installation of system.

E. Beginning installation means installer accepts existing conditions.

F. Installer shall coordinate work with all tradesmen.

G. Comply with requirements for demarcation point, pathways, cabinets, and racks specified in Division 27 Sections. Drawings indicate general arrangement of pathways and fittings.

H. Comply with TIA/EIA-569-B for pull-box sizing and length of conduit and number of bends between pull points.

I. Comply with requirements in Division 26 Section "Raceway and Boxes for Electrical Systems" for installation of conduits and wireways.

J. Install manufactured conduit sweeps and long-radius elbows whenever possible.

K. Pathway Installation in Communications Equipment Rooms:

1. Position conduit ends adjacent to a corner on backboard where a single piece of plywood is installed, or in the corner of room where multiple sheets of plywood are installed around perimeter walls of room.
2. Install cable trays to route cables if conduits cannot be located in these positions.
3. Secure conduits to backboard when entering room from overhead.
4. Install metal conduits with grounding bushings and connect with grounding conductor to grounding system.

3.2 APPLICATION OF MEDIA

A. Horizontal Cable for Data and Voice Service: Use UTP Category-6 cable for runs between wiring closets and workstation outlets; **COLOR: BLUE for Data and Voice**.

3.3 INSTALLATION OF CABLES

A. Comply with NECA 1.

B. General Requirements for Cabling:

1. Comply with TIA/EIA-568-C.
2. Comply with BICSI ITSIM, Ch. 6, "Cable Termination Practices."
3. Comply with NECA 1.

4. Wiring Method: Install cables in raceway except within consoles, cabinets, and accessible ceiling spaces and in gypsum board partitions where unenclosed wiring method may be used. Support cabling with J-hooks or cable tray above accessible ceilings. Use UL-listed plenum cable in environmental air spaces, including plenum ceilings. Conceal raceway and cables except in unfinished spaces. Install cabling in raceway where subject to damage: locker rooms, gyms, mechanical rooms, etc. Raceways and boxes are specified in Division 26 Section "Raceways and Boxes for Electrical Systems."
5. Install 110-style IDC termination hardware unless otherwise indicated.
6. Terminate all conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
7. Install cables using techniques, practices, and methods that are consistent with Category-6 rating of components and that ensure Category-6 performance of completed and linked signal paths, end to end.
8. Install cables without damaging conductors, shield, or jacket.
9. **Do not paint cables as this will void the warranty.**
10. All horizontal cabling shall terminate back at each area's respective rack. Terminate on patch panel.
11. All cabling shall be routed through cable tray or J-hook assembly (as noted on drawings) above accessible corridor ceilings.
12. All Category-6 UTP cables must be within the Category-6 distance of 295 feet. The contractor shall notify the Owner of any locations that exceed this distance limitations prior to installation.
13. Install lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by manufacturer.
14. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIM, "Cabling Termination Practices" Chapter. Use lacing bars and distribution spools.
15. In the communications equipment room, install a 10-foot-long service loop on each end of cable.
16. Contractor shall core floors as required for installation of data cabling. Verify all locations of codes with architect/engineer in field. All cores shall be sleeved and fire proofed, as required. Field verify all equipment and piping locations before making cores. Under no circumstances will any structural member be cut in this process.
17. Install exposed cables parallel and perpendicular to surfaces or exposed structural members and follow surface contours where possible.
18. Make terminations only at indicated outlets, terminals, and cross-connect and patch panels. Do not install consolidation points. Do not splice cables.
19. Pulling Cable: Do not exceed manufacturer's written recommended pulling tensions. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
20. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.
21. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals. Utilize J-hooks or cable tray.

22. Maintain a maximum UTP cable bend radius of four times the cable diameter, six times if in conduit.
23. Apply cable ties loosely and at random intervals.
24. Minimize the amount of jacket twisting and avoid stretching the cable.
25. Use an appropriate method for dressing and securing cables (i.e., cable ties – wide type, wire management panels, cable support bards and velcro straps).
26. Do not exceed a 90 degree bend.
27. Do not over tighten cable ties.
28. Do not over twist cables.
29. Do not exceed 25 lbs. of pulling tension. Pull cables simultaneously if more than one is being installed in same raceway. Use pulling compound or lubricant if necessary. Use compounds that will not damage conductor insulation. Use pulling means, including fish tape, cable, rope, and basket-weave wire or cable grips, that will not damage media or raceway.
30. Do not use staple guns to position or fasten cables.

C. UTP Cable Installation:

1. Comply with TIA/EIA-568-C.2-1.
2. Do not untwist UTP cables more than 1/2 inch from the point of termination to maintain cable geometry. Strip back only as much cable jacket as required for termination.

D. Open-Cable Installation:

1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
2. Suspend UTP cable not in a wireway or pathway, a minimum of 8 inches above ceilings by cable supports not more than 30 inches apart.
3. Cable shall not be run through structural members or in contact with pipes, ducts, or other potentially damaging items.
4. **Do not run cables above top chord of bar joists and within 6 inches of the roof deck.**

E. Wiring within Wiring Closets and Enclosures:

1. Install fire rated plywood backboards on walls of equipment rooms and wiring closets when needed.
2. Mount patch panels on floor-mounted racks and include wire managers above and below, front and back, for each patch panel used.
3. Group connecting hardware for cables into separate logical fields.
4. Train conductors to terminal points with no excess.
5. Use lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by manufacturer.

F. Group connecting hardware for cables into separate logical fields.

G. Separation from EMI Sources:

1. Comply with BICSI TDMM and TIA/EIA-569-D recommendations for separating unshielded copper voice and data communication cable from potential EMI sources, including electrical power lines and equipment.
2. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:

    a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 5 inches.
    b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches.
    c. Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches.

3. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:

    a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 2-1/2 inches.
    b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches.
    c. Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches.

4. 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:

    a. Electrical Equipment Rating Less Than 2 kVA: No requirement.
    b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches.
    c. Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches.

5. Separation between Communications Cables and Electrical Motors and Transformers, 5 kVA or HP and Larger: A minimum of 48 inches.
6. Separation between Communications Cables and Fluorescent Fixtures: A minimum of 5 inches.

3.4 FIRESTOPPING

A. Comply with requirements in Division 07 Section "Penetration Firestopping."

B. Comply with TIA/EIA-569-D, Annex A, "Firestopping."

C. Comply with BICSI TDMM, "Firestopping Systems" Article.

D. Install sleeves as required for cabling access; install end bushing/fitting to protect cabling. Fireproof after cabling is installed.

3.5 GROUNDING

A. Install grounding according to BICSI TDMM, "Grounding, Bonding, and Electrical Protection" Chapter.

B. Comply with ANSI-J-STD-607-A.

C. Bond metallic equipment to the grounding bus bar, using not smaller than No. 6 AWG equipment grounding conductor.

D. Grounding Points:

1. Locate grounding terminals in each equipment room, wiring closet, rack, and cabinet.

E. Bonding Conductors:

1. Where a panelboard for telecommunications is located in same room or space as a grounding busbar, bond to equipment ground bus of electrical panelboard.
2. Extend from grounding busbars to ground terminals in equipment racks and cabinets.
3. Extend from grounding busbars to building metal frame within room, or to metal frame external to room but readily accessible.

F. Special Requirements:

1. Bonding conductors shall be insulated copper, No. 6 AWG minimum.
2. Install only in nonmetallic conduit, unless specifically required for protection of conductor. Metallic conduit, if used, shall be RMC. For RMC that exceeds 36 inches in length, conductors shall be bonded at each end of conduit.
3. Bonding conductors shall be installed without splices unless approved by Architect because of special circumstances. Where splices are necessary, they shall be accessible and shall be located in telecommunications spaces. Splices shall be by irreversible compression connectors or by exothermic welding.

3.6 IDENTIFICATION

A. Identify system components, wiring, and cabling complying with TIA/EIA-606-C. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

1. Administration Class: 2.
2. Color-code cross-connect fields and apply colors to voice and data service backboards, connections, covers, and labels.

B. Comply with requirements in Division 09 Section "Interior Painting" for painting backboards. For fire-resistant plywood, do not paint over manufacturer's label.

C. See Division 27 Section "Communications Horizontal Cabling" for additional identification requirements. See Evaluations for discussion about TIA/EIA standard as it applies to this Section. Paint and label colors for equipment identification shall comply with TIA/EIA-606-C for Class 2 level of administration.

D. Comply with requirements in Division 27 Section "Communications Horizontal Cabling" for cable and asset management software.

E. Cable Schedule: Install in a prominent location in each equipment room and wiring closet. List incoming and outgoing cables and their designations, origins, and destinations. Protect with rigid frame and clear plastic cover. Furnish an electronic copy on memory stick of final comprehensive schedules for Project, in electronic format compatible with Owner's equipment.

F. Cabling Administration Drawings: Show building floor plans with cabling administration-point labeling. Identify labeling convention and show labels for telecommunications closets, terminal hardware and positions, horizontal cables, work areas and workstation terminal positions, grounding buses and pathways, and equipment grounding conductors. Provide electronic copy to Owner in DVD/Memory Stick format compatible with Owner's equipment. (Microsoft® Word® format or other type as selected by Owner).

G. Cable and Wire Identification and Administration:

1. Administration

a. Administrative requirements include identifiers, records, record linkages and labeling for the purposes of administering building cabling, pathways and spaces and grounding/bonding within a facility. No hand-written labels.
b. The administrative system shall be developed in Microsoft Word format or other electronics program approved by the Engineer. Should the Contractor elect to provide documentation of the administrative system in a proprietary format, the owner shall be provided with a retail licensed version of the software by the Contractor allowing the full editing and reading the documentation.
c. Refer to the Administrative System Outline below for minimum requirements.
d. Identifiers:

1) Identifiers shall be marked at the equipment to be administered.
2) Identifiers shall be unique for each type of equipment. For example, in no case shall the identifier for a cable be the same as the identifier for a pathway.

e. Records:

1) Provides descriptive information about the identified equipment.

f. Linkages:

1) To be used to describe the connection between an identifier and a record. In addition, a linkage is used to point from one record to another record.

g. Presentation of Administrative System:

1) Provide reports cataloging the records for all equipment.
2) Sample reports shall be provided to show explanations of the meaning of all information in the record.
3) Provide reports showing the labeling scheme for all components of the Administrative system.

h. Administrative System Outline: The format of the outline is as follows:

1) Subsystem:

a) Required identifiers.
b) Linked records.

2) Pathways: Pathway identifier, type, fill, loading.

a) Cable records, space records, pathway records, grounding records.

3) Spaces: Space identifier, space type.

a) Pathway records, cable records, grounding records.

4) Cable: Cable identifier, cable type, total pair count, damaged pair count, unterminated pair count.

a) Termination records, splice records, pathway records, grounding records.

5) Cabling Termination Hardware: Termination identifier, hardware type, damaged position numbers.

a) Termination position records, space records, grounding records.

6) Termination Position: Termination position identifier, termination type.

a) Cable records, termination hardware records, space records.

7) Splice: Splice identifier, splice type.

a) Cable records, space records.

8) Telecommunications Main Ground Bar: TMGB identifier, busbar type, grounding conductor identifier.

a) Bonding conductor records, space records.

9) Bonding Conductors: Bonding conductor identifier, conductor type, busbar identifier.

a) Grounding busbar records, pathway records.

10) Telecommunications Ground Bar: TGB identifier, busbar type.

a) Bonding conductor records, space records.

2. Labeling

a. Adhesive labels shall meet the requirements of UL 969 (Ref D-16) for legibility, defacement and adhesion. Exposure requirements of UL 969 for indoor and outdoor (as applicable) use shall be met.
b. Insert labels shall meet the requirements of UL 969 for legibility, defacement and general exposure.
c. Labeling shall be consistent for all common elements in the project. This consistency shall include label size, color, typeface an attachment method.
d. Labels incorporating bar codes shall be either Code 39 conforming to USS-39 or Code 128 conforming to USS-128.

1) a. All Code 39 bar codes shall have a ratio between 2.5:1 and 3.0:1. Provide a minimum "quite zone" of 0.25" on each side of the bar code.
2) A descriptive label for reading by personnel shall be provided with any bar code. Bar codes by themselves are not acceptable.

e. Color Code: Observe the following requirements for color coding:

1) Labels on each end of a cable shall be the same color for each termination.
2) Labels for cross-connects shall be two different colors at each termination fields, representative of the color of that field.
3) Orange (Pantone 15C) shall be used for the demarcation point.
4) Green (Pantone 353C) shall be used for the termination point of network connection on the facility side of the demark.
5) Purple (Pantone 264C) shall be used to identify the termination of cables from common equipment (PBX, computers, LANS, etc.)
6) White shall be used to identify the first-level backbone termination in the main cross-connect.
7) Gray (Pantone 422C) shall be used to identify the second-level backbone termination in the main cross-connect.
8) Blue (Pantone 291C) shall be used to identify the termination of station cabling at the telecommunications closet and/or equipment room end of the cable.
9) Brown (Pantone 465C) shall be used to identify the termination of the interbuilding backbone cable terminations.
10) Yellow (Pantone 101C) shall be used to identify the termination of auxiliary circuits, alarms, maintenance, security, etc.
11) Red (Pantone 184C) shall be used to identify the termination of key telephone systems.
12) In facilities that do not contain a main cross-connect, the color white may be used to identify second-level backbone terminations.

f. Tag all Category-6, Data Patch Panel and Voice Termination Blocks and optical fiber cables at both the Communications Equipment Room and

the information outlets using the following alphanumeric labeling system: Includes Data Patch Panel and Voice Termination Blocks.

1) The Telecommunications Administration System shall meet or exceed TIA/EIA-606-A standards.
2) All Telecommunications Outlets, Data Patch Panel, Voice Termination Blocks and Cables shall be clearly labeled using a Code identifying each information outlet location as unique throughout the College of DuPage Campus. The font type shall be similar to Arial, Bold Faced with font size of 14. All alternate font type and size must be approved by College of DuPage IT.
3) This code, which will identify cabling and terminations at both IDF and Media Outlet locations, shall be as follows: BB-XCC-F-###A

    a) BB= the designation to identify the specific building.
    b) XCC = the Telecommunications Closet (TC) serving that jack. The TC is designated by Floor (XX) and their geographic location on that floor (CC) (e.g. Northwest, Southeast, etc.).
    c) F = the Floor on which the jack is located.
    d) ### = a sequential number assigned to that jack.
    e) A = Alpha designation used ONLY if multiple jacks of a given type (e.g. Voice or Data) are housed in the same Outlet assembly.
    f) For example, "IC-2NW-3-123" designates the 123rd jack on the 3rd Floor served from the IDF in the Northwest area of the 2nd Floor of the IC building. If multiple Data cables would be contained in the outlet, they would be identified as "A", "B", "C", and so on.

4) This numbering sequence plus a two (2) character Building Designator shall be utilized in the Cable Management System for identification of station cabling. Building designations are as follows:

    a) Arts Center = AR
    b) Instructional Center = IC
    c) K Building = KK
    d) L Building = LL
    e) M Building = MM
    f) Open Campus Center (OCC) = OC
    g) Physical Education = PE
    h) Seaton Computing Center = SC
    i) Student Resource Center (SRC) = SR
    j) WDCB Tower = JJ
    k) Westmont Center = WC
    l) Naperville Center = NC
    m) Davea (Addison) = AD
    n) Bloomingdale Center = BC
    o) Lombard Center = LC
    p) Carol Stream Community Education Center = CC
    q) West Chicago Community Education Center = WE

r) H Building = HH
s) BIC Annex = BA
t) Early Childhood Education Center = EC
u) Technology Education Center = TC
v) Business & Community Education Center = BC
w) Parking Structure = PG
x) Health Careers and Natural Sciences Building = HS
y) Culinary Arts Center = CH
z) Homeland Security Education Center = HE

5) Hardware designations (HD) are as follows:

a) Controller Termination block = TB
b) HID Proximity Reader = PR
c) Electrified Lock/lock Trim = EL
d) Power Supply (low voltage) = PS
e) Power Supply (line voltage) = XP
f) Remote Door Release/RTE = RX
g) Door Position/Contact switch = DS
h) Monitoring switch = MS
i) Dual Tech Motion Sensor = DT
j) Local Annunciation Device = LA
k) Data Converter = DC
l) CCTV Camera = CC
m) PTZ/Dome Camera = EC
n) Fiber Optic Transceiver = FT
o) Video Transmitter = VT
p) Video Receiver = VR

6) Where adding to an existing installation, cable identification numbering must be integrated into the established plan and must be approved by the Owner.
7) Where adding to an installation, both voice and data numbering must remain in a "matched" sequence. Throughout the building, at each location has the "same" numbering on the faceplate ID for both voice and data. Example: If the 4th location in a series is a "voice only" location, then the data patch panel would be skipping number 4 in its sequence. Therefore, if the numbers are continuing, (assuming the "next" location is both voice and data) the data patch panel's next number would be 5 (skipping # 4) with NO blank data jacks open on the data patch panel. By the same description, if a location in a series is a "data only", the voice designation strip would represent a "skip" in its sequence. Again the arrangement of the added cables would leave NO blanks on the 110-voice frame.
8) ALL labeling shall be machine generated (Panduit) in black ink on white background tags and be permanent. NO HAND WRITTEN LABELS SHALL BE ALLOWED.
9) Cables:

a) ALL Cables shall be identified AT BOTH ENDS, within 4 inches of termination, using a self-laminating tag wrapped

around the cable (e.g. not a "flag"). The Contractor shall use labeler. Cable labels shall indicate cable designation and destination. In Station cables, for example, this designation shall be the Telecommunications Outlet identification.

10) Telecommunications Outlets:

a) Telecommunications Outlets are to be labeled (1) on the cover of the assembly, (2) on the base of the assembly (if applicable) and (3) on each cable terminated at that location.
b) Where multiple cables of a given type (e.g. "Data") are contained in a single outlet, the alpha-designator ("A", "B", "C", and so on) those jack positions shall be so labeled.

11) Data Patch Panels:

a) Data Patch panels shall be clearly labeled as to the destination and position of each cable terminated on that panel. Cables shall be positioned in sequence of Outlet I.D.
b) The TC designator may be omitted on each jack position provided that the panel itself includes the TC designator.
c) Station cables shall be labeled within 4-inches of the cable choke at Data Patch Panels.
d) Where closet servers information outlets on multiple floors, panel for each floor shall be in a different rack moving from left to right on the racks, (i.e., first rack on the left most position will receive all the cables coming from the first floor, the rack #2 to the right of the first rack will receive cables from second floor and son on).

12) Voice Termination Block:

a) Each horizontal row (in pairs) of the Voice Termination Block shall be labeled with "Designation Strips" which identify the destination and position of each cable terminated on that block.
b) Designation Strips shall be color coded to indicate the block's application. Color-coding shall be as follows:

(i) Inter-Building Cable (e.g. IC-PE or OCC-"K") = Brown
(ii) Intra-Building Cable (MDF-IDF) = White
(iii) Station Cable = Blue

c) Blocks on which "Station" Cabling is terminated will be labeled as to identify Telecommunications Outlet I.D.s. Voice termination blocks on which "Backbone" or "Tie" Cabling is terminated will be labeled to identify Pair Count are identified (e.g. 1-25, 26-50, etc.). Assignment of Pair Count(s) shall consider the existing count and must be approved by Owner.

H. Contractor shall bear all costs associated with walking each room/area for verification of actual room numbers prior to labeling, no exceptions. Please note that room numbers could change under this construction project.

3.7 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Perform tests and inspections.

C. Basic UTP Cabling Tests (up to 650 MHz):

1. Test instruments shall meet or exceed applicable requirements in TIA/EIA-568-C.2-1. Perform tests with a tester that complies with performance requirements in Annex I, complying with measurement accuracy specified in Annex H. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.

    a. Conduct tests and inspections after installation has been completed to assure the Owner's requirements for installation have been met. Upon request, prior to Owner's acceptance, allow access by Owner to test the equipment and wiring system. The contractor shall be responsible for testing each run "end-to-end" (both ways) and certifying, in writing, that the cabling meets Category/Level-6 UTP specifications and is in proper working condition. Each UTP cable shall be fully tested with a level III tester (i.e., Lantek II-500 and Fluke DTX series or equal). The output from each UTP cable test/certification shall be printed out and provided to Owner in as-built/close-out documentation.
    b. Required test data for UTP horizontal cables shall include: wire map, length attenuation, link test, plug de-embedding, ANEXT, AFEXT, PSA NEXT, PSAFNEXT, ACR, ACRF, PSACR, and PSACRF.

2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
3. Wire-map test that reports open circuits, short circuits, crossed pairs, reversed pairs, split pairs, and improper terminations.
4. Permanent link tests for cable length, insertion loss, near-end crosstalk loss, power sum near-end crosstalk loss, equal-level far-end crosstalk loss, power sum equal-level far-end crosstalk, return loss, propagation delay, and delay skew. Performance shall comply with minimum criteria in TIA/EIA-568-C.2-1 for Category-6 cable and as required by Manufacturer's Warranty.
5. All test results shall be printed out and provided to Owner in Close-Out Documents. Provide electronic copy on DVD or Memory Stick.

D. Data for each measurement shall be documented. Data for submittals shall be printed in a summary report that is formatted similar to Table 10.1 in BICSI TDM, or transferred from the instrument to the computer, saved as text files, and printed and submitted.

E. Remove and replace cabling where test results indicate that they do not comply with specified requirements.

F. Retest and inspect cabling to determine compliance of replaced or additional work with specified requirements.

3.8 MANUFACTURER'S FIELD SERVICE

A. Upon acceptance of installation registration form, manufacturer will provide at a minimum 25 year warranty on all parts/cabling and labor to repair and/or replace any non-performing device.

B. Manufacturer's representative shall visit the site to determine if the system complies with all requirements.

3.9 CLEANING

A. Clean all devices of dust and debris.

3.10 DEMONSTRATION

A. Train Owner's maintenance personnel in cable-plant management operations, including changing signal pathways for different workstations, rerouting signals in failed cables, and extending wiring to establish new workstation outlets. Refer to Division 1 Section "Closeout Procedures" and "Demonstration and Training."

B. Provide system demonstration. Show Owner as-builts and how all cabling was routed. Demonstrate method of tagging. Identify what rooms are fed from each rack. Identify spare capacity.

C. Describe wiring of system and functionality of all jacks and related devices.

END OF SECTION

SECTION 27 51 16
PUBLIC ADDRESS AND MASS NOTIFICATION 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.

1.2 SUMMARY

A. Section Includes Expansion of Existing Paging System:

1. Power amplifiers.
2. Volume limiter/compressors.
3. Loudspeakers.
4. Conductors and cables.
5. Raceways.

1.3 DEFINITIONS

A. Channels: Separate parallel signal paths, from sources to loudspeakers or loudspeaker zones, with separate amplification and switching that permit selection between paths for speaker alternative program signals.

B. VU: Volume unit.

C. Zone: Separate group of loudspeakers and associated supply wiring that may be arranged for selective switching between different channels.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For supports, amplifiers, speakers, and cabling and components. Include plans, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, required clearances, method of field assembly, components, and location and size of each field connection.
2. Control panels locations.
3. Calculations: For sizing backup battery, when additional load is applied.
4. Wiring Diagrams: For power, signal, and control wiring.

a. Identify terminals to facilitate installation, operation, and maintenance.

b. Single-line diagram showing interconnection of components.
c. Cabling diagram showing cable routing.

C. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings are shown and coordinated with each other, using input from installers of the items involved.

D. Qualification Data: For qualified Installer and testing agency.

E. Field quality-control reports.

F. Operation and Maintenance Data: For public address and mass notification systems to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

1. Personnel certified by NICET as Audio Systems Level II Technician.

B. Testing Agency Qualifications: Qualified agency, with the experience and capability to conduct testing indicated.

1. Testing Agency's Field Supervisor: Currently certified by NICET at Level III to supervise on-site testing.

C. Source Limitations: Obtain public address from single source from single manufacturer.

D. 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.

E. Comply with NFPA 70.

F. Comply with U.L. 50.

1.6 COORDINATION

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

B. Include new power branch circuits as needed for new amplifier locations. Wire to emergency power circuit and lock-out breaker. Label Card Directory.

1.7 EXTRA MATERIALS (*REFER TO DRAWINGS FOR ADDITIONAL INFORMATION*)

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fuses: One (1) of each type and size.
2. Keys: Ten (10) of each.

1.8 WARRANTY

A. Provide one year warranty on all parts and labor.

B. Service must be provided within four hours of notification.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Bogen Communications, Inc.

2.2 FUNCTIONAL DESCRIPTION OF EXISTING SYSTEM

A. Existing System Functions:

1. Selectively connect any zone to any available signal channel.
2. Selectively control sound from microphone outlets and other inputs.
3. "All-call" feature shall connect the all-call sound signal simultaneously to all zones regardless of zone or channel switch settings.
4. Telephone paging adapter shall allow paging by dialing an extension from any local telephone instrument and speaking into the telephone.
5. Produce a program-signal tone that is amplified and sounded over all speakers, overriding signals currently being distributed.
6. Reproduce high-quality sound that is free of noise and distortion at all loudspeakers at all times during equipment operation including standby mode with inputs off; output free of non-uniform coverage of amplified sound.
7. The contractor shall revise/modify existing system as required to expand system into new areas for proper audibility coverage.

2.3 GENERAL EQUIPMENT AND MATERIAL REQUIREMENTS (*REFER TO DRAWINGS FOR ADDITIONAL INFORMATION*)

A. Compatibility of Components: Coordinate component features to form an integrated system. Match components and interconnections for optimum performance of specified functions.

B. Equipment: Comply with UL 813. Equipment shall be modular, using solid-state components, and fully rated for continuous duty unless otherwise indicated. Select equipment for normal operation on input power usually supplied at 110 to 130 V, 60 Hz.

C. Equipment Mounting: Where rack, cabinet, or console mounting is indicated, equipment shall be designed to mount in a 19-inch housing complying with TIA/EIA-310-D.

D. Weather-Resistant Equipment: Listed and labeled by a qualified testing agency for duty outdoors or in damp locations.

2.4 POWER AMPLIFIERS

A. Mounting: Match existing.

B. Output Power: Balanced line voltage to match existing. Do not exceed 80 percent of the sum of wattage settings of connected load for each station and speaker connected in all-call mode of operation, plus an allowance for future stations.

C. Total Harmonic Distortion: Less than 3 percent at rated power output from 50 to 12,000 Hz.

D. Minimum Signal-to-Noise Ratio: 60 dB, at rated output.

E. Frequency Response: Within plus or minus 2 dB from 50 to 12,000 Hz.

F. Output Regulation: Less than 2 dB from full to no load.

G. Controls: On-off, input levels, and low-cut filter.

H. Input Sensitivity: Matched to preamplifier and to provide full-rated output with sound-pressure level of less than 10 dynes/sq. cm impinging on speaker microphone or handset transmitter.

2.5 TRANSFER TO STANDBY AMPLIFIER

A. Monitoring Circuit and Sensing Relay: Detect reduction in output of power amplifier of 40 percent or more and, in such event, transfer load and signal automatically to standby amplifier.

2.6 LOUDSPEAKERS (*MATCH OWNER'S EXISTING LAY-IN 1' X 2' CEILING SPEAKERS*)

A. Cone-Type Loudspeakers (Match Owner's Existing Speaker Style):

1. Comply with TIA/EIA SE-103.
2. Minimum Axial Sensitivity: 91 dB at one meter, with 1-W input.
3. Frequency Response: Within plus or minus 3 dB from 50 to 15,000 Hz.
4. Size: 8 inches with 1-inch voice coil and minimum 5-oz. ceramic magnet.

5. Minimum Dispersion Angle: 100 degrees.
6. Rated Output Level: 10 W.
7. Matching Transformer: Full-power rated with four taps. Maximum insertion loss of 0.5 dB.
8. Flush-Ceiling-Mounting Units: In steel back boxes, acoustically dampened. Metal ceiling grille with white baked enamel.
9. Grilles will either be round or square to match existing type.

2.7 OUTLETS

A. Volume Attenuator Station: Wall-plate-mounted autotransformer type with paging priority feature.

1. Wattage Rating: 10 W unless otherwise indicated.
2. Attenuation per Step: 3 dB, with positive off position.
3. Insertion Loss: 0.4 dB maximum.
4. Attenuation Bypass Relay: Single pole, double throw. Connected to operate and bypass attenuation when all-call, paging, program signal, or prerecorded message features are used. Relay returns to normal position at end of priority transmission.
5. Label: "PA Volume."

2.8 BATTERY BACKUP POWER UNIT

A. Unit shall be rack or wall mounted, consisting of time-delay relay, sealed lead-calcium battery, battery charger, on-off switch, "normal" and "emergency" indicating lights, and adequate capacity to supply maximum equipment power requirements for one hour of continuous full operation.

B. Unit shall supply public address equipment with 12- to 15-V dc power automatically during an outage of normal 120-V ac power.

C. Battery shall be on float charge when not supplying system and to transfer automatically to supply system after three to five seconds of continuous outage of normal power, as sensed by time-delay relay.

D. Unit shall automatically retransfer system to normal supply when normal power has been reestablished for three to five seconds continuously.

E. Provide new unit for new amplifier locations. Modify existing when loads have been increased.

2.9 CONDUCTORS AND CABLES

A. Jacketed, twisted pair and twisted multipair, untinned solid copper.

1. Insulation for Wire in Conduit: Thermoplastic, not less than 1/32 inch thick.
2. West Penn Shielded Speaker Plenum Cable: Listed and labeled for plenum installation.

2.10 RACEWAYS

A. Conduit and Boxes: Comply with Division 26 Section "Raceway and Boxes for Electrical Systems."

1. Outlet boxes shall be not less than 2 inches wide, 3 inches high and 2-1/2 inches deep.

PART 3 - EXECUTION

3.1 WIRING METHODS

A. Wiring Method: Install cables in raceways and cable trays except within consoles, cabinets, desks, and counters, and except in accessible ceiling spaces and in gypsum board partitions where unenclosed wiring method may be used. Conceal raceway and cables except in unfinished spaces.

1. Install plenum cable in environmental air spaces, including plenum ceilings unless restricted by local codes.
2. Comply with requirements for raceways and boxes specified in Division 26 Section "Raceway and Boxes for Electrical Systems."
3. All raceway stubs shall be provided with end bushing/fittings.
4. All exposed raceways installed in finished areas shall be of the metallic wiremold type.

B. Wiring within Enclosures: Bundle, lace, and train cables to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.

C. All cables subject to damage (i.e., in receiving rooms, mechanical rooms, open spaces, etc.) shall be installed in a complete dedicated raceway and painted out per Architect’s direction.

3.2 INSTALLATION OF RACEWAYS

A. Comply with requirements in Division 26 Section "Raceway and Boxes for Electrical Systems" for installation of conduits and wireways.

B. Install manufactured conduit sweeps and long-radius elbows whenever possible.

C. Install conduit stubs in new construction out to above accessible ceiling.

3.3 INSTALLATION OF CABLES

A. Comply with NECA 1.

B. General Cable Installation Requirements:

1. Terminate conductors; no cable shall contain unterminated elements. Make terminations only at outlets and terminals.
2. Splices, Taps, and Terminations: Arrange on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures. Cables may not be spliced.
3. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
4. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.
5. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
6. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used.

C. Open-Cable Installation:

1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
2. Suspend speaker cable not in a wireway or pathway a minimum of 8 inches above ceiling by cable supports not more than 48 inches apart.
3. Cable shall not be run through structural members or be in contact with pipes, ducts, or other potentially damaging items. **Do not mount above top chord of bar joists or within 6 inches of roof deck to prevent damage caused by roofing nails.**
4. Install exposed cables parallel and perpendicular to surfaces or exposed structural members and follow surface contours.

D. Separation of Wires: Separate speaker-microphone, line-level, speaker-level, and power wiring runs. Install in separate raceways or, where exposed or in same enclosure, separate conductors at least 12 inches apart for speaker microphones and adjacent parallel power and telephone wiring. Separate other intercommunication equipment conductors as recommended by equipment manufacturer.

E. Control Circuit Wiring: Install number and size of conductors as recommended by system manufacturing for control functions indicated.

3.4 INSTALLATION

A. Match input and output impedances and signal levels at signal interfaces. Provide matching networks where required.

B. Identification of Conductors and Cables: Color-code conductors and apply wire and cable marking tape to designate wires and cables so they identify media in coordination with system wiring diagrams.

C. Equipment Cabinets and Racks:

1. Group items of same function together, either vertically or side by side, and arrange controls symmetrically. Mount monitor panel above the amplifiers.
2. Arrange all inputs, outputs, interconnections, and test points so they are accessible at rear of rack for maintenance and testing, with each item removable from rack without disturbing other items or connections.
3. Blank Panels: Cover empty space in equipment racks so entire front of rack is occupied by panels.
4. Label all controls for ease of identification.

D. Wall-Mounted Outlets: Flush mounted, label all jacks.

E. Conductor Sizing: Unless otherwise indicated, size speaker circuit conductors from racks to loudspeaker outlets not smaller than No. 18 AWG and conductors from microphone receptacles to amplifiers not smaller than No. 22 AWG.

F. Weatherproof Equipment: For units that are mounted outdoors, in damp locations, or where exposed to weather, install consistent with requirements of weatherproof rating.

G. Speaker-Line Matching Transformer Connections: Make initial connections using tap settings indicated on Drawings.

H. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.5 GROUNDING

A. Ground cable shields and equipment to eliminate shock hazard and to minimize ground loops, common-mode returns, noise pickup, cross talk, and other impairments.

B. Signal Ground Terminal: Locate at main equipment cabinet. Isolate from power system and equipment grounding.

C. Install grounding electrodes as specified in Division 26 Section "Grounding and Bonding for Electrical Systems."

D. Insulate all microphone and 600 Ohm lines from each other and from conduit. Verify that conduits have been mechanical and electrically connected to boxes and grounded. Do not splice lines in conduit.

E. Do not ground microphone line shields, except at microphone frame and at console input connectors.

F. Ground other shields of two (2) conductor cables only at one (1) end, as appropriate. Terminate “floating” ends with wedge-on collars, plastic tape or heat shrinkable tubing.

G. Maintain continuity of shields at all connecting points.

H. Connect all audio grounds in an equipment rack to common point.

3.6 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. Schedule tests with at least seven days' advance notice of test performance.
2. After installing public address and mass notification systems and after electrical circuitry has been energized, test for compliance with requirements.
3. Operational Test: Perform tests that include originating program and page messages at microphone outlets, preamplifier program inputs, and other inputs. Verify proper routing and volume levels and that system is free of noise and distortion.
4. Signal-to-Noise Ratio Test: Measure signal-to-noise ratio of complete system at normal gain settings as follows:

    a. Disconnect microphone at connector or jack closest to it and replace it in the circuit with a signal generator using a 1000-Hz signal. Replace all other microphones at corresponding connectors with dummy loads, each equal in impedance to microphone it replaces. Measure signal-to-noise ratio.
    b. Repeat test for each separately controlled zone of loudspeakers.
    c. Minimum acceptance ratio is 50 dB.

5. Distortion Test: Measure distortion at normal gain settings and rated power. Feed signals at frequencies of 50, 200, 400, 1000, 3000, 8000, and 12,000 Hz into each preamplifier channel. For each frequency, measure distortion in the paging and all-call amplifier outputs. Maximum acceptable distortion at any frequency is 3 percent total harmonics.
6. Acoustic Coverage Test: Feed pink noise into system using octaves centered at 500 and 4000 Hz. Use sound-level meter with octave-band filters to measure level at five locations in each zone. For spaces with seated audiences, maximum permissible variation in level is plus or minus 2 dB. In addition, the levels between locations in same zone and between locations in adjacent zones must not vary more than plus or minus 3 dB.
7. Power Output Test: Measure electrical power output of each power amplifier at normal gain settings of 50, 1000, and 12,000 Hz. Maximum variation in power output at these frequencies must not exceed plus or minus 1 dB.
8. Signal Ground Test: Measure and report ground resistance at pubic address equipment signal ground. Comply with testing requirements specified in Division 26 Section "Grounding and Bonding for Electrical Systems."

C. Retesting: Correct deficiencies, revising tap settings of speaker-line matching transformers where necessary to optimize volume and uniformity of sound levels, and retest. Prepare a written record of tests.

D. Inspection: Verify that units and controls are properly labeled and interconnecting wires and terminals are identified. Prepare a list of final tap settings of paging speaker-line matching transformers.

E. Public address systems will be considered defective if they do not pass tests and inspections.

F. Prepare test and inspection reports.

1. Include a record of final speaker-line matching transformer-tap settings, and signal ground-resistance measurement certified by Installer.

3.7 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

1. Verify that electrical wiring installation complies with manufacturer's submittal and installation requirements.
2. Complete installation and startup checks according to manufacturer's written instructions.

3.8 ADJUSTING

A. On-Site Assistance: Engage a factory-authorized service representative to provide on-site assistance in adjusting sound levels, resetting transformer taps, and adjusting controls to meet occupancy conditions.

B. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

3.9 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain the public address and mass notification systems and equipment.

B. Provide system training. Provide training manual for each person.

END OF SECTION

SECTION 28 05 00
COMMON WORK RESULTS FOR ELECTRONIC SAFETY AND SECURITY

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.

1.2 SUMMARY

A. Section Includes:

1. Electronic safety and security equipment coordination and installation.
2. Sleeves for raceways and cables.
3. Sleeve seals.
4. Grout.
5. Common electronic safety and security installation requirements.

1.3 DEFINITIONS

A. EPDM: Ethylene-propylene-diene terpolymer rubber.

1.4 SUBMITTALS

A. Product Data: For sleeve seals.

1.5 COORDINATION

A. Coordinate arrangement, mounting, and support of electronic safety and security equipment:

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 right of way for piping and conduit installed at required slope.
4. So connecting raceways, 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 electronic safety and security 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."

PART 2 - PRODUCTS

2.1 SLEEVES FOR RACEWAYS AND CABLES

A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.

2.2 SLEEVE SEALS

A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Advance Products & Systems, Inc.
   b. Calpico, Inc.
   c. Metraflex Co.
   d. Pipeline Seal and Insulator, Inc.

2. Sealing Elements: EPDM interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
3. Pressure Plates: Stainless steel. Include two for each sealing element.
4. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.3 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.

PART 3 - EXECUTION

3.1 COMMON REQUIREMENTS FOR ELECTRONIC SAFETY AND SECURITY INSTALLATION

A. Comply with NECA 1.

B. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.

C. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.

D. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electronic safety and security equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.

E. Right of Way: Give to piping systems installed at a required slope.

3.2 SLEEVE INSTALLATION FOR ELECTRONIC SAFETY AND SECURITY PENETRATIONS

A. Electronic safety and security penetrations occur when raceways, 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 all penetrations. Install sleeves during erection of slabs and walls.

C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.

D. 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.

E. Cut sleeves to length for mounting flush with both surfaces of walls. If above accessible ceiling, sleeves can extend 1 inch out of wall.

F. Extend sleeves installed in floors to reach equipment.

G. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway. All other sleeves for cabling shall be sized based upon 40 percent NEC fill rate and allow for minimum of 50 percent expansion for future cables. Utilize multiple sleeves as required.

H. Seal space outside of sleeves with grout for penetrations of concrete and masonry

1. Promptly pack grout solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect grout while curing.

I. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Division 07 Section "Joint Sealants.".

J. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at raceway and cable penetrations. Install sleeves and seal raceway and cable penetration sleeves with firestop materials. Comply with requirements in Division 07 Section "Penetration Firestopping."

K. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.

L. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

M. Furnish and install sleeves for all low voltage cabling, including Data, Voice, Video, Paging, Clock, Thermostat, Fire Alarm, Security, etc. All sleeves shall be provided with end bushing/fitting to protect cabling. Sleeves shall be sized based upon 40 percent NEC fill rate and allow for minimum of 50 percent expansion for future cables. Utilize multiple sleeves as required. Minimum sleeve size is 3/4 inch conduit.

3.3 SLEEVE-SEAL INSTALLATION

A. Install to seal exterior wall penetrations.

B. Use type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.4 FIRESTOPPING

A. Apply firestopping to penetrations of fire-rated floor and wall assemblies for electronic safety and security installations to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 07 Section "Penetration Firestopping."

END OF SECTION

SECTION 28 05 13
CONDUCTORS AND CABLES FOR ELECTRONIC SAFETY AND SECURITY

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.

1.2 SUMMARY

A. Section Includes:

1. Control-circuit conductors.
2. Fire alarm wire and cable.
3. Identification products.

1.3 DEFINITIONS

A. BICSI: Building Industry Consulting Service International.

B. EMI: Electromagnetic interference.

C. IDC: Insulation displacement connector.

D. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control and signaling power-limited circuits.

E. Open Cabling: Passing telecommunications cabling through open space (e.g., between the studs of a wall cavity).

F. RCDD: Registered Communications Distribution Designer.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

1. For cables, include the following installation data for each type used:

a. Nominal OD.
b. Minimum bending radius.
c. Maximum pulling tension.
d. Electrical characteristics.

B. Shop Drawings: Cable layout, showing cable route with relationship between adjacent structural, electrical, and mechanical elements.

C. Qualification Data: For qualified layout technician, installation supervisor, and field inspector.

D. Source quality-control reports.

E. Field quality-control reports.

F. Operation and Maintenance Data: For wire and cable to include in operation and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:

1. Allowable pulling tension of cable.
2. Cable connectors and terminations recommended by the manufacturer.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: An NRTL – U.L.

1. Testing Agency's Field Supervisor: Currently certified by BICSI as an RCDD to supervise on-site testing.

B. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 50 or less.

C. 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.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Test cables upon receipt at Project site.

1. Test each cable for open and short circuits.
2. Store all hardware and cables in environmentally controlled room, dry location.

1.7 PROJECT CONDITIONS

A. Do not install conductors and cables that are wet, moisture damaged, or mold damaged.

1. Indications that wire and cables are wet or moisture damaged include, but are not limited to, discoloration and sagging of factory packing materials.

B. Environmental Limitations: Do not deliver or install cables and connecting materials until 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.

C. **Do not allow cables to be painted.** All cables painted will be replaced at the contractor's expense.

1.8 WARRANTY

A. One Year unless manufacturer's standard warranty is for greater length of time.

B. Refer to other Division 26 and 27 Sections for additional warranty requirements.

PART 2 - PRODUCTS

2.1 PATHWAYS

A. Support of Open Cabling: U.L. labeled for support of low voltage cabling, designed to prevent degradation of cable performance and pinch points that could damage cable.

1. Support brackets with cable tie slots for fastening cable ties to brackets.
2. Lacing bars, spools, J-hooks, and D-rings (minimum of 1.7 inches bearing surface).
3. Straps and other devices.

B. Conduit and Boxes: Comply with requirements in Division 26 Section "Raceway and Boxes for Electrical Systems."

C. Outlet boxes shall be no smaller than 2 inches wide, 3 inches high, and 2-1/2 inches deep, as needed to accommodate devices being installed.

2.2 BACKBOARDS

A. Backboards: Plywood, fire-retardant treated, 3/4 inch thick. Comply with requirements for plywood backing panels in Division 06 Section "Rough Carpentry".

2.3 LOW-VOLTAGE CONTROL CABLE

A. Plenum-Rated, Paired Cable: NFPA 70, Type CMP.

1. 1 pair, twisted, No. 16 AWG, stranded (19x29) and No. 18 AWG, stranded (19x30) tinned copper conductors. Coordinate sizes with equipment manufacturer requirements.
2. Fluorinated ethylene propylene insulation.
3. Unshielded.
4. Fluorinated ethylene propylene jacket.
5. Flame Resistance: Comply with NFPA 262.

2.4 CONTROL-CIRCUIT CONDUCTORS

A. Class 1 Control Circuits: Stranded copper, Type THHN-THWN, complying with UL 83, in raceway.

B. Class 2 Control Circuits: Stranded copper, Type THHN-THWN, complying with UL 83, in raceway and power-limited cable, complying with UL 83, concealed in building finishes.

C. Class 3 Remote-Control and Signal Circuits: Stranded copper, Type TW or TF, complying with UL 83.

D. All cabling installed in plenum areas will be plenum rated.

2.5 FIRE ALARM WIRE AND CABLE

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Comtran Corporation.
2. Helix/HiTemp Cables, Inc.; a Drake Company.
3. Rockbestos-Suprenant Cable Corp.
4. West Penn Wire; a brand of Belden Inc.
5. Allied Wire and Cable.
6. Coleman Cable Inc.
7. Belden Cable.

B. General Wire and Cable Requirements: U.L. listed and labeled as complying with NFPA 70, Article 760.

C. Signaling Line Circuits: Twisted, shielded pair (or as required by manufacturer), plenum rated, fire protection listed, not less than No. 18 AWG and as recommended by system manufacturer.

D. Non-Power-Limited Circuits: Solid-copper conductors with 600-V rated, 75 deg C, color-coded insulation.

1. Low-Voltage Circuits: No. 16 AWG, minimum, plenum rated.
2. Line-Voltage Circuits: No. 12 AWG, minimum, plenum rated.
3. If multi-pair cables are used, they shall be fire protection listed, plenum rated.

E. **All fire alarm cabling to be RED and installed in RED conduit in concealed areas, walls, and above non-accessible ceilings.**

2.6 IDENTIFICATION PRODUCTS

A. Manufacturers: Subject to compliance with requirements:

1. Brady Corporation.
2. HellermannTyton.
3. Kroy LLC.
4. PANDUIT CORP.

B. Comply with UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

C. Comply with requirements in Division 26 Section "Identification for Electrical Systems."

2.7 SOURCE QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to evaluate cables.

B. Factory test cables according to TIA/EIA-568-C.

C. Cable will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 INSTALLATION OF PATHWAYS

A. Install in a dedicated raceway system.

B. Comply with TIA-569-B for pull-box sizing and length of conduit and number of bends between pull points.

C. Comply with requirements in Division 26 Section "Raceway and Boxes for Electrical Systems." for installation of conduits and wireways.

D. Install manufactured conduit sweeps and long-radius elbows whenever possible.

E. Backboards: Install fire rated backboards, 3/4 inch thick as needed. Paint out WHITE; do NOT cover fire listing label.

3.2 INSTALLATION OF HANGERS AND SUPPORTS

A. Comply with requirements in Division 26 Section "Hangers and Supports for Electrical Systems." for installation of supports for pathways, conductors and cables.

3.3 WIRING METHOD (*OTHER THAN FIRE ALARM*)

A. Install wiring in metal raceways and wireways. Conceal raceway except in unfinished spaces and as indicated. Minimum conduit size shall be 3/4 inch. Control and data transmission wiring shall not share conduit with other building wiring systems.

B. Install wiring in raceways except in accessible indoor ceiling spaces. Conceal raceways and wiring except in unfinished spaces and as indicated. Minimum conduit size shall be 3/4 inch. Control and data transmission wiring shall not share conduit with other building wiring systems. All cabling subject to damage (i.e., Receiving Rooms, Mechanical Rooms, Open Areas, etc.) shall be installed in raceway.

C. Install cable, concealed in accessible ceilings, walls, and floors when possible.

D. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points. Use lacing bars and distribution spools. Separate power-limited and non-power-limited conductors as recommended in writing by manufacturer. Install conductors parallel with or at right angles to sides and back of enclosure. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with intrusion system to terminal blocks. Mark each terminal according to system's wiring diagrams. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.

E. When exposed raceway is required, utilize IVORY surface mounted metallic wiremold raceway. Coordinate installation with Architect prior to rough-in. Utilize matching wiremold metallic back box for devices being installed.

3.4 INSTALLATION OF CONDUCTORS AND CABLES

A. Comply with NECA 1.

B. Conductors: Size according to system manufacturer's written instructions unless otherwise indicated.

C. General Requirements for Cabling:

1. Comply with TIA/EIA-568-C.
2. Comply with BICSI ITSIM, Ch. 6, "Cable Termination Practices."
3. Terminate all conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, and cross-connect and patch panels.

4. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
5. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIM, "Cabling Termination Practices" Chapter. Install lacing bars and distribution spools.
6. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
7. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.
8. Pulling Cable: Comply with BICSI ITSIM, Ch. 4, "Pulling Cable." Monitor cable pull tensions.

D. Open-Cable Installation:

1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
2. Suspend copper cable not in a wireway or pathway a minimum of 8 inches above ceilings by cable supports not more than 48 inches apart.
3. Cable shall not be run through structural members or in contact with pipes, ducts, or other potentially damaging items.

E. Separation from EMI Sources:

1. Comply with BICSI TDMM and TIA-569-B recommendations for separating unshielded copper voice and data communication cable from potential EMI sources, including electrical power lines and equipment.
2. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:

    a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 5 inches.
    b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches.
    c. Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches.

3. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:

    a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 2-1/2 inches.
    b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches.
    c. Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches.

4. 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:

    a. Electrical Equipment Rating Less Than 2 kVA: No requirement.

b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches.
c. Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches.

5. Separation between Cables and Electrical Motors and Transformers, 5 kVA or HP and Larger: A minimum of 48 inches.
6. Separation between Cables and Fluorescent Fixtures: A minimum of 5 inches.

3.5 FIRE ALARM WIRING INSTALLATION

A. Comply with NECA 1 and NFPA 72.

B. Wiring Method: Install wiring in dedicated metal raceway according to Division 26 Section "Raceway and Boxes for Electrical Systems."

1. Utilize RED conduit in concealed spaces in walls and above non-accessible ceilings.
2. Fire alarm circuits and equipment control wiring associated with the fire alarm system shall be installed in a dedicated raceway system. This system shall not be used for any other wire or cable.
3. When exposed raceway is required, utilize IVORY surface mounted metallic wiremold raceway. Coordinate installation with Architect prior to rough-in. Utilize matching wiremold metallic back box for devices being installed.
4. Utilize plenum rated fire protection listed cabling for all exposed fire cable above accessible ceilings.

C. Wiring Method:

1. Signaling Line Circuits: Power-limited plenum rated fire alarm cables may be installed in the same cable or raceway as signaling line circuits.

D. Wiring within Enclosures: Separate power-limited and non-power-limited conductors as recommended by manufacturer. Install conductors parallel with or at right angles to sides and back of the enclosure. Bundle, lace, and train conductors to terminal points with no excess. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with the fire alarm system to terminal blocks. Mark each terminal according to the system's wiring diagrams. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors. Do NOT use wire nuts with multiple cables.

E. Cable Taps: Use numbered terminal strips in cabinets or equipment enclosures where circuit connections are made. **DO NOT MAKE SPLICES IN JUNCTION BOXES ABOVE CEILINGS. RUN ALL WIRING FROM DEVICE TO DEVICE.**

F. Color-Coding: Color-code fire alarm conductors differently from the normal building power wiring. Use one color-code for alarm circuit wiring and another for supervisory circuits. Color-code audible alarm-indicating circuits differently from alarm-initiating circuits. Use different colors for visible alarm-indicating devices. (Paint fire alarm system junction boxes and covers red.)

3.6 POWER AND CONTROL-CIRCUIT CONDUCTORS

A. 120-V Power Wiring: Install according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables" unless otherwise indicated.

B. Minimum Conductor Sizes:

1. Class 1 remote-control and signal circuits, No. 14 AWG.
2. Class 2 low-energy, remote-control and signal circuits, No. 16 AWG.
3. Class 3 low-energy, remote-control, alarm and signal circuits, No. 12 AWG.

3.7 CONNECTIONS

A. Comply with requirements in Division 28 Section "Digital Addressable Fire-Alarm System" for connecting, terminating, and identifying wires and cables.

3.8 FIRESTOPPING

A. Comply with requirements in Division 07 Section "Penetration Firestopping."

B. Comply with TIA-569-B, "Firestopping" Annex A.

C. Comply with BICSI TDMM, "Firestopping Systems" Article.

3.9 GROUNDING

A. For communications wiring, comply with ANSI-J-STD-607-A and with BICSI TDMM, "Grounding, Bonding, and Electrical Protection" Chapter.

B. For low-voltage wiring and cabling, comply with requirements in Division 26 Section "Grounding and Bonding for Electrical Systems."

3.10 IDENTIFICATION

A. Identify system components, wiring, and cabling complying with TIA/EIA-606-A. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

3.11 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Perform tests and inspections.

C. Tests and Inspections:

1. Visually inspect cable jacket materials U.L. certification markings. Inspect cabling terminations to confirm color-coding for pin assignments, and inspect cabling connections to confirm compliance with TIA/EIA-568-C.
2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
3. Test cabling for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination but not cross connection.

    a. Test instruments shall meet or exceed applicable requirements in TIA/EIA-568-C. Perform tests with a tester that complies with performance requirements in "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in "Measurement Accuracy (Informative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.

D. Document data for each measurement. Print data for submittals in a summary report that is formatted using Table 10.1 in BICSI TDMM as a guide, or transfer the data from the instrument to the computer, save as text files, print, and submit.

E. End-to-end cabling will be considered defective if it does not pass tests and inspections.

F. Prepare test and inspection reports.

END OF SECTION

SECTION 28 31 11
FIRE-ALARM AND VOICE-NOTIFICATION SYSTEM

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. Refer to drawings for manufacturer, model numbers and additional requirements.

1.2 SUMMARY

A. Section includes extension of an existing Notifier NFS2-3030 fire-alarm control unit, including voice evacuation system.

1. Manual fire-alarm boxes.
2. System smoke detectors.
3. Heat detectors.
4. Notification appliances, including audio speakers.
5. Addressable interface monitor and control devices.

1.3 DEFINITIONS

A. LED: Light-emitting diode.

B. NICET: National Institute for Certification in Engineering Technologies.

C. LCD: Liquid Crystal Display.

D. AHJ: Authorities Having Jurisdiction.

E. MNS: Mass Notification System.

1.4 BUILDING CODES AND STANDARDS

A. The publications listed below form a part of this publication to the extent referenced. The publications are referenced in the text by the basic designation only. The latest version of each listed publication shall be used as a guide unless the authority having jurisdiction has adopted an earlier version.

1. FM Global (Factory Mutual (FM)): FM Approval Guide
2. National Fire Protection Association (NFPA)

B. National Fire Protection Association (NFPA):

1. NFPA-70 - National Electrical Code (NEC) 2014
2. NFPA-72 - National Fire Alarm and Signaling Code - with Mass Notification
3. NFPA 720 - Standard for inspection of carbon monoxide detection and wiring.
4. NFPA 101 - Life Safety Code 2015
5. IBC - International Building Code 2015
6. IFC - International Fire Code 2015
7. IMC - International Mechanical Code 2015

C. National Electrical Manufacture's Association (NEMA)

D. Underwriters Laboratories, Inc. (UL)

1. UL-864 - Control Units for Fire Protective Signaling Systems (9th Edition)
2. UL-268 - Smoke Detector for Fire Protective Signaling Systems
3. UL-217 - Smoke Detectors for Single and Multiple Station
4. UL-521 - Heat Detectors for Fire Protective Signaling Systems
5. UL-464 - Audible Signaling Appliances
6. UL-1971 - Visual Signaling Appliances
7. UL-38 - Manually Actuated Signaling Boxes
8. UL-1480 Standard for Speakers for Fire Alarm, Emergency, and Commercial and Professional Use
9. UL-1481 - Power Supplies for Fire Protective Signaling Systems
10. UL 2017 - Mass Notification Systems
11. UL 2572 - Control and Communication Units for Mass Notification Systems
12. UL 228 - Door Holding Devices
13. UL 268A - Smoke Detectors for Duct Application
14. UL 1283 - Electromagnetic Interference Filters
15. UL 1449 - Transient Voltage Surge Suppressors

1.5 REGULATORY REQUIREMENTS

A. All equipment specified shall be UL/FM listed and cross listed for use with the main fire alarm control panel and shall bear the same manufacturer's name on the main control panel as well as all the remote devices. Systems having equipment with various manufacturers' names will not be acceptable. All control equipment shall be listed under UL category UOJZ as a single control unit and also UL/FM listed for power limited applications per NEC 760.

1.6 EXISTING SYSTEM DESCRIPTION

A. Non-coded, UL Listed intelligent analog addressable system, digital voice communications with multiplexed signal transmission and survivable network nodes. The entire system shall be UL2572 Listed Mass Notification System.

B. The System supplied under this specification shall utilize node-to-node, direct wired, multi priority peer-to-peer network operations where network control or remote voice command centers are located on the drawings. The system shall utilize independently addressed, input/output modules, audio amplifiers, and voice communications as described in this specification. The peer-to-peer network shall contain multiple nodes consisting of the command center, main controller, remote

control panels, and LCD panels. Each panel shall be an equal, active functional member of the network, which is capable of making all local decisions and generating network tasks to other panels in the event of panel failure or communications failure between panels. Master/slave system configurations shall not be considered as equals.

C. The fire alarm equipment and installation shall comply with the current provisions of the following latest edition UL and NFPA standards and shall be listed for its intended purpose and be compatibility listed to insure integrity of the complete system.

D. The entire system shall be a UL464 Listed Audio Evacuation System. This includes all Control Panels, Remote Command Centers, Remote Microphones, Data Gathering Panels, Network Nodes, all amplifiers and all high fidelity speakers. All of these components shall be UL cross-listed together.

E. The system performance specified herein is based upon a minimum design performance requirements utilizing high fidelity speakers with the following minimum selectable sound performance levels from 81.5; 84.1; 87.3; and 90.5 dBA (.25, .50, 1.0, 2.0 watts, respectively).

F. Each Command Center shall be fully redundant on the network with redundant audio network, audio messages (up to 100 minutes of message storage capacity), paging microphone and the following:

1. Command Center or Local Operator Console (LOC) with redundant audio messages, paging microphone and request for control switches & status indicators. Each Command Center shall have switches with LED annunciating control and requesting control as follows:

    a. Request Take Control
    b. Request Accepted
    c. Request Deny
    d. Restore command center to normal operation
    e. Priority request override Take Control

G. The Emergency Voice Paging System will provide multi-Channel audio paging and audio paging areas via a system microphone and telephone paging access. The paging system shall be used for routine and emergency paging.

1. Existing paging areas to remain as is.

H. Provide telephone access paging interface selectable with ten paging areas, plus all call.

I. All remote local operating console (remote annunciator/LOC) shall have LCD display, paging microphone, audio zone selection switches and by-pass switches. Provide visual indication which microphone is active during paging operations. During local microphone paging the speakers located near by the microphone shall be muted through software programmable audio control relays. The LOC shall not override the Command Center operations.

J. The fire alarm equipment and installation shall comply with the current provisions of the following latest edition standards (unless otherwise noted below) applicable to the jurisdictional authorities, including their local adoptions and amendments and it shall be listed for its intended purpose of a Mass Notification and Emergency Communication Signaling System and be compatibility listed to insure integrity of the complete system. It shall be listed to all of the UL Standards listed herein, without exception.

1.7 SUBMITTALS

A. The Contractor shall not purchase any equipment for the system specified herein until the Owner and/or designated representative has approved the project submittals in their entirety and has returned them to the contractor. It is the responsibility of the contractor to meet the entire intent and functional performance detailed in these specifications. Approved submittals shall only allow the contractor to proceed with the installation and shall not be construed to mean that the contractor has satisfied the requirements of these specifications. The Contractor shall submit six (6) complete sets of documentation.

1. Submittals shall be approved by authorities having jurisdiction prior to submitting them to the Architect.
2. Include all required fees for permit, drawing review and any inspection fees as required by City/Fire Department.
3. Technical Submittals including Engineered Fire Alarm Installation layout Shop Drawings shall be prepared by persons with the following qualifications:

    a. Registered Professional Fire Protection Engineer which is a Licensed Professional Engineer who has passed the NCEES Principles and Practices of Fire Protection Engineering Examination licensed in the state which has jurisdiction.
    b. NICET Level IV technician who has been certified at Level IV in the sub-field of Fire Alarm Systems Layout.
    c. Submittals shall also include the Quality Assurance certifications of the Fire Alarm Technician (see Paragraph Section 1.8).
    d. Distributor Qualifications: Provide documentation of the independently owned, Fire Alarm Distributor’s qualifications, including all licenses, certificates and proof of authorization as a Manufacturer’s Representative in Good Standing.

B. Product Data: Product Data sheets with the printed logo or trademark of the manufacturer of all equipment. Indicated in the documentation shall be the type, size, rating, style, and catalog number for all items proposed to meet the system performance detailed in this specification. The proposed equipment shall be subject to the approval of the Owner.

C. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Comply with all recommendations in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter in NFPA72.

2. Include voltage drop calculations for notification appliance circuits based on manufacturer-provided panel start voltage and point-to-point notification appliance circuit calculations. System Layout drawings prepared using the Lump Sum Method for visual strobe circuits are not acceptable.
3. Include battery-size calculations. Batteries shall be include a 30% safety factor above the minimum requirements derived from calculations, as required by NFPA 72.
4. Power supplies shall be sized to furnish the total connected load in a worse-case condition, plus 30 percent spare capacity for future growth.
5. Include fire alarm plans (AutoCAD drawings to scale), riser diagrams, point-to-points showing all devices and locations of all end of line resistors.
6. Include performance parameters and installation details for each detector, verifying that each detector is listed for complete range of air velocity, temperature, and humidity possible when air-handling system is operating.
7. Include plans, sections, and elevations of heating, ventilating, and air-conditioning ducts, drawn to scale and coordinating installation of duct smoke detectors and access to them. Show critical dimensions that relate to placement and support of sampling tubes, detector housing, and remote status and alarm indicators. Locate detectors in accordance with NFPA 72.
8. Include voice/alarm signaling-service equipment rack or console layout, grounding schematic, amplifier power calculation, and single-line connection diagram.
9. Indicate speaker wattage tap settings for all speakers on the floor plans, calculate and show dB Line Loss calculations for all speaker circuits using the Lump sum method. dB Losses shall be no greater than 3.0 dB from amplifier start terminals to last device.
10. Indicate all Acoustically Distinguishable Areas on the installation shop drawings.
11. Include floor plans to indicate final outlet locations showing address of each addressable device. Show size and route of cable and conduits from end-to-end. "Home Run" indicators or other non-end-to-end wire path designations are not acceptable.
12. Include programming matrix for all devices showing input and output functions.

D. Operation and Maintenance Data: For fire-alarm systems and components to be included in emergency, operation, and maintenance manuals. In addition to items specified in Division 1 Section "Operation and Maintenance Data, include the following:

1. Comply with the "Records" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA72.
2. Provide "Record of Completion Documents" according to NFPA72 article "Permanent Records" in the "Records" Section of the "Inspection, Testing and Maintenance" Chapter.
3. Record copy of site-specific software database file, hardcopy printout and CD, with password for delivery to the owner. Proprietary system/service companies will not be acceptable.
4. Provide "Maintenance, Inspection and Testing Records" according to NFPA72 article of the same name and include the following:

    a. Frequency of testing of installed components.

b. Frequency of inspection of installed components.
c. Requirements and recommendations related to results of maintenance.
d. Manufacturer's user training manuals (hardcopy) and electronic on CD.

5. Manufacturer's required maintenance related to system warranty requirements.
6. Abbreviated operating instructions for mounting at fire-alarm control unit.
7. Copy of NFPA 25 results.

E. Software and Firmware Operational Documentation:

1. CD of site-specific software database file with password and all product data sheets. Provide hard copy printout of the software program. Single Source Providers or Proprietary System/service companies will not be acceptable.
2. Provide a list of global system settings.
3. Provide a list of the contents of each system cabinet and their settings.
4. Provide a list of all addressable devices with their addresses and settings.
5. Software Modifications:

a. Provide the services of a factory trained and authorized Commercial Alarm Systems, LLC technician to perform all system software modifications, upgrades or changes.
b. Provide all hardware, software, programming tools and documentation necessary to modify the fire alarm system on the site. Modification includes addition and deletion of devices, circuits, zones and changes to system operation and custom label changes for devices or zones. The system structure and software shall place no limit on the type or extent of software modifications on-site. Modification of software shall not require power-down of the system or loss of system fire protection while modifications are being made.
c. Upon submittal of "as-built drawings", contractor shall have 60-days to complete the graphic screens. Graphic screens shall match the as-built drawings.

1.8 QUALITY ASSURANCE

A. All modifications to the existing Campus fire alarm network including connections to panels/nodes, revisions to programming, revisions to graphics, etc. shall be performed by the owner's preferred fire alarm service provider. **The Owner's preferred fire alarm service provider is Commercial Alarm Systems, LLC; contact James McCollam at 630-832-2844, JMcCollam@CASystemsLLC.com**

B. Installer Qualifications: Fire Alarm distributor's employed personnel shall be trained and certified by manufacturer (a Notifier Authorized NESCO Systems Dealer with direct ties to the manufacturer) on the make and model of the fire alarm control panel specified for this Project. Installation shall be by personnel certified by NICET as a technician who has been certified at Level II in the sub-field of Fire Alarm Systems Layout.

C. Project Manager Qualifications: Installation shall be supervised by personnel certified by NICET as Fire Alarm System Layout Level IV Technician (SET), an NFPA

Certified Fire Protection Specialist (CFPS) or an NCEES accredited Licensed Fire Protection Engineer (FPE).

D. Source Limitations for Fire-Alarm System and Components: Obtain fire-alarm system from single source from single distributor and manufacturer. Components shall be compatible with, and operate as a fully U.L. listed extension of a U.L. 864 listed fire alarm control system.

E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA70, by a qualified testing agency, and marked for intended location and application.

F. Fire Alarm Distributor Qualifications:

1. Contractor shall utilize an Illinois Licensed Private Alarm Contractor Agency that is an authorized, independently owned Manufacturers representative of the specified fire alarm equipment manufacturer.
2. Fire Alarm Distributor shall be a full service entity qualified to provide the engineering for the technical submittal, furnishing of the equipment, commissioning, testing and inspection services outlined herein including intelligibility testing and capable of providing full repair service to any fire alarm system and/or provide fire alarm system installation and design including, but not limited to, the following minimum requirements:

    a. Qualified Fire Alarm Service Company with employees who meet the criteria defined by NFPA 72 for the qualifications of both System Designers and System Installers to include the requirements of the Authorities Having Jurisdiction (AHJ).
    b. Certified Fire Alarm Service Inspectors with employees of the entity who are certified in Fire Protection Engineering Technology by the National Institute for Certification in Engineering Technologies (N.I.C.E.T.) in FIRE ALARM SYSTEMS – LEVEL II, minimum.
    c. Five (5) Years of experience with intelligibility measurement technology and testing (minimum) is required for this project and the Fire Alarm Distributor shall provide intelligibility measurement equipment capable of registering and recording Intelligibility readings in accordance with IEC 60268-16, Sound System Equipment - Part 16: Objective Rating of Speech Intelligibility by Speech Transmission Index. Equipment shall have been calibrated within one (1) year of the commencement of the intelligibility testing for this project.

3. Distributor shall be a registered Illinois legal entity (Corporation, Partnership, Professional Corporation or Limited Liability Company) in Good Standing with the Secretary of State of Illinois.
4. Distributor entity shall hold a valid Illinois Private Alarm Contractor Agency License. Sub-contractors or licensed individual Private Alarm Contractors DO NOT meet this requirement.
5. Distributor entity shall be qualified by the AHJ, including the Illinois Department of Professional Regulation to provide engineering design services for a fire alarm and mass notification system as evidenced by holding an Illinois Registered Professional Design Firm license. Sub-contractors or

individually licensed individual Registered Architects, Professional or Structural Engineers DO NOT meet this requirement.

6. All service employees of the entity shall have a valid Illinois Permanent Employee Registration Card (P.E.R.C.).

G. Contractor must inspect the buildings and become familiarized with building construction prior to submitting their bid.

1.9 PROJECT CONDITIONS

A. Interruption of Existing Fire-Alarm Service: Do not interrupt fire-alarm service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary guard service according to requirements indicated:

1. Notify Architect, Construction Manager and Owner no fewer than seven (7) days in advance of proposed interruption of fire-alarm service.
2. Do not proceed with interruption of fire-alarm service without Architect's, Construction Manager's and Owner's written permission.

1.10 SEQUENCING AND SCHEDULING

A. Existing Fire-Alarm Equipment: Maintain existing equipment fully operational until new equipment has been tested and accepted. As new equipment is installed, label it "NOT IN SERVICE" until it is accepted. Remove labels from new equipment when put into service and label existing fire-alarm equipment "NOT IN SERVICE" until removed from the building.

B. Equipment Removal: After acceptance of new fire-alarm system, remove existing disconnected fire-alarm equipment and wiring.

1.11 DELIVERY, STORAGE AND HANDLING

A. Store all devices in a clean, dry, heated space.

B. After installation, protect equipment from damage by work of other trades.

1.12 PROTECTION/CLEANING

A. Provide dumpster for all removed equipment at contractor’s expense.

B. Protect all areas working in. Provide tarps to cover all floors and equipment to avoid damage. Provide hard boards to cover specialized flooring areas to prevent damage/scratches to special surfaces. Thoroughly clean and vacuum all areas that work has been completed in.

1.13 ACCESSIBILITY

A. Provide appropriate lifts and ladders to reach specified work. Do not use the Owner's equipment and supply.

1.14 WARRANTY and SOFTWARE SERVICE AGREEMENT

A. The contractor shall warranty all materials, installation and workmanship for One (1) year from date of acceptance. A copy of any additional manufacturers' warranty shall be provided with closeout documentation and included with the operation and installation manuals.

B. The System Supplier shall maintain a service organization with adequate spare parts stocked within 75 miles of the installation. Any defects that render the system inoperative shall be repaired within 4 hours of the Owner notifying the contractor.

C. Technical Support: Beginning with Substantial Completion, provide software support for three (3) years, shall be included in this project.

D. Detector Sensitivity Testing: During the warranty period, each year the contractor is to perform detector sensitivity testing and provide report to the Owner. Unless, the system is UL Listed to perform automatic sensitivity testing without any manual intervention and should detector fall outside of sensitivity window, the system will automatically indicated a devices trouble. A copy of UL letter is to be provided as proof of system operation.

E. Upgrade Service: Update software as required to make fire alarm system modifications. Install and program software upgrades as needed. Upgrading software shall include operating system. Upgrade shall include new or revised licenses for use of software.

1. Provide 30 days' notice to Owner to allow scheduling and access to system and to allow Owner to upgrade computer equipment if necessary.

1.15 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. Provide quantity equal to 2% percent of amount of each type installed, but no less than one (1) unit of each type.

a. Smoke Detectors, heat detectors, carbon monoxide detectors, manual pull stations, duct smoke detector, monitor modules and control modules:
b. Notification appliances; speakers, speaker-strobes and strobes.

2. Keys: The installing contractor shall collect all equipment spare keys provided with each lockable or resettable device/cabinet and shall turn all of them over to the Owner at completion.

3. Owner's Stock shall not be used for warranty service.

PART 2 - PRODUCTS

2.1 MANUFACTURERS (*NOTIFIER ONLY*)

A. Manufacturers: The materials, appliances, equipment and devices shall be tested and listed by a nationally recognized approvals agency for use as part of a protected premises protective signaling fire alarm system. The authorized representative of the manufacturer of the major equipment, such as control panels, shall be responsible for the satisfactory installation of the complete system.

B. The Contractor shall provide, from the acceptable manufacturer's current product lines, equipment and components, which comply, with the requirements of these Specifications. Equipment or components, which do not provide the performance and features, required by these specifications are not acceptable, regardless of manufacturer.

C. Strict conformance to this specification is required to ensure that the installed and programmed system will function as designed, and will accommodate the future requirements and operations of the building Owner. All specified operational features must be met without exception.

D. All control panel assemblies and connected (new) field appliances shall be provided by the same System Supplier, and shall be designed and tested to ensure that the system operates as specified. All equipment and components shall be installed in strict compliance with the manufacturer's recommendations.

E. Approved Products: All panel devices and peripheral devices shall be of the standard product of single manufacturer and shall display the manufacturer's name of each component. The catalog numbers specified under this section are those of Notifier (a Honeywell Company) and shall constitute the type, product quality, material and desired operating features necessary for the completion of this projects intended design and function.

F. Acceptable Manufacturers:

1. Notifier

2.2 MANUFACTURER'S SERVICES

A. The following supervision of installation shall be provided by a trained service technician who is employed by the manufacturer of the fire alarm equipment. The technician shall be UL and NICET Level III certified and have had a minimum of two (2) years of service experience in the fire alarm industry. The technician's name shall appear on equipment submittals and a letter of certification from the fire alarm manufacturer shall be sent to the project engineer. The manufacturer's service technician shall be responsible for the following items:

1. Pre-installation visit to the job site to review equipment submittals and verify method by which the system should be wired.
2. During job progress, make periodic job site visits to verify installation and wiring of system.
3. Upon completion of wiring, final connections shall be made under the supervision of this technician and final checkout and certification of the system.
4. At the time of final checkout, technician shall give operational instructions to the Owner and/or his representative on the system.

B. All job site visits shall be dated and documented in writing and signed by the electrical contractor. Any discrepancies will be noted on this document and a copy kept in the system job folder which will be turned over to the project engineer any time during the project.

2.3 EXISTING SYSTEMS OPERATIONAL DESCRIPTION

A. Mass Notification initiated event shall override any event and take the highest system priority.

B. Fire-alarm signal initiation shall be by one or more of the following devices:

1. Manual stations.
2. Heat detectors.
3. Beam detectors.
4. Smoke detectors.
5. Carbon monoxide detectors.
6. Duct smoke detectors.
7. Verified automatic alarm operation of smoke detectors.
8. Automatic sprinkler system water flow.
9. Heat detectors in elevator shaft and pit.
10. Fire-extinguishing system operation.

C. Fire-alarm signal shall initiate the following actions where applicable to this facility and jurisdiction:

1. Activate multiple channel pre-recorded voice messages preceded and followed by temporal tone.
2. Continuously operate the visual notification appliances.
3. Identify alarm at fire-alarm control unit and remote annunciators.
4. Transmit an alarm signal to the remote alarm receiving station.
5. Unlock electric door locks in designated egress paths.
6. Release fire and smoke doors held open by magnetic door holders.
7. Switch heating, ventilating, and air-conditioning equipment controls to fire alarm mode.
8. Close smoke dampers in air ducts of designated air-conditioning duct systems.
9. Recall elevators to primary or alternate recall floors.
10. Activate emergency shutoffs for gas and fuel supplies.
11. Record events in the system memory.
12. Record events by the system printer.

D. Supervisory signal initiation shall be by one or more of the following devices and actions:

1. Valve supervisory switch.
2. Low-air-pressure switch of a dry-pipe sprinkler system.
3. Elevator shunt-trip supervision.
4. Duct smoke detector activation.

E. System trouble signal initiation shall be by one or more of the following devices and actions:

1. Open circuits, shorts, and grounds in designated circuits.
2. Opening, tampering with, or removing alarm-initiating and supervisory signal-initiating devices.
3. Loss of primary power at fire-alarm control unit.
4. Ground or a single break in fire-alarm control unit internal circuits.
5. Abnormal ac voltage at fire-alarm control unit.
6. Break in standby battery circuitry.
7. Failure of battery charging circuitry
8. High or low battery charge.
9. Abnormal position of any switch at fire-alarm control unit or annunciator.
10. Fire-pump power failure, including a dead-phase or phase-reversal condition.
11. Low-air-pressure switch operation on a dry-pipe or pre-action sprinkler system.

F. System Trouble and Supervisory Signal Actions: Initiate notification appliance and annunciate at fire-alarm control unit and remote annunciators. Record the event on system printer if specified.

2.4 EXISTING FIRE-ALARM CONTROL UNIT (*EXISTING SYSTEM DESCRIPTION*)

A. The main control panel is a multi-processor based networked system designed specifically for detection, and one-way emergency audio communications applications. The control panel(s) is listed and approved for the application under the standard(s) as listed. The control panel is a Notifier NFS2-3030.

B. The control panel(s) includes all required hardware, software and site-specific system programming to provide a complete and operational system. The control panel(s) is designed such that interactions between any applications can be configured, and modified using software provided by a single supplier. The control panel operational priority shall assure that life safety takes precedence among the activities coordinated by the control panel.

C. The network of control panels shall include the following features.

1. Ability to download all network applications and firmware from the configuration computer on the network or at any control panel (network node) location.
2. Each control panel (network node) shall have an LCD display with common controls. The display shall be configurable to display the status of any and all

combinations of alarm, supervisory, trouble, monitor, or group event messages.

3. From each LCD display on the system shall be capable of being programmed for control functions of any node or the entire network. The LCD display shall reside on the network as a node and continue to operate with fault on the network. An LCD can be programmed to be only operation when a node is operational in stand-alone mode, with a network fault.
4. The system program shall have a minimum of 100 system definable Service Groups to facilitate the testing of installed system based on the physical layout of the system. Service groups that disable entire circuits serving multiple floors or fire zones shall not be considered as equal.
5. Advanced Windows based programming with Program Version Reporting to document any and all changes made during system start-up or system commissioning. Time and date stamps of all modifications made to the program must be included to allow full retention of all previous program version data. The operator display shall clearly identify unacknowledged and acknowledged alarm, supervisory, trouble, and monitor status messages. The system shall provide the ability to download data from the analog/addressable detectors to a PC while the system is on-line and operational in the protected premises. The downloaded data may then be analyzed in a diagnostic program supplied by the system manufacturer.
6. Provide system reports that list a detailed description of the status of system parameters for corrective action or for preventive maintenance. Reports shall be displayed on the operator interface or be capable of being sent to a printer.
7. Provide an authorized operator with the ability to operate or modify system functions such as system time, date, passwords, holiday dates, restart the system and clear the control panel event history file.
8. Provide an authorized operator the ability to perform test functions within the installed system.
9. Supervision of system components, wiring, initiating devices and software shall be provided by the control panel. Failure or fault of system component or wiring shall be indicated by type and location on the LCD display. Software and processor operation shall be independently monitored for failure. The system shall provide fail-safe operation, with multiple-levels of system operation.

D. Each network control panel shall be capable of:

1. Supporting up to 3180 intelligent analog/addressable points.
2. Supporting up to ten (10) intelligent addressable loops, each loop supporting 159 detectors and 159 modules, total of 318 points.
3. Supporting network connections up to 54 other control panels and annunciators.
4. Support up ten network digital dialers with Contact ID or SIA format and TAP Pager protocol.
5. Supporting multiple RS-232 communication ports and protocol.
6. Supporting up to 4000 chronological history events.
7. Total network response shall not exceed 3 seconds.

E. Existing Alphanumeric Display and System Controls: Arranged for interface between human operator at fire-alarm control unit and addressable system

components including annunciation and supervision. Display alarm, supervisory, monitor, trouble and component status messages and control menu.

1. The common control switches and with corresponding LEDs provided as minimum will be; Reset Alarm Silence, Panel Silence, and Drill. It shall be able to add additional switches/LEDs as required.
2. The main control panel shall have display that is 16 lines by 40 character graphic LCD and backlit when active, 640 characters.
3. Provide 8 simultaneous events to be displayed. The first seven (7) highest priority events in addition to the most recent event. The events shall be automatically placed in event types (Alarm, Supervisory, Monitor & Trouble) for easy access and shall be possible to view the specific event type separately. Having to scroll through a mixed list of event types is not acceptable.
4. Provide an internal audible signal with different programmable patterns to distinguish between alarm, supervisory, trouble and monitor conditions.
5. This display shall be a Notifier CPU2-3030D (16 by 40 Characters).

F. Audio One-Way Voice Communication & Amplifier Performance Requirement

1. The voice communication system shall be multi-channel capable audio evacuation system, to allow the ability to have eights simultaneous announcements/paging. The audio channels shall be design as such (coordinate with Owner):

    a. Mass Notification Message (HIGHEST PRIORITY)
    b. Fire Message
    c. Alert Message
    d. Stand-by Message
    e. Elevator Message
    f. Stairwell Message
    g. Security/Weather Threat
    h. Manual Paging

2. The existing system custom digital voice message shall provide a minimum of 32 minutes and be created as a .wav file format. All messages shall be able to be created on-site without any special tools or burning of chips. Provide as minimum one twenty (20) watt supervised audio amplifier per paging zone. The system software shall be capable of selecting the required audio source signal for amplification. To enhance system survivability, each audio amplifier shall automatically provide an internally generated local 3-3-3, 1000 Hz temporal pattern output upon loss of the audio signal from the one-way emergency audio control unit, during an alarm condition.

    a. List of Potential Recorded Messages to Use **(Existing Messages to be Maintained)**:

        1) Fire Alarm (Automatic and Pre-Recorded)

            a) Tone Type: Three Pulse Temporal (NFPA 72, A.18.4.2.1)
            b) Tone Cycles: 2 times before and after message (NFPA 72, 24.4.2.17.1)

c) Tone Duration: Per NFPA 72, 18.4.2.1
d) Message Content: *"May I have your attention please. A fire emergency has been reported in the building. Please walk to the nearest exit and leave the building."*

2) Building Emergency (Evacuate)

a) Tone Type: Chime (NFPA 72, A.18.4.2.1(b))
b) Tone Cycles: 2 times before and after message (NFPA 72, 24.4.2.17.1)
c) Tone Duration: Per NFPA 72, A.18.4.2.1(b)
d) Message Content: *"May I have your attention please. An emergency has been reported in the building. Please walk to the nearest exit and leave the building."*

3) Area Emergency (Shelter-in-Place)

a) Tone Type: Chime or 1000 Hz tone
b) Tone Cycles: 2 times before the message only
c) Tone Duration: 3 seconds
d) Message Content: *"May I have your attention please. An emergency has been reported in the area. Please remain in the building and await further instructions."*

4) Severe Thunderstorm Warning

a) Tone Type: Chime or 1000 Hz tone
b) Tone Cycles: 2 times before the message only
c) Tone Duration: 3 seconds
d) Message Content: *"May I have your attention please. The National Weather Service has issued a SEVERE THUNDERSTORM WARNING for this area; please take immediate shelter indoors."*

5) Tornado Warning

a) Tone Type: Chime or 1000 Hz tone
b) Tone Cycles: 2 times before the message only
c) Tone Duration: 3 seconds
d) Message Content: *"May I have your attention please. The National Weather Service has issued a TORNADO WARNING for this area; please take immediate shelter in the tornado shelter, basement, or on the lowest level at the center of the building away from exterior windows and doors."*

6) Test

a) Tone Type: Chime or 1000 Hz tone
b) Tone Cycles: 2 times before and after the message
c) Tone Duration: 3 seconds

d) Message Content: *"May I have your attention please. This is a test of the building mass notification system. Please continue your normal duties. This is only a test."*

7) All Clear

a) Tone Type: Chime or 1000 Hz tone
b) Tone Cycles: 2 times before and after the message
c) Tone Duration: 3 seconds
d) Message Content: *"May I have your attention please. An all clear has been issued; resume normal activities."*

8) Microphone (LOC or ACU) Keying

a) Tone Type: Chime or 1000 Hz tone
b) Tone Cycles: Once

3. Audio amplifiers shall be power limited and protected from short circuits conditions on the audio circuit wiring. Each amplifier output shall be a supervised, dedicated, selectable 25/70 Vrms output. All circuit voltages to match existing system output.
4. Provide a standby audio amplifier per node that will automatically sense the failure of any primary amplifier installed in the same panel and replace the function of the failed amplifier.
5. Amplifier Minimum Sizing Specification shall be as follows:

a. 7.5 Watts per Trumpet Type Loudspeaker
b. 2 Watts per 8 inch cone type speaker
c. 1 Watts per 4 inch cone type speaker
d. 4 Watts per re-entrant horn-driver type speaker
e. Plus 30% spare capacity for each connected amplifier or speaker signal circuit switching module.

G. Existing Emergency Voice Communication System with the following features:

1. An audio control unit with Microphone for Paging.
2. Provide 3-position switch for each evacuation signaling zone and "All-Call", with "Page FIRE", "Auto" and "Page ALERT" positions identified and two LED status indicators for each audio visual evacuation signaling "zone", one red and one yellow.
3. These LED's shall illuminate to indicate respectively:

a. Evacuation signals activated (red).
b. Trouble in audio (speaker) or visual (strobe) circuit(s) (yellow).

H. Provide 2-position switch for manually activate pre-recorded voice messages, with "Message Name" positions identified and one LED status indicators, one red. Provide minimum of 12 selector switches.

1. These LED's shall illuminate to indicate respectively:

a. Message activated (red)

I. Instructions: Computer printout or typewritten instruction card mounted behind a plastic or glass cover in a stainless steel or aluminum frame. Include interpretation and describe appropriate response for displays and signals. Briefly describe the functional operation of the system under normal, alarm, and trouble conditions

J. Circuits Requirements:

1. Signaling Line Circuits for Intelligent Analog Addressable Loop:

   a. Style 4.

2. Notification Appliance Circuits:

   a. Style 4.
   b. Maximum circuit loading not to exceed 75% of the visual circuits terminal capacity or the power supplies total amperage rating (i.e., no more than 6.0 amps on an 8.0 amp power supply).

3. Activation of alarm notification appliances, smoke control, elevator recall and other functions shall occur within 3 seconds after the activation of an initiating device.

K. Smoke-Alarm Verification:

1. Initiate an audible and visible indication of an "alarm-verification" signal at fire-alarm control unit.
2. Activate U.L.-listed and -approved "alarm-verification" sequence at fire-alarm control unit and detector.
3. Record events by the system memory.
4. Sound general alarm if the alarm is verified.
5. Cancel fire-alarm control unit indication and system reset if the alarm is not verified.
6. Coordinate final decision and program feature requirements with Fire Departments and Owner.

L. Elevator Recall:

1. Smoke detectors at the following locations shall initiate automatic elevator recall. Alarm-initiating devices, except those listed, shall not start elevator recall.

   a. Elevator lobby detectors except the lobby detector on the designated floor.
   b. Smoke detector in elevator machine room.
   c. Smoke detectors in elevator hoistway.

2. Elevator lobby detectors located on the designated recall floors shall be programmed to move the cars to the alternate recall floor.
3. Heat detector and water-flow alarm connected to sprinkler in an elevator shaft and elevator machine room shall shut down elevators associated with the location without time delay.

a. Water-flow switch associated with the sprinkler in the elevator pit may have a delay to allow elevators to move to the designated floor.

M. Door Controls: Door hold-open devices that are controlled by smoke detectors at doors in smoke barrier walls shall be connected to fire-alarm system.

N. Remote Smoke-Detector Sensitivity Adjustment: Controls shall select specific addressable smoke detectors for adjustment, display their current status and sensitivity settings, and change to alternate settings. Allow controls to be used to program repetitive, time-scheduled, and automated changes in sensitivity of specific detector groups. Record sensitivity adjustments and sensitivity-adjustment schedule changes in system memory, and print out the final adjusted values.

O. Primary Power: 24-V dc obtained from 120-V ac service and a power-supply module. Initiating devices, notification appliances, signaling lines, trouble signals, shall be powered by nominal 24-V dc source. Obtain 120-V power from emergency power panels on generator.

P. Secondary Power: Shall provide 60 hours supervisory and 15 minutes of alarm thereafter with batteries, automatic battery charger, and automatic transfer switch.

2.5 EXISTING REMOTE ANNUNCIATOR WITH ONE-WAY VOICE COMMUNICATION (*COMMAND CENTER LLC*)

A. Annunciator shall match those of fire-alarm control unit display functions for alarm, supervisory, monitor and trouble indications and common system controls including; acknowledging, silencing, resetting, and testing. The fire alarm bypass function switches and LCD Keypad may be housed separately in a locked enclosure to prevent unauthorized use and control of fire alarm system program control and bypass, but the Paging Microphone, Audio Selector and Message Selector Switches shall be housed in a listed enclosure which is capable of being fitted with an unlocked latching knob for the enclosure, such that these emergency communication and signaling controls are readily accessible for emergency signaling. The Contractor shall verify this feature with Owner prior to ordering equipment.

1. This display is a Notifier LCD-160 Series unit and has the following minimum features:

a. LCD Display
b. Paging Microphone
c. Audio Selector Switches
d. Audio Message Selector Switches
e. System Bypass Switches

B. Existing Campus Fire Alarm Network Color Graphics Annunciation System:

1. Programming and graphics software shall be provided to display on single or multiple screens, the status of every device located on a floor plan of the building. Alarms shall be audible and visual and shall annunciate regardless of the screen that is currently visible. Text on screens shall be a minimum of

1/10" high. Coordinate with the Owner, the floor plan on each screen prior to programming. A backup of all system programming and graphics shall be provided to the Owner.

2. Graphic screens shall match in style and color to existing graphic screens. Provide screens dividing building so that all text within rooms is clearly legible. Provide full floor screens with navigation buttons linked to area screens. Provide key-maps to every screen. Link key-maps to appropriate screen for proper navigation. Screens shall not divide rooms unless deemed necessary due to size.
3. Modify software and provide new maps showing all new areas created by this remodeling project.

2.6 NAC POWER SUPPLY

A. The NAC power supply shall be independent unit that will provide power to visual strobe notification appliances. It shall be possible to configure the NAC's to follow the main panel's NAC or activate from intelligent synchronized modules. The booster NAC's must be configurable to operate independently at any one of the following rates: continuous synchronized, or 3-3-3 temporal. Fault conditions on the power supply shall not impede alarm activation of host NAC circuits or other power supplies. The NAC power supply must be able to provide concurrent power for notification devices, security devices, access control equipment and auxiliary devices such as door holders. . All the NAC Power Supplies shall be synchronized. The power supply shall support up to 24 amp hour batteries.

1. Power supply shall be minimum of 8 amps and UL 864 Listed. Include battery back-up for 60 hours stand-by and 15 minutes of alarm thereafter. Include 25 percent spare capacity.
2. Four independent 3.0 amp NAC circuits. Each being configurable as auxiliary power.
3. All circuits shall be synchronized.
4. Do not exceed 70 percent of each circuits rating so as to provide future capability.
5. Shall be Notifier, model HPFF8 or equivalent to match existing building system.
6. Obtain 120 V power from emergency power panels on generator. Install lock-out device on breaker.
7. Do not mount above ceilings. Locate in equipment closets.
8. Install smoke detector at this location for protecting unit or other detection device suitable for the application.

2.7 INTELLIGENT ANALOG SYSTEM SMOKE AND HEAT DETECTORS

A. General Requirements for Intelligent Analog Detectors

1. All devices shall match current type being used in the building. Automatically reports all alarm and trouble conditions.
2. Automatically updates historic information including hours of operation, last maintenance date, number of alarms and troubles, time of last alarm1 and analog signal patterns for each sensing element just before last alarm.

3. Field Replaceable Smoke Sensing Chamber: Analog detectors must have a modular, removable smoke sensing chamber which can be removed for easy cleaning and/or convenient, cost effective service replacement without removing the detector base or resetting the device address, without removal of detector electronics and without requiring any system or device programming adjustments which necessitate a system re-test.
4. Addressing: It shall be possible to address each intelligent module using DIP or rotary switches.
5. Automatic Device Mapping: Each detector transmits wiring information regarding its location with respect to other devices on the circuit, creating an As-Built wiring diagram. This will also provide enhanced supervision of the device physical location and the device message shall reside with the location and not the device address. Devices installed in the wrong location will always report the correct message of the physical location.
6. Sensitivity Range: Each analog addressable smoke detector's sensitivity shall be capable of being programmed individually as: most sensitive, more sensitive, normal, less sensitive or least sensitive. It shall be possible to automatically change the sensitivity of individual analog/addressable detectors for the day and night periods. It shall be possible to program control panel activity to each level.
7. Pre-Alarm: Detector stores 20 pre-alarm sensitivity values to alert local personnel prior to the sensor reaching a full evacuation sensitivity. Sensitivity values can be set in 5% increments.
8. Environmental Compensation: The detector's sensing element reference point shall automatically adjust, compensating for background environmental conditions such as dust, temperature, and pressure. Periodically, the sensing element real-time analog value shall be compared against its reference value. The detector shall provide a maintenance alert signal when the detector reaches 75% (Dirty) to 99% (More Dirty) compensation has been used. The detector shall provide a dirty fault signal when 100% or greater compensation has been used.
9. Twin Status LEDs: Flashing Green LED shows normal; flashing RED shows alarm state; steady RED and steady GREEN show alarm state in stand-alone mode, visible from any direction.
10. UL Sensitivity Testing: The detector shall utilize a supervised microprocessor that is capable of monitoring the sensitivity of the detector. If the detector sensitivity shifts outside of the UL limits, a trouble signal is sent to the panel.
11. Device Replacement: The system shall allow for changing of detector types for service replacement purposes without the need to reprogram the system. The replacement detector type shall automatically continue to operate with the same programmed sensitivity levels and functions as the detector it replaced. System shall display an off-normal condition until the proper detector type has been installed or change in the application program profile has been made.

B. Intelligent Photoelectric Detector

1. Provide intelligent analog addressable photoelectric smoke detectors at the locations shown on the drawings.
2. Provide Notifier FSP-851 Series.

C. Intelligent 135 Degree Fixed Temperature / Rate of Rise Heat Detector

1. Where called for on the contract drawings, provide intelligent combination fixed temperature/rate-of-rise heat detectors at the locations shown on the drawings. The heat detector shall have a low mass thermistor heat sensor and operate at a fixed temperature and at a temperature rate-of-rise. It shall continually monitor the temperature of the air in its surroundings to minimize thermal lag to the time required to process an alarm. The integral microprocessor shall determine if an alarm condition exists and initiate an alarm based on the analysis of the data. The intelligent heat detector shall have a nominal fixed temperature alarm point rating of 135 deg F and a rate-of-rise alarm point of 15 deg F per minute. The heat detector shall be rated for ceiling installation at a minimum of 70 ft centers and be suitable for wall mount applications.
2. Provide Notifier FST-851 Series.

D. Detector Base Types

1. Provide standard detector mounting bases suitable for mounting on 1-gang, or 4 inch octagon box and 4 inch square box. The base shall, contain no electronics and support all series detector types. Bases with electronics or dip-switches are not acceptable.

   a. Provide Notifier B210LP Series.

2.8 Intelligent Modules

A. Address each intelligent module using DIP or rotary switches. The personality of multifunction modules shall be programmable at site to suit conditions and may be changed at any time using a personality code downloaded from the Analog Loop Controller.

1. Reports all module conditions if the device is alarm or trouble condition.
2. Automatically updates historic information including hours of operation, number of alarms and troubles, time of last alarm.
3. Automatic Device Mapping: Each detector transmits wiring information regarding its location with respect to other devices on the circuit, creating an As-Built wiring diagram. This will also provide enhanced supervision of the device physical location.
4. Twin Status LEDs: The modules shall have a minimum of 2 diagnostic LEDs mounted behind a finished cover plate. A green LED shall flash to confirm communication with the loop controller. A red LED shall flash to display alarm status.
5. Input and output circuit wiring shall be supervised for open and ground faults.
6. Two styles of modules shall be available, those designed for gang box mounting, and where multiple modules are required in a single location, plug in modules shall be provided with a Universal Input/Output motherboard.

B. Intelligent Input Module. The Input Module shall provide one or two supervised Class B input circuit capable of a minimum of 4 personalities, each with a distinct operation. The module shall be suitable for mounting on North American 2-1/2 inches deep 1-gang boxes and 1-1/2 inches deep 4 inches square boxes with 1-gang covers. The single input module shall support the following circuit types:

1. Normally-Open Alarm Latching (Manual Stations, Heat Detectors, etc.)
2. Normally-Open Alarm Delayed Latching (Waterflow Switches)
3. Normally-Open Active Non-Latching (Monitor, Fans, Dampers, Doors, etc.)
4. Normally-Open Active Latching (Supervisory, Tamper Switches)
5. Provide Notifier FMM and FZM Series Devices.

C. Intelligent Relay Module. Provide addressable control relay circuit modules shall provide one (1) form C dry relay contacts rated at 24Vdc @ 2 amps (pilot duty) to control external appliances or equipment. The position of the relay contact shall be confirmed by the system firmware. The module shall be suitable for mounting on North American 2-1/2 inches deep 1-gang boxes and 1-1/2 inches deep 4 inches square boxes with 1-gang covers.

1. Provide FRM Series Devices.

D. NAC Control Module: Provide intelligent NAC control module shall provide one (1) supervised Class B output circuit capable of a minimum of 2 personalities, each with a distinct operation. The gang box -mounted version shall be suitable for mounting in North American 2-1/2 inches deep 2-gang boxes and 1-1/2 inches deep 4 inches square boxes with 2-gang covers. The plug-In version shall plug into a universal multi-module motherboard. The NAC control module shall support the following operations:

1. 24volt NAC circuit
2. Audio notification circuit 25v (match Owner’s existing system)
3. Telephone Power Selector with Ring Tone (Firefighter’s Telephone)
4. Visual Synchronized Output to Genesis appliances or to NAC Power Supply.
5. Provide Notifier FCM Series.

2.9 MANUAL FIRE-ALARM BOXES

A. General Requirements for Manual Fire-Alarm Boxes: Comply with UL38. Boxes shall be finished in red with molded, raised-letter operating instructions in contrasting color; shall show visible indication of operation; and shall be mounted on recessed outlet box. If indicated as surface mounted, provide manufacturer's surface back box.

1. Double-action mechanism requiring two actions to initiate an alarm, pull-lever type; with integral addressable module arranged to communicate manual-station status (normal, alarm, or trouble) to fire-alarm control unit.
2. The manual pull station will have an intelligent module integral of the unit.
3. Station Reset: key operated switch shall match the control panel key.
4. Manual pull stations that initiated an alarm condition by opening the unit are not acceptable.
5. Provide Notifier NBG-12LX.

2.10 NOTIFICATION APPLIANCES (*MATCH OWNER’S EXISTING DEVICES*)

A. All appliances shall be of the same manufacturer as the Fire Alarm Control Panel specified to insure absolute compatibility between the appliances and the control

panels, and to insure that the application of the appliances are done in accordance with the single manufacturers' instructions.

B. Any appliances, which do not meet the above requirements, and are submitted, for use must show written proof of their compatibility for the purpose intended. Such proof shall be in the form of documentation from all manufacturers which clearly states that their equipment (as submitted) are 100% compatible with each other for the purposes intended. All appliances shall be UL 1971, UL 1638 and UL 464 listed for Fire Protective Service. Speakers shall also be UL 1480F listed. Combination Speaker-Visual appliances may be used where shown on the contract drawings and standalone Visual Strobes and Speaker-Only devices may be used where shown on the contract drawings provided they meet the performance requirements specified herein for both audible and visual notification.

C. Notification Appliances – Visual (Fire – Evacuation)

1. Provide wall or ceiling mounted clear lens strobes with white body and "FIRE" markings. Strobes shall provide a smooth light distribution pattern field selectable candela 15 cd, 30 cd, 75 cd, and 110 cd flash output rating, UL1971 listed with in-out screw terminals shall be provided for wiring. The strobe (15, 30, 75, 110) candela rating shall be view from the side window to verify the setting. All strobes shall be synchronization to within 10 milliseconds for an indefinite period shall not require the use of separately installed remote synch modules. The strobes shall mount to one-gang electrical box.
2. The device shall have plastic protective cover for during installation. All ceiling mounted devices shall be provided with junction box and T-grid support bar or other means of adequate support that is U.L. listed.
3. The actual candela setting on the visual shall be marked on the appliance.

D. Notification Appliance – High Fidelity Speaker

1. High Fidelity White Speakers shall have a 4 inch Mylar/paper cone. The rear of the speakers shall be completely sealed protecting the cone during and after installation. In and out screw terminals shall be provided for wiring. Speakers shall provide 1/4w, 1/2w, 1w, and 2w power taps for use with 25V systems. The actual speaker wattage & strobe candela setting shall be view from the device window to verify the wattage setting, without removing the device. To make any changes to the speaker wattage will only require the removal of the cover plate.
2. High Fidelity Speaker listed frequency response of 400 to 4,000 Hz and listed sound output of 90.5 dBA at 10 feet, as measured in reverberation room per UL-1480.
3. Furnish devices with the following selectable minimum sound level output:

    a. 1/4 watt – 81.5 dBA
    b. 1/2 watt – 84.1 dBA
    c. 1 watt – 87.3 dBA
    d. 2 watt – 90.5 dBA
    e. All ceiling mounted devices shall be provided with speaker back box and speaker truss support for T-grid ceilings or utilize other U.L. listed support means for other types of ceiling materials.

4. Provide Notifier SP/SPC Series.

E. Notification Appliance - Re-entrant Speakers (Mechanical, Storage, Unfinished Ceiling Locations and Exterior Use; Color Selected by Owner)

1. Provide 4 inch diameter red re-entrant speakers at loud ambient locations or for outdoor weatherproof installation. Weatherproof boxes shall be provided for outdoor mounting. Speakers shall provide 2w, 4w, 8w, and 15w power taps. The re-entrant speakers shall utilize a high-efficiency compression driver. Cone type drivers are not acceptable. At the 15 watt setting, the speaker shall provide a 102 dBA sound output over a frequency range of 400-4000 Hz. when measured in reverberation room per UL-1480.
2. Combination speaker strobes shall meet both sections of above.
3. Provide Notifier SPRK/SPSRK Series or SPSCRK Series.

2.11 SURGE PROTECTION

A. Install surge protection on normal ac power for the FACP and its accessories.

B. Install surge protectors recommended by FACP manufacturer. Install on all system wiring external to the building housing the FACP.

C. Install surge protection on all lines entering the building and other out-buildings (i.e., mobile classrooms).

D. Ground to building ground/water piping system as required.

2.12 SPRINKLER SYSTEM (*EXISTING*)

A. Sprinkler Waterflow Switch: Switch shall have two (2) sets of N.O. contacts and adjustable retard chamber to compensate for water surge. Verify quantity in field.

B. Sprinkler System Gate Valve Supervisory Switch: Verify quantity in field.

C. Sprinkler System Dry System Pressure Switch and Alarm Switch: Existing.

D. Provide addressable monitor module for each device listed above.

2.13 GUARDS FOR PHYSICAL PROTECTION

A. Provide welded mesh of size and shape for the manual pull stations, smoke detectors, notification appliances at location noted on the drawings.

2.14 MAGNETIC DOOR HOLDERS

A. Description: Units are equipped for wall or floor mounting as indicated and are complete with matching doorplate.

1. Electromagnet: Requires no more than 3 W to develop 25-lbf holding force.
2. Wall-Mounted Units: Flush mounted unless otherwise indicated.
3. Rating: 24-V dc.
4. Provide Notifier FM-Series.
5. Coordinate Magnetic Hold opens with the General Trades and Door Hardware Contractors.
6. Contractor will field verify exact type to be used prior to bidding. Installation of devices must allow for at least 90 degree door swing if adjacent to wall. Utilize Sentronic type combination door holder/closer if not possible.

2.15 INSPECTION BAR CODES (*MATCH EXISTING SYSTEM*)

A. Company shall provide a system for creating, updating and maintaining all service work, inspections, and maintenance performed as part of this specification to Inspection bar codes shall be installed on all initiating devices, annunciators, control panels and power supplies.

B. Inspection bar codes used by the system must utilize Code 3 of 9 or other approved format, and contain a minimum of eight (8) digits that comprise a unique serial identifier within the Web-based Reporting System. There shall be no duplication of serial numbers. Serial number shall be printed below the bar code for identification purposes.

C. Inspection bar codes shall be limited in size to no more than 2 inches in width, and 3/8 inches in height and shall include a Mylar or other protective coating to protect the bar code from fading due to sunlight or exposure.

D. Inspection bar codes shall be installed on each device in such a manner as to require that scanning of the bar code take place no further than 12 inches from the device during inspection.

E. Modify System for devices removed and new devices added. Include all location changes, device type, and new/existing serial numbers.

2.16 WIRE AND CABLE

A. Signaling Line Circuits – Network Data: Plenum rated cable (FPLP) fire protection listed, twisted pair, not less than No. 16 AWG or as recommended by the manufacturer. Systems which use Shielded Wire requiring continuous foil shields and continuous drain wires are not acceptable, as they may lead to multiple ground faults and communication integrity faults.

B. Signaling Line Circuits – Intelligent Loop: Plenum rated cable (FPLP) fire protection listed, non-Twisted pair, not less than No. 16 AWG or as recommended by the manufacturer. Systems which use Shielded Wire requiring continuous foil shields and continuous drain wires are not acceptable, as they may lead to multiple ground faults and communication integrity faults.

C. Notification Appliance Circuits

1. Audio: Plenum rated (FPLP) fire protection listed, shielded, twisted pair, not less than No. 16 AWG or as recommended by the manufacturer. Include shield when required by manufacturer
2. Visual. Plenum rated (FPLP) fire protection listed, non-Twisted pair, not less than No. 14 AWG or as recommended by the manufacturer and required by the voltage drop calculations (it may be No. 12 AWG in some cases).

D. Manufacturers:

1. General Cable
2. Radix
3. Comtran Corp.
4. Helix
5. Belden
6. West Penn.

PART 3 - EXECUTION

3.1 EQUIPMENT INSTALLATION

A. Comply with NFPA 72 and Article 760 for installation of fire-alarm equipment.

B. All system devices (initiating and notification) shall be inspected and tested for operation including the operation of air handlers and roof top units under global shut down. All NAC panels shall be checked for supervision. See drawings for sequence of operation matrix to understand current operation of system. All devices not labeled shall be labeled per the specifications.

C. The contractor shall download the current system software with all associated programmed devices onto an electronic disk for the Owner’s safekeeping. Include a printout of all system devices, locations, nomenclature and their address. Have the Owner sign for the disk and print out prior to performing any work on the system.

D. Coordinate the pretest date and time with the Owner a minimum of one week in advance. The Owner will be required to be present with the technician during the pretest. All tests done without the Owner’s presence will be redone at the contractor’s expense.

E. Equipment Mounting: Install fire-alarm NAC panels on wall with tops of cabinets not more than 72 inches above the finished floor.

F. Smoke- or Heat-Detector Spacing:

1. Comply with NFPA 72, "Smoke-Sensing Fire Detectors" Section in the "Initiating Devices" Chapter, for smoke-detector spacing.
2. Comply with NFPA 72, "Heat-Sensing Fire Detectors" Section in the "Initiating Devices" Chapter, for heat-detector spacing.
3. Smooth ceiling spacing shall not exceed 30 feet.
4. Spacing of detectors for irregular areas, for irregular ceiling construction, and for high ceiling areas shall be determined according to Appendix in NFPA 72.

5. HVAC: Locate detectors not closer than 5 feet from air-supply diffuser or return-air opening.
6. Lighting Fixtures: Locate detectors not closer than 12 inches from any part of a lighting fixture.
7. DO NOT INSTALL HEAT DETECTORS ABOVE MECHANICAL HEATING PIPES, ADJUST LOCATION ACCORDINGLY TO PREVENT FALSE ALARMS.

G. Remote Status and Alarm Indicators: Install near each smoke detector and each sprinkler water-flow switch and valve-tamper switch that is not readily visible from normal viewing position.

H. Audible Alarm-Indicating Devices (when wall mounted): Install at 80 inches above finished floor to bottom or 6 inches below the ceiling, whichever is less. Install devices on flush-mounted back boxes with the device-operating mechanism concealed behind a grille. Install ceiling mounted devices when shown.

I. Visible Alarm-Indicating Devices (when wall mounted): Install at least 80 inches above finished floor to bottom or 6 inches below the ceiling, whichever is less. Install ceiling mounted devices when shown.

J. Device Location-Indicating Lights: Locate in public space near the device they monitor.

K. Pull Stations: Mount top of unit at 48 inches above finished floor.

L. Furnish and install additional power sub-panels as required to obtain power to new "NAC" panels. Two breakers from one existing 120/208 volt emergency power panel shall be removed to accommodate the installation of a two pole, 50 amp breaker. The sub-panel and feeder shall be rated for 50 amp single phase, three wire with ground. Conduit shall be type EMT. Install two breakers sized to match existing removed and reconnect to existing branch circuit. Extend wiring as required. Install additional single pole 15 amp breakers to power new "NAC" panels. Install lock-out device on breakers serving "NAC" panels. Install card directory. Panel shall be U.L. listed, equivalent to Square-D NQOD System. All bussing shall be copper. All breakers shall be "QOB" style.

M. All "NAC" panels being remotely located shall be protected with a smoke detector. Mount detector above all panel locations and connect to system.

N. If the contractor is unable to maintain an active fire alarm system during times of construction, a certified Fire Watchman (approved by the Fire Department) shall be hired to guard the building. All costs shall be part of this contract. No additional costs will be incurred by the Owner. At no time shall the building be left unprotected/unsupervised. String up temporary detectors throughout the building for protection as required. Remove once new system is operational.

3.2 WIRING INSTALLATION

A. All wiring to be PLENUM RATED, FIRE PROTECTION LISTED.

B. Install wiring according to the following:

1. NECA 1.
2. TIA/EIA 568-C.

C. All junction boxes and conduit above ceilings to be painted red and labeled "FIRE ALARM" in black lettering. Identify circuiting information for both initiating and notification circuits. All conduit concealed in walls or above ceilings to be red in color.

D. Wiring Method: Install wiring in metal raceway according to Division 26 Section "Raceways and Boxes for Electrical Systems."

1. Fire alarm circuits and equipment control wiring associated with the fire alarm system shall be installed in a dedicated raceway system. This system shall not be used for any other wire or cable.
2. Fire alarm wiring may be installed exposed above accessible ceilings. All exposed wiring in unfinished areas to be installed in raceway up to ceiling structure for protection. All wiring installed exposed in finished areas will be installed in ivory metallic wiremold raceway. All raceways shall be stubbed out to above accessible ceilings. All exposed wiring above accessible ceilings shall be supported with J-hooks. All raceways stubs shall be provided with end bushing/fittings. All wiring installed above non-accessible ceilings shall be installed in conduit. All cabling subject to damage (i.e., receiving rooms, mechanical rooms, boiler rooms, etc.) shall be installed in raceway. Type to be selected by Owner/Engineer.
3. No cabling shall be fastened to bar joists, electrical conduits, other system piping or raceway, ceiling system supports, etc. Utilize independent J-hooks and hangers.
4. **Do not install conduit or cabling above top chord of bar joists or within 6 inches of roof deck so as to prevent damage from roofing nails.**

E. Wiring within Enclosures: Separate power-limited and non-power-limited conductors as recommended by manufacturer. Install conductors parallel with or at right angles to sides and back of the enclosure. Bundle, lace, and train conductors to terminal points with no excess. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with the fire alarm system to terminal blocks. Mark each terminal according to the system's wiring diagrams. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.

F. Cable Taps: Use numbered terminal strips in cabinets or equipment enclosures where circuit connections are made. No cable taps will be allowed in junction boxes above ceiling.

G. Color-Coding: Use one color-code for alarm circuit wiring and a different color-code for supervisory circuits. Color-code audible alarm-indicating circuits differently from alarm-initiating circuits. Use different colors for visible alarm-indicating devices. Match Owner's existing color scheme.

H. All fire alarm terminal and junction locations shall be identified in accordance with NFPA 70, Section 760-3 and the latest edition of the National Electrical Code. All junction and terminal boxes shall be painted red and stenciled "Fire Alarm." This

requirement is to prevent unintentional interference with the signaling circuits during testing, servicing and additional modifications to the system.

I. Install new fire alarm zone maps (in plexi-glass frame with metallic frame boarder) showing new devices and "NAC" panels at both control and annunciator panel locations. Refer to drawings for additional information. Provide copy, including electronic copy, to Fire Department.

J. Remove and replace ceiling systems as required for installation of work. Replace all damaged ceiling materials with type to match existing ceiling without any additional cost to the Owner.

K. Where ceiling devices are removed and openings are abandoned, install blank coverplate and replace ceiling tile to match surrounding area.

L. Where wall devices are removed and openings are abandoned, install blank finished coverplate. Furnish and install oversized coverplates as required to obtain a finished look. Paint out to match surrounding area.

M. When raceway and devices are removed and leave existing walls and ceilings marked by absence of materials, existing walls and ceilings shall be patched and painted to match surrounding areas.

3.3 CONNECTIONS

A. For fire-protection systems related to doors in fire-rated walls and partitions and to doors in smoke partitions, comply with requirements. Connect hardware and devices to fire-alarm system.

1. Verify that hardware and devices are UL/FM listed for use with fire-alarm system in this Section before making connections.

B. Make addressable connections with a supervised interface device to the following devices and systems. Install the interface device less than 3 feet from the device controlled. Make an addressable confirmation connection when such feedback is available at the device or system being controlled.

1. Smoke dampers in air ducts of designated air-conditioning duct systems.
2. Supervisory connections at valve supervisory switches.
3. Supervisory connections at low-air-pressure switch of each dry-pipe sprinkler system.

3.4 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems." Provide identification labels on all cabling entering all panels and junction boxes.

B. Install framed instructions in a location visible from fire-alarm control unit.

C. Paint power-supply disconnect switch red and label "FIRE ALARM."

D. Program all addressable initiating devices with their true building location. Utilize Owner's final building room name and number plan. Do not use electrical drawing room labeling unless authorized by the Owner and verified by the Architect. Contractor shall bear all costs associated with walking each room/area for verification of actual room numbers prior to programming, no exceptions. Label all devices with their addressable identification and circuit numbering scheme. Use P-Touch label maker. Do not use markers.

E. Inspection Bar Codes (match existing system):

1. Inspection bar codes shall be installed on all initiating devices, annunciators, control panels and power supplies. These bar codes shall support future testing and archiving of the test via Owner's existing reporting system.
2. Inspection bar codes used by the system must utilize Code 3 of 9 or other approved format, and contain a minimum of eight (8) digits that comprise a unique serial identifier within the Web-based Reporting System. There shall be no duplication of serial numbers. Serial number shall be printed below the bar code for identification purposes.
3. Inspection bar codes shall be limited in size to no more than 2 inches in width, and 3/8 inch, in height and shall include a Mylar® or other protective coating to protect the bar code from fading due to sunlight or exposure.
4. Inspection bar codes shall be installed on each device in such a manner as to require that scanning of the bar code take place no further than 12 inches from the device during inspection.

3.5 GROUNDING

A. Ground fire-alarm control unit and associated circuits; comply with IEEE 1100.

3.6 FIELD QUALITY CONTROL (*GENERAL*)

A. Field tests shall be conducted by manufacturer's service representative and witnessed by the Owner, Engineer and authorities having jurisdiction (Fire Department). Notify local authorities having jurisdiction (AHJ), Owner and Engineer one (1) week in advance of inspection and testing, in writing with copies to Architect's/Engineer's office. Coordinate with owner in advance of scheduling with AHJ.

B. Two (2) tests shall be required to be performed by the fire alarm manufacturer's representative/technician:

1. First Test to be performed by contractor to ensure system is operating correctly.
2. Second test to be performed with Owner, Engineer and Fire Department/County Inspector.

C. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

D. Tests and Inspections:

1. Intelligibility testing (refer to Paragraph 3.8 for scope of this work).
2. Certify compliance with test parameters. All tests shall be conducted under the direct supervision of a NICET technician certified under the Fire Alarm Systems program at Level III.

    a. Devices that are outside their marked sensitivity range shall be replaced.

3. Visual Inspection: Conduct visual inspection prior to testing.

    a. Use as-built drawings and system documentation for the inspection. Identify improperly located, damaged, or nonfunctional equipment, and correct before beginning tests.
    b. Inspection shall be based on completed Record Drawings and system documentation that is required by NFPA 72 in its "Completion Documents, Preparation" Table in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter.
    c. Comply with "Visual Inspection Frequencies" Table in the "Inspection" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72; retain the "Initial/Reacceptance" column and list only the installed components.

4. System Testing: Comply with "Test Methods" Table in the "Testing" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.
5. Test audible appliances for the public operating mode according to manufacturer's written instructions. Perform the test using a portable sound-level meter complying with Type 2 requirements in ANSI S1.4. Modify and adjust audible taps to meet room needs.
6. Test audible appliances for the private operating mode according to manufacturer's written instructions. Modify and adjust audible taps to meet room needs.
7. Test visible appliances for the public operating mode according to manufacturer's written instructions.
8. Factory-authorized service representative shall prepare the "Fire Alarm System Record of Completion" in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter in NFPA 72 and the "Inspection and Testing Form" in the "Records" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.

E. Testing General:

1. All Alarm Initiating Devices shall be observed and logged for correct zone and sensitivity. These devices and their bases shall be tagged with adhesive tags located in an area not visible when installed, showing the initials of the installing technician and date.

2. 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.
3. The acceptance inspector shall be notified before the start of the required tests. All items found at variance with the drawings or this specification during testing or inspection by the acceptance inspector shall be corrected.
4. Test reports shall be delivered to the acceptance inspector as completed.
5. All test equipment, instruments, tools and labor required to conduct the system tests shall be made available by the installing contractor. The following equipment shall be a minimum for conducting the tests:

    a. Ladders and scaffolds as required to access all installed equipment.
    b. Multi-meter for reading voltage, current and resistance.
    c. Two-way radios and flashlights.
    d. A manufacturer recommended device for measuring air flow through air duct smoke detector sampling assemblies.
    e. Decibel meter, complying with Type 2 Requirements in ANSI S1.4.
    f. In addition to the testing specified to be performed by the installing contractor, the installation shall be subject to test by the acceptance inspector.

F. After tests have been completed, obtain written certification from Fire Department and include in As-Built/O&M Documentation.

G. Reacceptance Testing: Perform reacceptance testing to verify the proper operation of added or replaced devices and appliances.

H. Fire-alarm system will be considered defective if it does not pass tests and inspections.

I. Prepare test and inspection reports.

1. Upon completion of installation of fire alarm equipment, electrical contractor and fire alarm contractor shall provide to the engineer a signed, written statement substantially in the form as follows:
"The undersigned having been engaged as the electrical contractor and fire alarm contractor on the College of DuPage building confirms that the fire alarm equipment was installed in accordance with wiring diagrams, instruction and directions provided to us by the manufacturer and authorities having jurisdiction, and system as installed complies with local codes and NFPA codes."

J. Maintenance Test and Inspection: Perform tests and inspections listed for weekly, monthly, quarterly, and semiannual periods. Use forms developed for initial tests and inspections.

3.7 ACCEPTANCE TESTING (*ADDITIONAL INFORMATION/PROCEDURES*)

A. A written acceptance test procedure (ATP) for testing the fire alarm system components and installation will be prepared 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.

B. 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.

C. The installing contractor prior to the ATP shall prepare a complete listing of all device labels for alphanumeric annunciator displays.

D. Loop Resistance Tests: Measure and record the resistance of each circuit with each pair of conductors in the circuit short-circuited at the farthest point from the circuit origin. The tests shall be witnessed by the owner and test results recorded for use at the final acceptance test.

E. Preliminary Testing: Conduct preliminary tests and intelligibility tests to ensure that all devices and circuits are functioning properly. After preliminary testing is complete, provide a letter certifying that the installation is complete and fully operable. The letter shall state that each initiating and indicating device was tested in place and functioned properly. The letter shall also state that all panel functions were tested and operated properly. The Contractor and an authorized representative from each supplier of equipment shall be in attendance at the preliminary testing to make necessary adjustments.

F. Final Acceptance Test: Notify the owner in writing when the system is ready for final acceptance testing. Submit request for test at least 14 calendar days prior to the test date. A final acceptance test will not be scheduled until meggar test results, the loop resistance test results, and the submittals required in Part 1 are provided to the owner. Test the system in accordance with the procedures outlined in NFPA 72.

1. Verify that the control unit is in the normal condition as detailed in the manufacturer's operating and maintenance manual.
2. Test each initiating and indicating device (public operating mode) and circuit for proper operation and response. Disconnect the confirmation feature for smoke detectors during tests to minimize the amount of smoke or test gas needed to activate the detector.
3. Test the system for all specified functions in accordance with the contract drawings and specifications and the manufacturer's operating and maintenance manual.
4. Visually inspect all wiring.
5. Verify that all software control and data files have been entered or programmed into the FACP.
6. Verify that Shop Drawings reflecting as-built conditions are accurate.
7. Measure the current in circuits to assure that there is the calculated spare capacity for the circuits.
8. Measure voltage readings for circuits to assure that voltage drop is not excessive.
9. Measure the voltage drop at the most remote appliance on each notification appliance circuit.

G. 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 ATP, 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:

1. 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, releasing circuits.
   c. Primary power or battery disconnected.

2. System notification appliances shall be demonstrated as follows:

   a. All alarm notification appliances actuate as programmed.
   b. Audibility and visibility at required levels.

3. System indications shall be demonstrated as follows:

   a. Correct message display for each alarm input at the control display.
   b. Correct annunciator light for each alarm input at each annunciator and graphic display as shown on the drawings.
   c. Correct history logging for all system activity.

4. System off-site reporting functions shall be demonstrated as follows:

   a. Correct zone transmitted for each alarm input
   b. Trouble signals received for disconnect

5. Secondary power capabilities shall be demonstrated as follows:

   a. System primary power shall be disconnected for a period of time as specified herein. At the end of that period, an alarm condition shall be created and the system shall perform as specified for a period as specified.
   b. System primary power shall be restored for forty-eight hours and system-charging current shall be normal trickle charge for a fully charged battery bank.
   c. System battery voltages and charging currents shall be checked at the fire alarm control panel.

3.8 INTELLIGIBILITY TESTING AND ACOUSTUIC ADJUSTMENT

A. Installing Contractor and Fire Alarm Distributor Shall include in their bid all costs to provide two (2) full Intelligibility Tests of all Acoustically Distinguishable Spaces (ADS). Such tests shall be made and witnessed in the presence of the Owner and/or their designated representative.

B. Intelligibility testing of the System shall be accomplished in accordance with NFPA 72 for Voice Evacuation Systems, IEC 60268-16, and ASA S3.2.

1. Following are the specific requirements for intelligibility tests:

    a. Intelligibility Requirements: Verify intelligibility by measurement after installation.
    b. Ensure that a CIS value greater than the required minimum value is provided in each area where building occupants typically could be found. The minimum required value for CIS is 0.65.
    c. Areas of the building provided with hard wall and ceiling surfaces (such as metal or concrete) that are found to cause excessive sound reflections may be permitted to have a CIS score less than the minimum required value if approved by the AHJ installation, and if building occupants in these areas can determine that a voice signal is being broadcast and they must walk no more than 33 feet to find a location with at least the minimum required CIS value within the same area.
    d. Areas of the building where occupants are not expected to be normally present are permitted to have a CIS score less than the minimum required value if personnel can determine that a voice signal is being broadcast and they must walk no more than 50 feet to a location with at least the minimum required CIS value within the same area.
    e. Take measurements near the head level applicable for most personnel in the space under normal conditions (e.g., standing, sitting, sleeping, as appropriate).
    f. The distance the occupant must walk to the location meeting the minimum required CIS value shall be measured on the floor or other walking surface as follows:

        1) Along the centerline of the natural path of travel, starting from any point subject to occupancy with less than the minimum required CIS value.
        2) Curving around any corners or obstructions, with a 12 inches clearance there from.
        3) Terminating directly below the location where the minimum required CIS value has been obtained.

2. Use commercially available test instrumentation to measure intelligibility as specified by ISO 7240-19 and ISO 7240-16 as applicable. Use the mean value of at least three readings to compute the intelligibility score at each test location.
3. Record all intelligibility readings for the ADS in the web-based bar code inspection and testing software and affix barcode to the nearest audible notification appliance closes to the entrance or exit from the ADS.

C. Upon completion of fire alarm system installation, the contractor shall perform an audibility level check in all occupied spaces. Adjust all speakers to assure sound levels meet code:

1. 15 dB above average ambient sound levels or 5 dB above maximum ambient sound level (whichever is greater).

D. Provide a preliminary report to the Owner and Owner's Representative for review. Include time for a review meeting to discuss the results and any areas for adjustments.

E. Provide one (1) full speaker tap setting adjustment to each notification appliance within the entire audible notification appliance network. Adjust speaker wattage tap settings up or down based upon the direction provided by the Owner's Representative. Do not adjust speaker tap settings for speakers or areas which are not determined to need adjustment.

F. Provide a second full Intelligibility Test and Final Intelligibility Report to the Owner and Owner's Representative for approval.

3.9 DOCUMENTATION (*6 SETS REQUIRED*)

A. System documentation shall be furnished to the owner and shall include but not be limited to the following:

1. System record drawings and wiring details including SIX (6) sets of drawings, and a DVD or Memory Stick with copies of the record drawings in DXF format for use in a CAD drafting program, and in "PDF" format.
2. System operation, installation and maintenance manuals.
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, testing and ATP phases of the system installation.
5. System program showing system functions, controls and labeling of equipment and devices.

3.10 ADJUSTING (*FOR DEVICES INSTALLED*)

A. Occupancy Adjustments: When requested within 11 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project outside normal occupancy hours for this purpose.

B. Annual Test and Inspection: Eleven months after date of Substantial Completion, test the fire alarm system complying with the testing and visual inspection requirements in NFPA 72. Perform tests and inspections listed for monthly, quarterly, semiannual, and annual periods. Use forms developed for initial tests and inspections. Repair/replace all defective parts at no additional cost to the Owner. Contractor shall schedule this with Owner at the ten month point after substantial completion. If this procedure is not done and the warranty has expired, the contractor/manufacturer will be liable for all defective parts after the warranty expiration period for an indefinite period of time.

3.11 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain the fire alarm system, appliances, and devices. Refer to Division 01 Sections.

END OF SECTION

EXHIBIT B – SPECIFICATION DRAWINGS

MEDIA LAB
COLLEGE OF DuPAGE

425 FARWELL ST.
GLEN ELLYN, IL 60137

07MAY18
ISSUE FOR BID & PERMIT DOCUMENTS

OWNER	ARCHITECT	MEPFP
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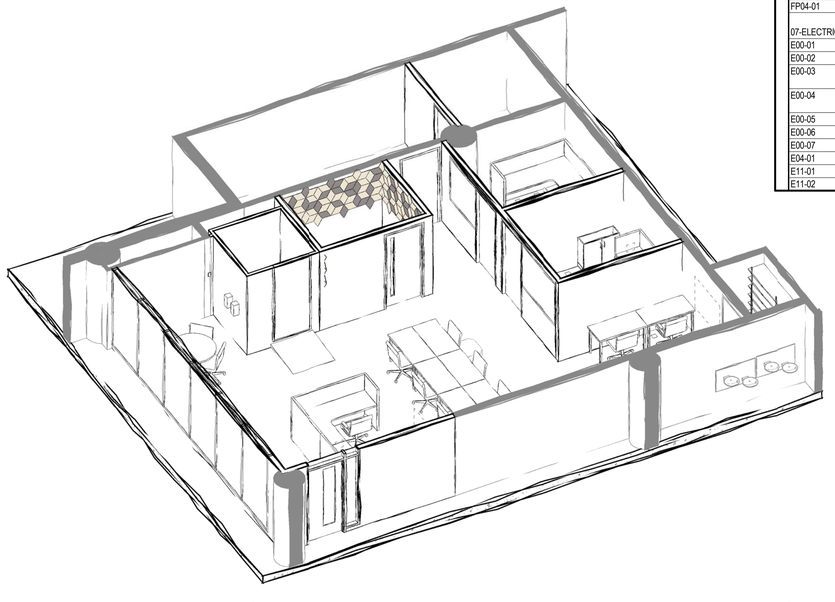


SHEET NUMBER	DRAWING INDEX	ISSUED FOR BID + PERMIT - 07 MAY 2018
01-GENERAL		
G00-00	COVER SHEET	•
G01-01	CODE COMPLIANCE PLANS	•
04-ARCHITECTURAL		
A00-01	REFERENCE SHEET	•
A04-01	DEMO, CONSTRUCTION & FINISH PLANS	•
A05-01	DEMO RCP & REFLECTED CEILING PLANS	•
A61-01	INTERIOR SCHEDULES & PARTITION TYPES	•
A62-01	DOOR SCHEDULE + DETAILS/INT. DETAILS	•
05-MECHANICAL		
M04-01	MECHANICAL DEMOLITION & NEW WORK	•
M20-01	MECHANICAL EQUIPMENT SCHEDULES & SPECIFICATIONS	•
M30-01	MECHANICAL DETAILS & SYMBOL LIST	•
06-FIRE PROTECTION		
FP04-01	FIRE PROTECTION DEMOLITION & NEW WORK	•
07-ELECTRICAL		
E00-01	ELECTRICAL NOTES AND DETAILS	•
E00-02	FIRE ALARM SYSTEM NOTES AND DETAILS	•
E00-03	LIGHT FIXTURE SCHEDULE AND LIGHTING CONTROL NOTES AND DETAILS	•
E00-04	LIGHT FIXTURE SCHEDULE AND LIGHTING CONTROL NOTES AND DETAILS	•
E00-05	TECHNOLOGY SYSTEM NOTES AND DETAILS	•
E00-06	TECHNOLOGY SYSTEM NOTES AND DETAILS	•
E00-07	TECHNOLOGY SYSTEM NOTES AND DETAILS	•
E04-01	ELECTRICAL DEMOLITION FLOOR PLANS	•
E11-01	ELECTRICAL NEW WORK FLOOR PLANS	•
E11-02	ELECTRICAL NEW WORK FLOOR PLANS	•

BLDG CODE STATEMENT OF COMPLIANCE

I CERTIFY THAT THESE ARCHITECTURAL DOCUMENTS DESCRIBED WITHIN WERE PREPARED BY ME OR UNDER MY DIRECT SUPERVISION, AND TO THE BEST OF MY KNOWLEDGE, CONFORM TO ALL APPLICABLE CODES AND REGULATIONS OF DUPAGE COUNTY AND THE STATE OF ILLINOIS; AND THAT I AM A DULY REGISTERED ARCHITECT UNDER THE LAWS OF THE STATE OF ILLINOIS.

NAME: RICHARD D. YOUNG

SIGNED _____ DATE 07 MAY 2018

ARCHITECT'S ILLINOIS LICENSE NUMBER: 011-021495 EXPIRES 11/30/2018

ADA / IAC COMPLIANCE

I HAVE PREPARED, OR CAUSED TO BE PREPARED UNDER MY DIRECT SUPERVISION, THE ATTACHED PLANS AND SPECIFICATIONS AND STATE THAT, TO THE BEST OF MY KNOWLEDGE AND BELIEF, AND TO THE EXTENT OF MY CONTRACTUAL OBLIGATION, THEY ARE IN COMPLIANCE WITH THE ENVIRONMENTAL BARRIERS ACT [410 ILCS 25] AND THE ILLINOIS ACCESSIBILITY CODE (71 ILL ADM. CODE 400).

NAME: RICHARD D. YOUNG

SIGNED _____ DATE 07 MAY 2018

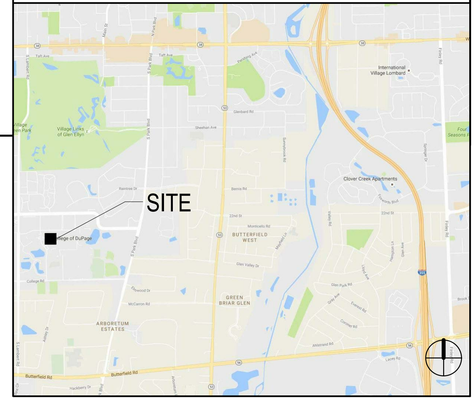
ARCHITECT'S ILLINOIS LICENSE NUMBER: 011-021495 EXPIRES 11/30/2018

PROJECT DATA

- **PROJECT DESCRIPTION: INTERIOR RENOVATION OF OFFICE SUITE**
- **JURISDICTION:** GLEN ELLYN, IL
- **OCCUPANCY CLASSIFICATION:**
  IBC: 2009 GROUP BUSINESS-B
- **CONSTRUCTION TYPE:**
  TYPE 1B, FULLY SPRINKLERED
- **REQUIRED CODES:**

2009 INTERNATIONAL BUILDING CODE (IBC) W/AMENDMENTS
2008 NATIONAL ELECTRICAL CODE (NEC) W/AMENDMENTS
2009 INTERNATIONAL FIRE CODE (IFC) W/AMENDMENTS
2015 INTERNATIONAL ENERGY CONSERVATION CODE (IECC)
2009 INTERNATIONAL MECHANICAL CODE (IMC) W/AMENDMENTS
1997 ILLINOIS ACCESSIBILITY CODE (IAC)
2014 ILLINOIS PLUMBING CODE (IPC)
2009 INTERNATIONAL PROPERTY MAINTENANCE CODE
2009 INTERNATIONAL FUEL GAS CODE
IECC 2015
NEC 2011 NATIONAL ELECTRICAL CODE
DUPAGE COUNTY COUNTYWIDE STORMWATER FLOODPLAIN ORDINANCE, 2013
ILLINOIS STATE PLUMBING CODE, 2004 (SUPERCEDED BY ILLINOIS STATE PLUMBING CODE, 2014)
ILLINOIS, NFPA 101 LIFE SAFETY CODE, 2009

VICINITY MAP



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CRYSTAL LAKE, IL 60014

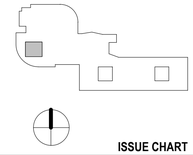
PROJECT

MEDIA LAB
425 FARWELL ST.
GLEN ELLYN, IL 60137

College of DuPage

COLLEGE OF DuPAGE

KEYPLAN



ISSUE CHART

MARK	ISSUE	DATE
1	ISSUE FOR BID & PERMIT	07MAY18

Job Number	024303.009
Drawn	Author
Checked	Checker
Approved	Approver

TITLE

COVER SHEET

SHEET NUMBER

G00-00

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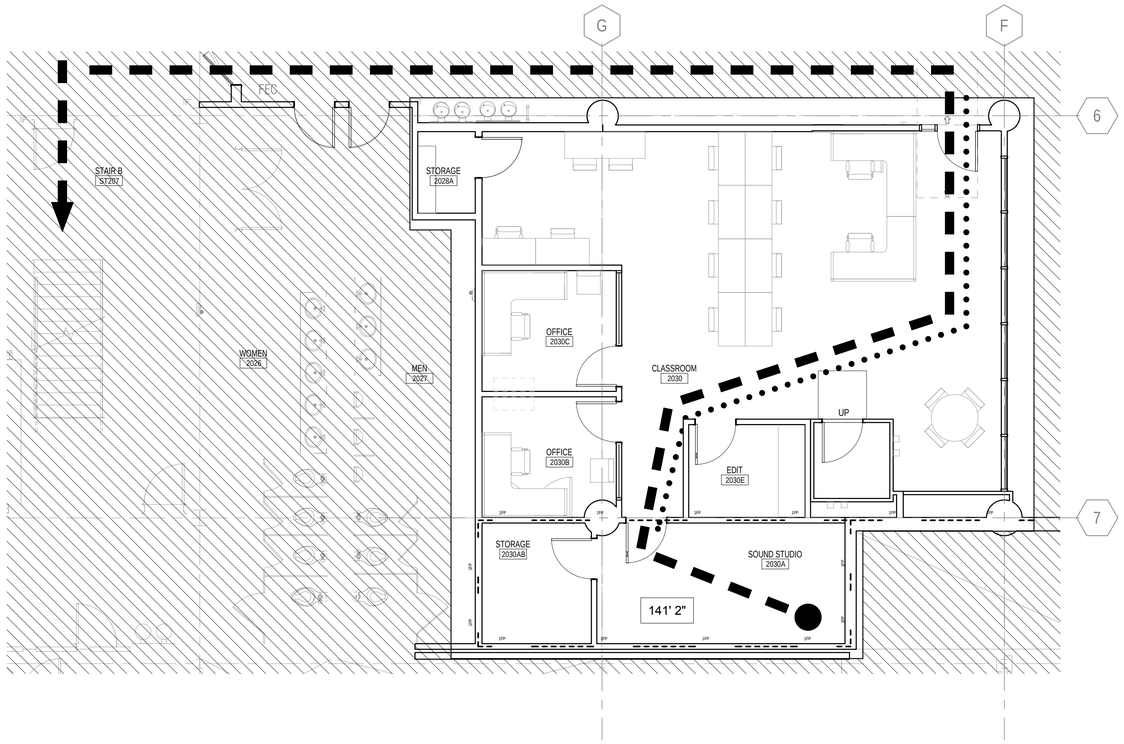
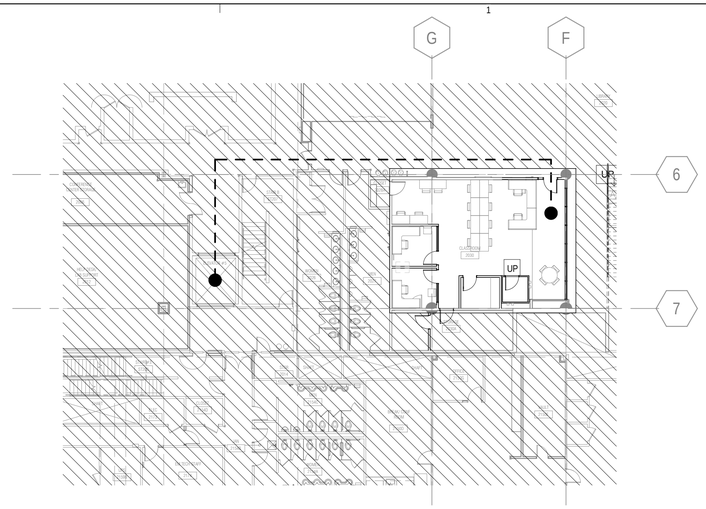


2 LEVEL 02 CODE COMPLIANCE PLANS

3/16" = 1'-0"



1 LEVEL 02 CONSTRUCTION ACCESS PLANS

1/16" = 1'-0"

ACCESSIBILITY NOTES

PROJECT WILL COMPLY WITH IAC/ICC/ANSI.

PROJECT WILL COMPLY WITH ALL IAC 400.310, (PUBLIC FACILITIES), REQUIREMENTS UNDER IAC 400 320 (n), (TENANT WORK). THE AMOUNT AND EXTENT OF THE ALTERATIONS THAT ARE TO BE ACCESSIBLE PER IAC 400.510 SHALL FULLY COMPLY WITH IAC 400.310.

PROJECT WILL COMPLY WITH ALL FEDERAL REQUIREMENTS UNDER 2010 ADA STANDARDS FOR ACCESSIBLE DESIGN; PUBLIC ACCOMMODATIONS AND COMMERCIAL FACILITIES, TITLE III.

PATH OF TRAVEL:
PROJECT HAS A FULLY ACCESSIBLE ENTRY AT THE GROUND FLOOR.
PROJECT HAS A FULLY ACCESSIBLE ROUTE FROM THE MAIN ENTRY TO THE ELEVATOR LOBBY.
PROJECT HAS A FULLY ACCESSIBLE ELEVATOR LEADING TO THE FLOOR BEING ALTERED.

TOILET FACILITIES:
PROJECT HAS A FULLY ACCESSIBLE MEN'S AND WOMEN'S TOILET ROOM OR A SINGLE USER TOILET ROOM ON THE FLOOR BEING ALTERED.

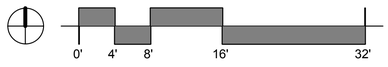
DRINKING FOUNTAINS:
PROJECT HAS AN ACCESSIBLE HI-LO DRINKING FOUNTAIN ON THE FLOOR BEING ALTERED.

OPERATING CONTROLS
ALL CONTROLS AND OPERATING MECHANISMS TO BE WITHIN REACH RANGE PER IAC/ICC/ANSI. FORWARD/FRONT APPROACH AND SIDE/PARALLEL APPROACH REACH RANGE FOR ALL CONTROLS AND OPERATING MECHANISM TO BE 15" TO 48".

DOORS:
PROVIDE PROPER MANEUVERING CLEARANCE AT DOOR PER IAC/ICC/ANSI.
ALL NEW OR ALTERED DOORS TO HAVE LEVER-OPERATED HARDWARE PER IAC/ICC/ANSI.
ALL DOORS MUST HAVE A 32" CLEAR DOOR OPENING MEASURED FROM THE FACE OF THE DOOR WHEN IT IS OPENED 90% TO THE DOOR STOP PER IAC/ICC/ANSI.
ALL DOORS LEADING INTO HAZARDOUS ROOMS OR SPACES TO HAVE KNURLED HARDWARE.
ALL PUBLIC AND COMMON AREA INTERIOR DOORS TO HAVE 5# MAX. FORCE TO OPEN.

FIRE ALARM:
ALL NEW, ALTERED, RELOCATED OR REPLACED FIRE ALARM OR EMERGENCY WARNING SYSTEM TO COMPLY FULLY WITH IAC/ ICC/ANSI. ALL VISUAL ALARMS TO BE SYNCHRONIZED THROUGHOUT. BOTH AUDIBLE AND VISUAL ALARMS WILL COMPLY WITH IAC). THE VISUAL ALARMS WILL BE FLASHING TYPE WHERE THE FLASHING IS SYNCHRONIZED AND IN COMPLIANCE FOR INTENSITY AND FREQUENCY.

FLOOR FINISHES:
FLOOR SURFACES SHALL BE FIRM STABLE AND SLIP RESISTANT PER IAC/ICC/ANSI.
CARPET PILE THICKNESS NOT TO EXCEED 1/2" PER IAC/ICC/ANSI. CARPET PILE THICKNESS IS MEASURED FROM FLOOR FINISH TO TOP OF PILE.



CODE ANALYSIS

CODE ANALYSIS	
SCOPE OF WORK	
ALTERATION TO EXISTING INTERIOR BUILD-OUT ON THE 2ND FLOOR. NO CHANGE OF OCCUPANCY, THE AREA REMAINS B-BUSINESS.	
AREA OF WORK	1,483 SF
OCCUPANCY TYPE	B - BUSINESS
CONSTRUCTION TYPE	TYPE 1B EXISTING / FULLY SPRINKLERED
CODES	
2009 INTERNATIONAL BUILDING CODE (IBC) W/AMENDMENTS 2011 NATIONAL ELECTRICAL CODE (NEC) W/AMENDMENTS 2009 INTERNATIONAL FIRE CODE (IFC) W/AMENDMENTS 2015 INTERNATIONAL ENERGY CONSERVATION CODE (IECC) 2009 INTERNATIONAL MECHANICAL CODE (IMC) W/AMENDMENTS 1997 ILLINOIS ACCESSIBILITY CODE (IAC) 2014 ILLINOIS PLUMBING CODE (IPC) 2009 INTERNATIONAL PROPERTY MAINTENANCE CODE 2009 INTERNATIONAL FUEL GAS CODE DUPAGE COUNTY COUNTYWIDE STORMWATER FLOODPLAIN ORDINANCE, 2013 ILLINOIS, NFPA 101 LIFE SAFETY CODE, 2009	
EXIT REQUIREMENTS	
TRAVEL DISTANCE TO EXIT	MAXIMUM ALLOWABLE = 300' ACTUAL MAXIMUM = 143'-6"
DEAD END CORRIDOR	MAXIMUM ALLOWABLE = 50' ACTUAL = 0'
COMMON PATH OF TRAVEL	MAXIMUM ALLOWABLE = 100 ACTUAL = 58'-3"

OCCUPANCY CALCULATION			
STORAGE #2028A	26 NET SF	100 SF/PERSON	1 OCCUPANT
CLASSROOM #2030	577 NET SF	100 SF/PERSON	6 OCCUPANTS
SOUND STUDIO #2030A	165 NET SF	100 SF/PERSON	2 OCCUPANT
STORAGE # 2030AB	73 NET SF	100 SF/PERSON	1 OCCUPANT
OFFICE #2030B	88 NET SF	100 SF/PERSON	1 OCCUPANT
OFFICE #2030C	90 NET SF	100 SF/PERSON	1 OCCUPANT
EDIT #2030E	60 NET SF	100 SF/PERSON	1 OCCUPANT
TOTAL OCCUPANCY			13 OCCUPANTS

LIFE SAFETY PLAN LEGEND

- DENOTES AREA "NOT IN CONTRACT"
- EXISTING NON-FIRE-RATED CONSTRUCTION TO REMAIN
- NEW PARTITION
- – 1FB – EXISTING 1 HOUR RATED CONSTRUCTION TO REMAIN
- XXX'-X" EGRESS PATH WITH TRAVEL DISTANCE
- CONSTRUCTION ACCESS PATH
- COMMON PATH OF TRAVEL

LIFE SAFETY NOTES

1. ALL WORK IS TO BE IN ACCORDANCE WITH ALL CODES HAVING AUTHORITY OVER THIS PROJECT.
2. EXIT DOORS SHALL SWING IN THE DIRECTION OF EGRESS TRAVEL WHEN SERVING 50 OR MORE OCCUPANTS.
3. ALL DOORS USED IN CONJUNCTION WITH EXITS SHALL BE SO ARRANGED AS TO READILY OPEN FROM THE SIDE FROM WHICH EGRESS IS TO BE MADE WITHOUT THE USE OF A KEY OR SPECIAL KNOWLEDGE.
4. FINAL LOCATIONS OF ALL LIFE SAFETY DEVICES AND FIXTURES ARE SUBJECT TO APPROVAL BY THE BUREAU OF THE FIRE PREVENTION.
5. PROVIDE A PORTABLE FIRE EXTINGUISHER IN A SEMI-RECESSED OR RECESSED FIRE EXTINGUISHER CABINET MOUNTED AT 48" AFF TO THE TOP OF THE FIRE EXTINGUISHER, WITHIN 75 FEET TRAVEL DISTANCE THROUGHOUT SPACE. MAKE NECESSARY PROVISIONS WITH WALL CONSTRUCTION TO PROVIDE ADEQUATE DEPTH FOR THE SPECIFIED EXTINGUISHER CABINETS.

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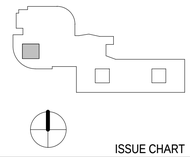

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CODE COMPLIANCE PLANS

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G01-01

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ABBREVIATIONS LEGEND

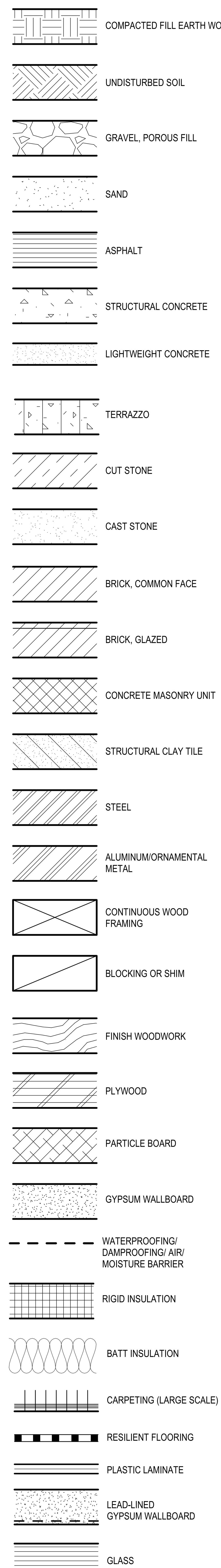
NOTE 1: ABBREVIATIONS WHEN USED IN COMPOSITION MAY INCLUDE PERIODS FOR CLARIFICATION
NOTE 2: ABBREVIATIONS MAY BE DIFFERENT WHEN A PART OF A SCHEDULE

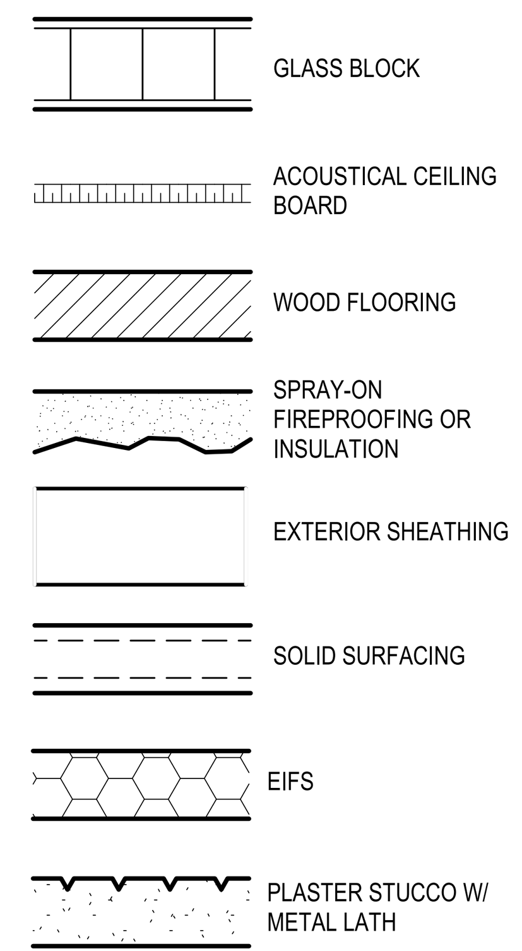
A/C	AIR CONDITION(ING)(ED)
ACC	ACCESSIBLE
ACST	ACOUSTIC(AL)
AD	AREA DRAIN
ADA DISABILITIES	AMERICANS WITH
ADJ	ADJUSTABLE/ ADJACENT
AFC	ABOVE FINISHED COUNTER
AFF	ABOVE FINISHED FLOOR
AFG	ABOVE FINISHED GRADE
AGGR	AGGREGATE
AHU	AIR HANDLING UNIT
ALT	ALTERNATE
ALUM	ALUMINUM
ANOD	ANODIZE(D)
APC CEILING	ACOUSTICAL PANEL
APPROX	APPROXIMATE
ARCH	ARCHITECT(URAL), ARCHITECT
ASPH	ASPHALT
AUTO	AUTOMATIC
AWT	ACOUSTICAL WALL TREATMENT
B/B	BACK TO BACK
BC	BACK OF CURB
BD	BOARD
BITUM	BITUMINOUS
BLDG	BUILDING
BM	BEAM/ BENCHMARK
BOT/	BOTTOM OF
BSMT	BASEMENT
BUR	BUILT-UP ROOFING
CAB	CABINET
CB	CATCH BASIN
CCTV	CLOSED CIRCUIT TELEVISION
CEM	CEMENT
CF/CI	CONTRACTOR FURNISHED, CONTRACTOR INSTALLED
CF/OI	CONTRACTOR FURNISHED, OWNER INSTALLED
CFM	CUBIC FEET PER MINUTE
CFMF	COLD-FORMED METAL FRAMING
CG	CORNER GUARD
CI	CAST IRON, CURB INLET
CIP	CAST-IN-PLACE
CJ	CONTROL JOINT
CL	CENTER LINE
CLG	CEILING
CLO	CLOSET
CLR	CLEAR
cm	CENTIMETER
CMU	CONCRETE MASONRY UNIT
CO	CLEANOUT
COL	COLUMN
CONC	CONCRETE
CONF	CONFERENCE
COORD	COORDINATE
CORR	CORRIDOR
CP	CARPET
CPT	CARPET TILES
CT	CERAMIC TILE
CTR	CENTER/CONTOUR
CU	CUBIC
CW	COLD WATER PIPING/ CHEMICAL WASTELINE
D	DEEP, DEPTH, PENNY (NAIL)
DBL	DOUBLE
DEG	DEGREE
DEMO	DEMOLISH, DEMOLITION
DEPT	DEPARTMENT
DF	DRINKING FOUNTAIN
DIA	DIAMETER (EXTERIOR)
DIAG	DIAGONAL
DIFF	DIFFUSER/ DIFFERENCE
DIM	DIMENSION
DISP	DISPENSER
DIV	DIVISION
DL	DEAD LOAD
DR	DOOR/ DRAIN
DS	DOWNSPOUT
DW	DISHWASHER
DWG	DRAWING
E	EAST
EA	EACH
EIFS	EXTERIOR INSULATION AND FINISH SYSTEM
EJ	EXPANSION JOINT
EL	ELEVATION
ELAST	ELASTOMERIC
ELEC	ELECTRIC(AL)
ELEV	ELEVATOR
EMER	EMERGENCY
EMER SHR	EMERGENCY SHOWER
ENGR	ENGINEER
ENTR	ENTRANCE
EO	ELECTRIC OUTLET
EOS	EDGE OF SLAB
EP	ELECTRICAL PANEL
EQ	EQUAL
EQUIP	EQUIPMENT
ETC	ET CETERA
ETR	EXISTING TO REMAIN
EW	EACH WAY
EWC	ELECTRIC WATER COOLER
EXH	EXHAUST
EXIST	EXISTING
EXP	EXPANSION
EXT	EXTERIOR, EXTERNAL
F/F	FACE TO FACE
FCO	FLOOR CLEANOUT
FD	FLOOR DRAIN
FDC	FIRE DEPARTMENT CONNECTION
FE	FIRE EXTINGUISHER
FEC CABINET	FIRE EXTINGUISHER
FF	FINISH FACE
FH	FIRE HYDRANT
FHC	FIRE HOSE CABINET
FIN	FINISH(ED)
FF EL	FINISHED FLOOR ELEVATION
FLR	FLOOR
FLUOR	FLUORESCENT
FO	FINISHED OPENING
FOC	FACE OF CURB
FOF	FACE OF FINISH
FOM	FACE OF MASONRY
FOS	FACE OF SLAB/ FACE OF STUD
FP	FIRE PROTECTION/ FIREPROOF
FRTW	FIRE RETARDANT TREATED WOOD
FT	FOOT (FEET)/ FIRE TREATED
FTG	FOOTING
FURG	FURRING
FURN	FURNISH, FURNITURE
FUT	FUTURE
FV	FIELD VERIFY
GA	GAGE
GALV	GALVANIZED
GEN	GENERAL
GFRC	GLASS FIBER REINFORCED CONCRETE
GFRG	GLASS FIBER REINFORCED GYPSUM
GL	GLASS
GL BLK	GLASS BLOCK
GLU LAM	GLUED LAMINATED WOOD
GR LN	GRADE LINE
GRFL	GROUND FLOOR
GSB	GYPSUM SHEATHING BOARD
GT	GREASE TRAP
GYP BD	GYPSUM BOARD
GYP PLAS	GYPSUM PLASTER
H	HIGH
HB	HOSE BIBB
HC	HOLLOW CORE
HDW	HARDWARE
HDWD	HARDWOOD
HM	HOLLOW METAL
HORIZ	HORIZONTAL
HPT	HIGH POINT
HSKPG	HOUSEKEEPING
HT	HEIGHT
HVAC	HEATING, VENTILATION, AIR CONDITIONING
HW	HOT WATER
ID	INSIDE DIAMETER
INCAND	INCANDESCENT
INSUL	INSULATION
INT	INTERIOR
INV	INVERT
JAN CLO	JANITOR'S CLOSET
KIT	KITCHEN
L	LONG, LENGTH
LAM	LAMINATE(D)
LAU	LAUNDRY
LAV	LAVATORY
LB	POUND(S)
LF	LINEAR FOOT, (FEET)
LH	LEFT HAND
LIB	LIBRARY
LKR	LOCKER
LL	LIVE LOAD
LONG	LONGITUDINAL
LOC	LOCATION
LPT	LOW POINT
LT	LIGHT
LVR	LOUVER
m	METER
MACH	MACHINE
MAINT	MAINTENANCE
MATL	MATERIAL
MAX	MAXIMUM
MECH	MECHANICAL
MEMB	MEMBRANE
MEP PROTECTION	MECHANICAL, ELECTRICAL, PLUMBING @ FIRE
MEZZ	MEZZANINE
MFR	MANUFACTURER
MH	MANHOLE
MHO	MAGNETIC HOLD OPEN
MIN	MINIMUM
MISC	MISCELLANEOUS
MKR BD	MARKER BOARD
mm	MILLIMETER
MO	MASONRY OPENING
MTL	METAL
N	NORTH
NIC	NOT IN CONTRACT
NO	NUMBER
NOM	NOMINAL
NTS	NOT TO SCALE
O/O	OUT TO OUT
OC	ON CENTER
OD	OUTSIDE DIAMETER
OF/CI	OWNER FURNISHED, CONTRACTOR INSTALLED
OF/OI	OWNER FURNISHED, OWNER INSTALLED
OFF	OFFICE
OPH	OPPOSITE HAND
OPNG	OPENING
OPP	OPPOSITE
ORD	OVERFLOW ROOF DRAIN
PA	PUBLIC ADDRESS
PAR	PARAPET, PARALLEL
PCC	PRE-CAST CONCRETE
PERF	PERFORATED
PERP	PERPENDICULAR
PLAM	PLASTIC LAMINATE
PLAS	PLASTER
PLBG	PLUMBING
PLYWD	PLYWOOD
PNT	PAINT
POL	POLISHED
PR	PAIR
PREFAB	PREFABRICATE(D)
PROJ	PROJECT
PROP	PROPERTY
PSF	POUNDS PER SQUARE FOOT
PSI	POUNDS PER SQUARE INCH
PT	POINT/ PRESSURE TREATED
PTD DISPENSER	PAPER TOWEL
PTN	PARTITION
PVC	POLYVINYL CHLORIDE
PVG	PAVING
QT	QUARRY TILE
QTY	QUANTITY
R	THERMAL RESISTANCE, RADIUS, RISER
RB	RUBBER BASE
RC	REINFORCED CONCRETE
RCP	REFLECTED CEILING PLAN
RCPTN	RECEPTION
RD	ROOF DRAIN
REC	RECESSED
REF	REFERENCE, REFRIGERATOR
REINF	REINFORCE, REINFORCING
REQ(D)	REQUIRE, REQUIRED
RESIL	RESILIENT
S	SOUTH
SAN	SANITARY
SC	SOLID CORE
SCHED	SCHEDULE
SECT	SECTION
SF	SQUARE FOOT(FEET)
SGL	SINGLE
SHR	SHOWER
SHT	SHEET
SIM	SIMILAR
SJ	SLIP JOINT, SCORED JOINT
SPEC	SPECIFICATION
SPKR	SPEAKER
SQ	SQUARE
STN	STAIN
SST	STAINLESS STEEL
STA	STATION
STC	SOUND TRANSMISSION CLASS
STD	STANDARD
STL	STEEL
STOR	STORAGE
STRUCT	STRUCTURAL
SUSP	SUSPENDED
SV	SHEET VINYL
SYMM	SYMMETRICAL
T	TREAD
T/	TOP OF
TA	TOILET ACCESSORY
T&B	TOP & BOTTOM
T&G	TONGUE & GROOVE
TEL	TELEPHONE
TEMP	TEMPORARY
TER	TERRAZZO
THK	THICK
TI	TENANT IMPROVEMENT
TO_	TOP OF _____
TOPO	TOPOGRAPHY, TOPOGRAPHIC
TRTD	TREATED
TS	TUBE STEEL
TV	TELEVISION
TYP	TYPICAL
U	HEAT TRANSFER COEFFICIENT
UH	UNIT HEATER
UL	UNDERWRITER'S LABORATORIES
UNEX	UNEXCAVATED
UNFIN	UNFINISHED
UNO	UNLESS NOTED OTHERWISE
UTIL	UTILITY
VB	VINYL BASE
VCT	VINYL COMPOSITION TILE
VENT	VENTILATION
VERT	VERTICAL
VEST	VESTIBULE
VIF	VERIFY IN FIELD
VNR	VENEER
VOL	VOLUME
VWC	VINYL WALL COVERING
W	WEST
W/	WITH
W/O	WITHOUT
WC	WATER CLOSET
WD	WOOD
WG	WALL GUARD
WH	WATER HEATER
WI	WROUGHT IRON
WSCT	WAINSCOT
WT	WEIGHT
WWF	WELDED WIRE FABRIC
WWM	WELDED WIRE MESH
X	BY
YD	YARD
YR	YEAR
ZN	ZINC

SYMBOLS

&	AND
∠	ANGLE
@	AT
x	BY (LOWERCASE)
℄	CENTER LINE
[	CHANNEL
X°	DEGREE
Ø	DIAMETER
⅃L	DOUBLE ANGLE
#	NUMBER, POUNDS
℘L	PROPERTY LINE
±	PLUS OR MINUS
⊕	SQUARE FEET
/	DIVIDED BY

MATERIALS





SYMBOLS LEGEND

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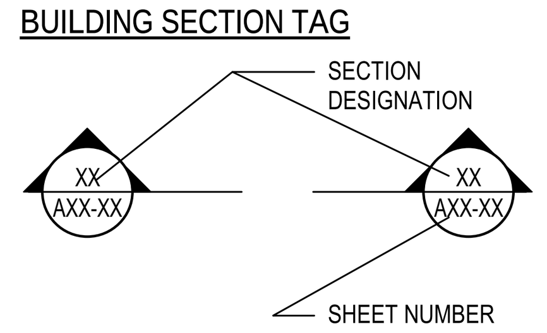
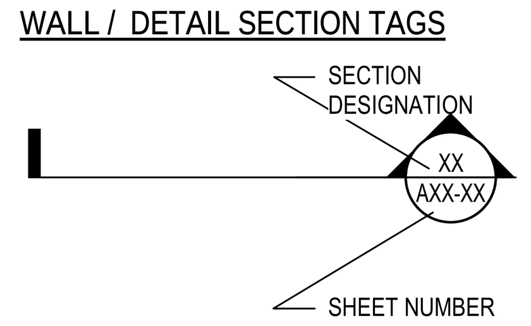


WALL / DETAIL SECTION TAGS



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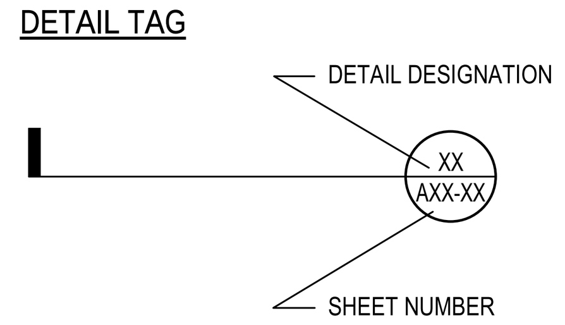

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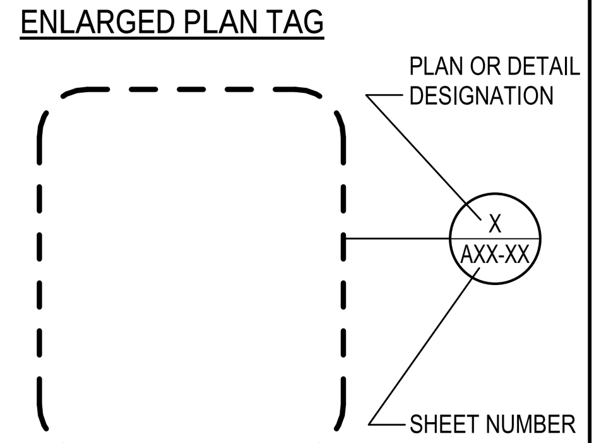
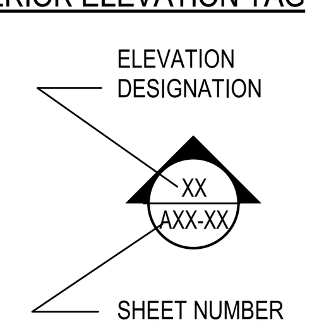


EXTERIOR ELEVATION TAG



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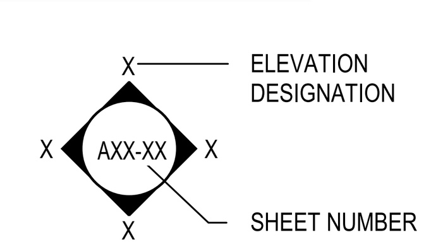
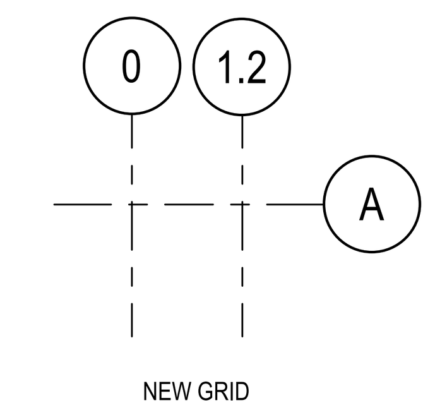
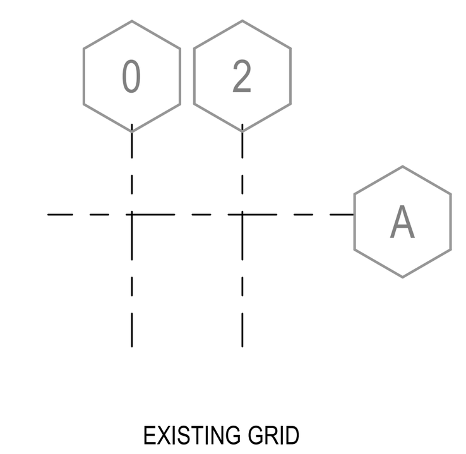


SYMBOLS LEGEND

COLUMN GRID DESIGNATION

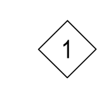




NOTE TAGS

?	"NOTES BY NUMBER"
?	SPECIFICATIO N KEYNOTES

WINDOW / GLAZING TYPE SYMBOL



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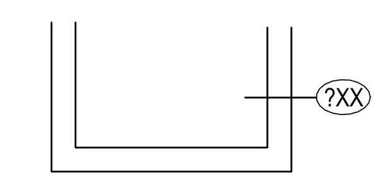

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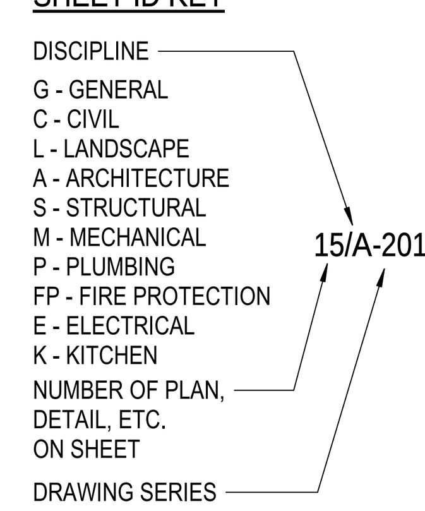


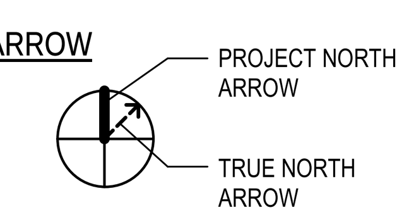
DOOR IDENTIFICATION TAG

(301A)

EQUIPMENT IDENTIFICATION TAG

E1	EQUIPMENT/APPLIANCE
TA1	TOILET ACCESSORY
#	PLUMBING FIXTURE

NORTH ARROW



GENERAL PROJECT NOTES

GENERAL NOTES

1. VERIFY ALL EXISTING CONDITIONS AND DIMENSIONS IN THE FIELD WITH THOSE SHOWN IN THE DRAWINGS. ADVISE THE ARCHITECT OF ANY DISCREPANCIES OR CONFLICTS PRIOR TO PROCEEDING WITH WORK.

2. PROVIDE BARRIERS AS NEEDED TO PROTECT OCCUPANTS FROM PHYSICAL HAZARD AND NOISE OF ALL DEMOLITION AND CONSTRUCTION WORK. BARRIERS AS INDICATED ON THIS SHEET ARE AS PROVIDED BY GC.

3. AREA OF CONSTRUCTION IS SHOWN FOR ORIENTATION ONLY AND SHOULD NOT BE CONSTRUED TO BE COMPLETE. REFER TO OTHER DRAWINGS FOR SOURCE OF UTILITY CONNECTIONS, EXTENT OF DEMOLITION, OFF-SITE WORK, ETC.

4. JUNCTIONS OF NEW AND EXISTING WORK SHALL BE REPAIRED AND PATCHED TO MATCH EXISTING ADJACENT SURFACES, EXISTING WALLS REQUIRING MODIFICATION OF ANY KIND SHALL BE REFINISHED TO THE NEAREST INTERNAL CORNER.

5. ALL PIPE, CONDUIT, AND OTHER PENETRATIONS OF EXISTING AND NEW FLOORS, FIRE PARTITIONS, AND SMOKE PARTITIONS ARE TO BE SEALED AIR TIGHT BOTH SIDES WITH UL RATED FIRESTOP SYSTEM PROVIDING EQUIVALENT TO THE WALL OR FLOOR CONSTRUCTION.

6. ALL SURFACES OF GYPSUM BOARD & CMU PARTITIONS EXPOSED TO VIEW SHALL BE PATCHED, FINISHED AND PAINTED, UNO. ANY EXISTING FIREPROOFING OVERSPRAY EXPOSED TO VIEW SHOULD BE REMOVED AND SURFACED SHOULD BE PREPARED TO RECEIVE PAINT.

7. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL CUTTING AND PATCHING IN EXISTING CONSTRUCTION WHERE REQUIRED FOR NEW CONSTRUCTION.

8. CONTRACTOR SHALL BE RESPONSIBLE FOR REPLACING, PATCHING, AND/OR ADDING FIREPROOFING WHERE DAMAGED, MISSING, OR IMPROPERLY INSTALLED TO MAINTAIN THE REQUIRED FIRE RESISTANCE RATING FOR BEAMS PER UL DESIGN N708 FOR RESTRAINED BEAMS.

9. PROVIDE AND MAINTAIN TEMPORARY FACILITIES AND CONTROLS AND "INTERIM LIFE SAFETY MEASURES" REQUIRED TO KEEP BUILDING OPERATING DURING CONSTRUCTION. OWNER RESPONSIBLE FOR PROVIDING ANY DOCUMENTS AND PLANS FOR PERMITS.

10. CONTRACTOR SHALL COMPLY WITH ALL APPROPRIATE FEDERAL, STATE AND LOCAL REGULATORY AGENCIES, CODES, LAWS, AND REQUIREMENTS. ITEMS SHOWN OR IMPLIED IN THE CONTRACT DOCUMENTS NOT IN ACCORDANCE WITH THESE RULES AND REGULATIONS SHALL BE BROUGHT IMMEDIATELY TO THE ATTENTION OF THE ARCHITECT.

11. CONTRACTOR SHALL REVIEW AND CONFIRM RULES AND REGULATIONS WITH THE BUILDING MANAGEMENT, INCLUDING DELIVERIES AND REMOVALS, USE OF ELEVATORS, ETC. WHERE THE BUILDING MANAGEMENT REQUIREMENTS FOR ALTERATIONS, CONSTRUCTION NOTES, OR DRAWINGS CALL FOR ANY WORK OF A MORE STRINGENT NATURE THAN THAT REQUIRED BY THE BUILDING CODE OR ANY OTHER DEPARTMENT HAVING JURISDICTION OVER THE WORK, THE MORE STRINGENT NATURE CALLED FOR SHALL BE FURNISHED IN ALL CASES.

12. WORK NOT SPECIFICALLY INCLUDED IN THE CONTRACT DOCUMENTS BUT REASONABLY CONSTRUED TO BE REQUIRED TO PRODUCE THE INTENDED RESULTS INDICATED SHALL BE THOROUGHLY PERFORMED AS THOUGH INCLUDED IN THE CONTRACT DOCUMENTS.

13. CONTRACTOR IS RESPONSIBLE FOR THE COORDINATION, THE LAYOUT, AND THE LINES AND MEASUREMENTS REQUIRED BY THE WORK OF THE CONTRACT DOCUMENTS AND AS REQUIRED BY THE BUILDING MANAGEMENT'S RULES AND REGULATIONS. CONTRACTOR SHALL CLOSELY COORDINATE HIS WORK WITH THAT OF OTHERS TO ASSURE THAT ALL SCHEDULES ARE MET. ANY ERRORS OR INACCURACIES IN THE DOCUMENTS WHICH WOULD INTERFERE WITH THE SATISFACTORY COMPLETION OF THE WORK SHALL BE BROUGHT IMMEDIATELY TO THE ATTENTION OF THE ARCHITECT PRIOR TO THE WORK'S COMMENCEMENT.

14. CONTRACTOR SHALL PROVIDE THE OWNER AND THEIR REPRESENTATIVES AND THE ARCHITECT AND THEIR REPRESENTATIVES ACCESS TO THE WORK AT ALL TIMES.

15. CONTRACTOR SHALL VISIT THE SITE AND VERIFY ALL JOB CONDITIONS PRIOR TO SUBMITTING BIDS. ANY DISCREPANCIES, CONFLICTS, OR OMISSIONS WHICH WOULD INTERFERE WITH THE SATISFACTORY COMPLETION OF THE WORK SHALL BE BROUGHT IMMEDIATELY TO THE ATTENTION OF THE ARCHITECT PRIOR TO THE SUBMISSION OF CONTRACTOR'S BID.

16. CONTRACTOR SHALL BE RESPONSIBLE FOR ANY COST TO REPLACE AND/OR RESTORE ANY UNSATISFACTORY WORK CAUSED BY INFERIOR WORKMANSHIP OR MATERIALS OR IMPROPER SCHEDULING.

17. CONTRACTOS SHALL CONTINUOUSLY MAINTAIN AND PROTECT ALL EXISTING AND NEW WORK WITHIN AND ADJACENT SPACES, AND IN THE EVENT OF DAMAGE, REPAIR OR REPLACE SAME.

18. CONTRACTORS SHALL CLEAN UP DAILY, AND PERIODICALLY REMOVE ALL RUBBISH AND WASTE FROM THE JOB SITE.

19. CONTRACTOR SHALL PROTECT NON-PROJECT AREAS FROM DUST AND DEBRIS.

20. IN AREAS WHERE AN UNEVENNESS IN SURFACE OCCURS, CONTRACTOR SHALL PATCH AND REPAIR SURFACE TO PRODUCE A PLUMB AND/OR LEVEL SMOOTH SURFACE TO RECEIVE SPECIFIED FINISH MATERIAL.

21. CONTRACTOR SHALL DO ALL CUTTING, FITTING, AND PATCHING REQUIRED TO MAKE ALL PARTS OF THE WORK COME TOGETHER PROPERLY AND FIT TO RECEIVE OR BE RECEIVED BY THE WORK OF THE CONTRACT DOCUMENTS.

22. WHERE OPENINGS OCCUR IN EXISTING FIRE-RATED ASSEMBLIES OR ACOUSTICALLY TREATED WALLS DUE TO PENETRATIONS OF EXISTING OR NEW CONDUIT RUNS, DUCTOWRK, SLAB OPENINGS, CABLES, PIPES, ETC., AND/OR WHERE EXISTING FIREPROOFING HAS BEEN REMOVED AS A RESULT OF EXISTING OR NEW CONSTRUCTION WORK, CONTRACTOR SHALL CLOSE ALL SUCH OPENINGS TO MATCH IMMEDIATELY ADJACENT AREAS IN MATERIALS, FINISH, AND FIRE-RATING WITH RATED FIRESTOP SYSTEM PROVIDING EQUIVALENT TO THE WALL OR FLOOR CONSTRUCTION. ALL SUCH WORK SHALL BE INCLUDED IN CONTRACTOR'S BID PRICE.

23. INSTALL ALL WORK PLUMB, LEVEL, TRUE, SQUARE, STRAIGHT AND IN PROPER ALIGNMENT WITH NO DISTORTIONS. (PROVIDE SHIMS AS REQUIRED).

24. CONTRACTOR SHALL PROTECT ALL EXISTING WORK THAT FORMS PART OF THE COMPLETED PROJECT.

25. THE CONTRACTOR SHALL PROTECT EXISTING ACTIVE SERVICES AND UTILITY LINES ENCOUNTERED. DO NOT INTERRUPT SERVICES TO OTHER PARTS OF THE BUILDING. TEMPORARY SHUT DOWN OF SERVICES, IF REQUIRED, SHALL BE ONE ONLY WITH PRIOR APPROVAL OF THE BUILDING MANAGER.

26. ALL WOOD BLOCKING AND PLYWOOD ARE TO BE FIRE-RETARDANT.

27. CONTRACTORS FOR EACH TRADE ARE ADVISED THAT INFORMATION PERTINENT TO THEIR WORK MAY OCCUR IN OTHER PORTIONS OF THE CONTRACT DOCUMENTS. REFER TO STRUCTURAL, HEATING AND VENTILATION, ELECTRICAL, PLUMBING AND FIRE PROTECTION DRAWINGS FOR ADDITIONAL GENERAL NOTES, ABBREVIATIONS AND SYMBOLS. ALL NOTES ARE TO BE REVIEWED AND APPLIED TO RELATED BUILDING COMPONENTS. NOTES APPEAR ON VARIOUS SHEETS FOR DIFFERENT SYSTEMS AND MATERIALS. SHEETS ARE TO BE REVIEWED AND NOTES ON ANY ONE SHEET ARE TO BE APPLIED ON RELATED DRAWINGS AND DETAILS.

28. GC IS RESPONSIBLE FOR PROVIDING WOOD BLOCKING/PLYWOOD/SHEET METAL AS NECESSARY TO SUPPORT ALL WALL MOUNTED ITEMS (I.E. TELEVISIONS, SHELVING BRACKETS, GRAB BARS, ETC.)

29. GC IS RESPONSIBLE FOR PROVIDING SMOOTH TRANSITION BETWEEN PLATER FACED WALL CONSTRUCTION AND GYPSUM BOARD WALL CONSTRUVTION (FEATHERING). THERE SHOULD BE NO VISIBLE JOINTS.

LANDLORD COORDINATION

1. VERIFY THE BUILDING'S RULES FOR CONSTRUCTION WITH THE LANDLORD.

2. THE CONTRACTOR SHALL MAKE ALL ARRANGEMENTS WITH THE LANDLORD PERTAINING TO THE USE OF THE BUILDING ENTRANCES, WORKING HOURS, NOISY WORK, ACCESS TO ADJACENT SPACES, SECURITY, OWNERSHIP OF SALVAGED ITEMS AND OTHER ITEMS DEEMED TO BE OF MUTUAL INTEREST.

3. KEEP DRIVEWAYS, DOCKS AND ENTRANCES SERVING THE PREMISES CLEAR AND AVAILABLE TO THE LANDLORD AND THE LANDLORD'S TENANTS AND VENDORS AT ALL TIMES. DO NOT USE THESE AREAS FOR PARKING OR STORAGE OF MATERIALS. SCHEDULE DELIVERIES TO MINIMIZE SPACE AND TIME REQUIREMENTS FOR STORAGE OF MATERIAL AND EQUIPMENT ON SITE.

4. COORDINATE ALL REQUIREMENTS FOR ELEVATOR ACCESS TIME AND EXPENSE WITH THE LANDLORD. ELEVATOR ACCESS EXPENSE IS TO BE BORNE BY THE CONTRACTOR UNLESS OTHERWISE INDICATED BY THE LANDLORD.

5. THE CONTRACTOR SHALL COORDINATE WITH THE LANDLORD THE USE OF THE DESIGNATED TOILETS WITHIN THE BUILDING FOR USE BY THE CONTRACTOR'S PERSONNEL. USE OF EXISTING TOILETS WITHIN THE BUILDING OTHER THAN THOSE DESIGNATED BY THE LANDLORD WILL NOT BE PERMITTED. THE CONTRACTOR SHALL TAKE RESPONSIBILITY FOR THE PROTECTION OF THE TOILET FACILITIES, PROVIDING REGULAR MAINTENANCE AND STOCKING ALL NECESSARY SUPPLIES.

6. AVOID INTERRUPTION OF SERVICES (ELECTRICAL, SIGNAL, MECHANICAL, FIRE PROTECTION, LIFE SAFETY, PLUMBING, ETC.) TO OCCUPIED AREAS OF THE BUILDING DURING CONSTRUCTION. IF SERVICE INTERRUPTIONS ARE UNAVOIDABLE, THE CONTRACTOR SHALL NOTIFY AND OBTAIN APPROVAL FROM THE LANDLORD AND TENANT AT LEAST 24 HOURS PRIOR TO PROCEEDING SUCH WORK.

7. ALL WORK SHALL CONFORM TO ALL INDUSTRY AND MANUFACTURERS' PUBLISHED STANDARDS AND THE LANDLORD'S REQUIREMENTS FOR QUALITY OF MATERIALS AND WORKMANSHIP AS WELL AS ALL REQUIREMENTS IN THE DOCUMENTS. THE CONTRACTOR SHALL BE RESPONSIBLE TO BECOME FAMILIAR AND COMPLY WITH THE LANDLORD'S STANDARD DETAILS OF CONSTRUCTION. ANY CONFLICTING REQUIREMENTS OF THE SOURCES LISTED ABOVE SHALL BE BROUGHT TO THE ATTENTION OF THE ARCHITECT BEFORE PROCEEDING WITH THE WORK.

8. PENETRATIONS IN THE EXTERIOR BUILDING WALL ARE NOT ALLOWED, INCLUDING THOSE FOR OUTLETS AND BLOCKING, UNLESS EXPRESSLY ALLOWED BY THE LANDLORD.

9. ALL PENETRATIONS IN FLOOR SLABS MUST BE APPROVED BY THE LANDLORD.

PERMITS AND SAFETY

1. THE CONTRACTOR FOR THE PROJECT SHALL BE RESPONSIBLE FOR OBTAINING ALL REQUIRED BUILDING PERMITS.

2. THE CONTRACTOR SHALL TAKE ALL NECESSARY PRECAUTIONS TO ENSURE THE SAFETY OF THE PUBLIC AND THE WORKMEN ON THE JOB AND TO PREVENT ACCIDENTS OR INJURY TO ANY PERSONS ON, ABOUT, OR ADJACENT TO THE PREMISES WHERE THE WORK IS BEING PERFORMED. THE CONTRACTOR SHALL COMPLY WITH ALL OF THE LAWS, ORDINANCES, CODES, RULES AND REGULATIONS RELATIVE TO SAFETY AND THE PREVENTION OF ACCIDENTS.

3. THE CONTRACTOR SHALL PROVIDE TEMPORARY WALLS, AS REQUIRED, TO ENCLOSE AND BARRICADE FOR SAFETY, AND FOR LOCALIZING AND MINIMIZING DUST AND NOISE FROM ANY OPERATIONS AND TO EFFECTIVELY SEPARATE WORK AREA FROM OTHER OCCUPIED AREAS OF THE BUILDING.

4. PROVIDE ALL NECESSARY TEMPORARY POWER, LIGHTING, FIRE PROTECTION, ETC, AS REQUIRED DURING CONSTRUCTION.

5. DO NOT OBSTRUCT ACCESS TO EXISTING EXITS OR REDUCE THE WIDTH OF EXIT ACCESS CORRIDORS AND HALLWAYS.

CONSTRUCTION COORDINATION

1. THE CONTRACTOR IS RESPONSIBLE FOR THE COORDINATION OF ALL PARTS OF THE WORK STATED OR IMPLIED SO THAT NO WORK IS LEFT IN AN UNFINISHED OR INCOMPLETE CONDITION.

2. WHERE SPECIAL COORDINATION IS NECESSARY, PREPARE MEMORANDA FOR DISTRIBUTION TO EACH PARTY INVOLVED OUTLINING SPECIAL PROCEDURES REQUIRED FOR COORDINATION. INCLUDE SUCH ITEMS AS REQUIRED NOTICES, REPORTS, AND ATTENDANCE AT MEETINGS.

3. COORDINATE CONSTRUCTION ACTIVITIES INDICATED ON CONTRACT DOCUMENTS TO ASSURE EFFICIENT, ORDERLY, COMPLETE AND OPERATIONAL INSTALLATIONS OF EACH PART OF THE WORK. COORDINATE CONSTRUCTION OPERATIONS THAT ARE DEPENDENT UPON EACH OTHER FOR PROPER INSTALLATION, CONNECTION, AND OPERATION. WHERE MATERIALS APPLIED TO, OR ARE IN DIRECT CONTACT WITH, WORK INSTALLED BY ANOTHER SUBCONTRACTOR, COMMENCEMENT OF WORK IMPLIES ACCEPTANCE OF THE SUBSTRATE AS SUITABLE FOR THE APPLICATION INTENDED.

4. CONFINE OPERATIONS TO AREAS WITHIN CONTRACT LIMITS INDICATED. PORTIONS OF THE SITE BEYOND AREAS IN WHICH CONSTRUCTION IS INDICATED ARE NOT TO BE DISTURBED.

5. WHERE AVAILABILITY OF SPACE IS LIMITED, COORDINATE INSTALLATION OF DIFFERENT COMPONENTS TO ASSURE MAXIMUM ACCESSIBILITY OF REQUIRED MAINTENANCE, SERVICE AND REPAIR.

6. COORDINATE TRADES TO PATCH FINISHES THAT ARE DAMAGED AS A RESULT OF CUTTING IN OF WORK.

7. COORDINATE EXACT SIZE AND PLACEMENT OF EQUIPMENT BASE AND HOUSEKEEPING PADS WITH EQUIPMENT TO BE PROVIDED.

CONTRACT DOCUMENTS

1. DRAWINGS AND SPECIFICATIONS ARE COMPLEMENTARY AND ARE NOT INTENDED TO INCLUDE OR IMPLY ALL ITEMS REQUIRED FOR THE PROPER EXECUTION AND COMPLETION OF THE WORK. REFER TO COMPLETE SET OF DOCUMENTS FOR APPLICABLE NOTES, ABBREVIATIONS, AND SYMBOLS.

2. THE CONTRACTOR SHALL NOTIFY THE ARCHITECT IN WRITING OF ANY OMISSIONS, DISCREPANCIES, AND/OR CONFLICTS IN THE DRAWINGS AND SPECIFICATIONS.

3. DO NOT SCALE DRAWINGS. DIMENSIONS GOVERN. NOTIFY THE ARCHITECT IN WRITING OF ANY CONFLICTS OR DISCREPANCIES IN THE DIMENSIONS.

4. LARGE SCALE DRAWINGS GOVERN OVER SMALL SCALE DRAWINGS.

5. THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS AND CONDITIONS SHOWN ON THE DRAWINGS AT THE JOB SITE AND SHALL NOTIFY THE ARCHITECT OF ANY OMISSIONS, DISCREPANCIES, AND/OR CONFLICTS BEFORE PROCEEDING WITH THE PROJECT.

6. WHERE MOUNTING HEIGHTS ARE NOT INDICATED, INSTALL INDIVIDUAL COMPONENTS AT STANDARD MOUNTING HEIGHTS RECOGNIZED WITHIN THE INDUSTRY FOR THE PARTICULAR APPLICATION INDICATED AND TO CURRENT ADA/ACCESSIBILITY STANDARDS. REFER QUESTIONABLE MOUNTING HEIGHT DECISIONS TO THE ARCHITECT FOR FINAL DECISION.

7. FOR ACCESS PANELS NOT SHOWN BUT REQUIRED BY PROVISIONS OF THE CONTRACT DOCUMENTS, LOCATE IN ACCORDANCE WITH APPLICABLE CODES. SUBMIT PROPOSED LOCATION TO THE ARCHITECT FOR REVIEW AND APPROVAL PRIOR TO INSTALLATION.

CONSTRUCTION

1. NEW AND EXISTING OPENINGS IN RATED WALL, FLOOR, CEILING, AND ROOF ASSEMBLIES SHALL BE SEALED WITH PENETRATION SEALANT SYSTEMS MEETING OR EXCEEDING THE REQUIRED FIRE RESISTIVE RATINGS.

2. MAINTAIN THE FIRE RATING OF CONSTRUCTION AROUND CABINETS, PANELS, AND BOXES RECESSED IN RATED WALL, FLOOR, AND CEILING ASSEMBLIES.

3. PARTITION TYPES AND FIRE RESISTIVE RATINGS INDICATED ARE TO BE CONTINUOUS FOR THE LENGTH AND HEIGHT OF A PARTITION.

4. PROVIDE CONTINUOUS PERIMETER FIRE SAFING BETWEEN FLOORS AND COORDINATE THE INSTALLATION WITH THE EXTERIOR WALL. FIRE RATING OF SAFING SHALL MATCH FIRE RATING OF FLOOR CONSTRUCTION.

5. PROVIDE NON-COMBUSTIBLE STIFFENERS, BRACING, BACKING PLATES AND BLOCKING REQUIRED FOR SECURE INSTALLATION OF DOORS AND DOOR HARDWARE INCLUDING WALL-MOUNTED DOOR STOPS, MILLWORK, HANDRAILS, WALL-MOUNTED SHELVES, OPERABLE PARTITIONS, MISCELLANEOUS EQUIPMENT, AND SUSPENDED MECHANICAL AND ELECTRICAL EQUIPMENT.

6. ISOLATE DISSIMILAR METALS TO PREVENT GALVANIC CORROSION.

7. SEALANTS EXPOSED TO VIEW SHALL BE COLOR AS SELECTED BY ARCHITECT. COORDINATE LOCATION OF SEALANT AND COMPATIBILITY OF SEALANTS WITH ADJACENT WORK INCLUDING MATERIALS AND OTHER CONTIGUOUS SEALANTS.

EXISTING AND COMPLETED WORK

1. CLEAN AND PROTECT CONSTRUCTION IN PROGRESS AND ADJOINING MATERIALS IN PLACE. APPLY PROTECTIVE COVERING WHERE REQUIRED TO ENSURE PROTECTION FROM DAMAGE OR DETERIORATION. CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DAMAGE TO ALL EXISTING CONDITIONS AND COMPLETED WORK WHILE FULFILLING THE OBLIGATIONS OF THIS CONTRACT.

2. CLEAN AND MAINTAIN COMPLETED CONSTRUCTION AS FREQUENTLY AS NECESSARY THROUGH THE DURATION OF THE CONSTRUCTION PERIOD. ADJUST AND LUBRICATED OPERABLE COMPONENTS TO ENSURE PROPER FUNCTION WITHOUT DAMAGING EFFECTS.

3. THE CONTRACTOR SHALL BE RESPONSIBLE FOR REMOVAL, STORAGE, PROTECTION, AND REINSTALLATION OF THE EXISTING WINDOW TREATMENTS AT ALL WINDOWS SO AS TO RETURN THE WINDOW TREATMENTS TO THEIR ORIGINAL CONDITION AT THE CONCLUSION OF THE PROJECT. THE CONTRACTOR IS RESPONSIBLE FOR DOCUMENTING THE CONDITION OF ALL EXISTING WINDOW TREATMENTS AT THE BEGINNING OF THE PROJECT. ANY DAMAGED WINDOW TREATMENTS THAT WERE NOT DOCUMENTED AS SUCH BY THE CONTRACTOR AT THE BEGINNING OF THE PROJECT SHALL BE REPLACED BY THE CONTRACTOR AT NO ADDITIONAL COST TO THE LANDLORD OR TENANT.

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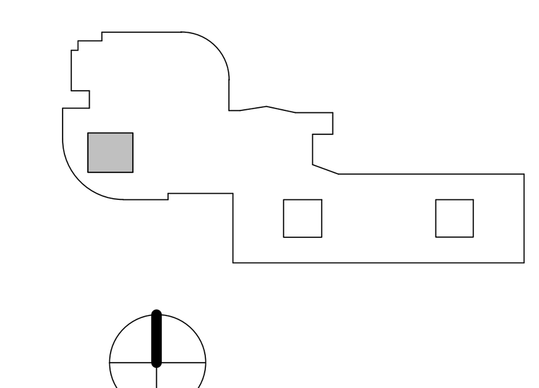
College of DuPage

COLLEGE OF DuPAGE

KEYPLAN



ISSUE CHART

MARK	ISSUE	DATE
1	ISSUE FOR BID & PERMIT	07MAY18

Job Number	024303.009
Drawn	Author
Checked	Checker
Approved	Approver

TITLE

REFERENCE SHEET

SHEET NUMBER

A00-01

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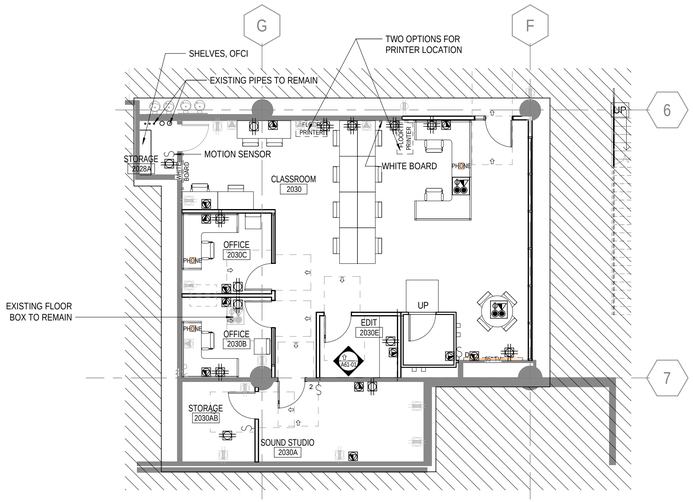
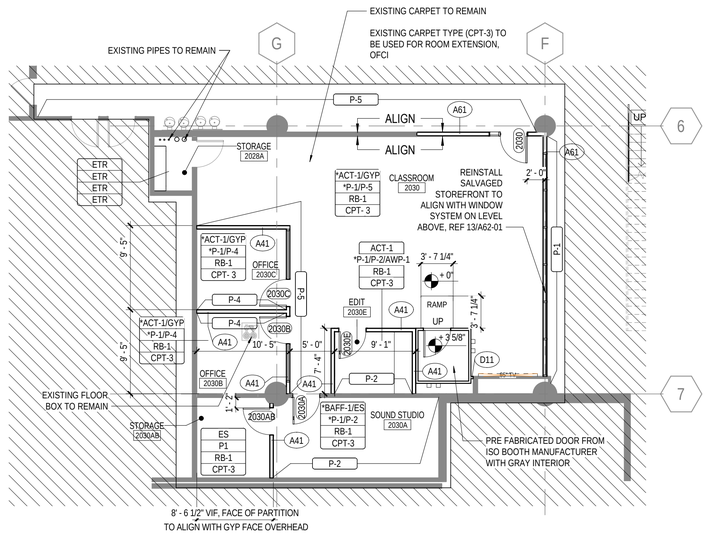
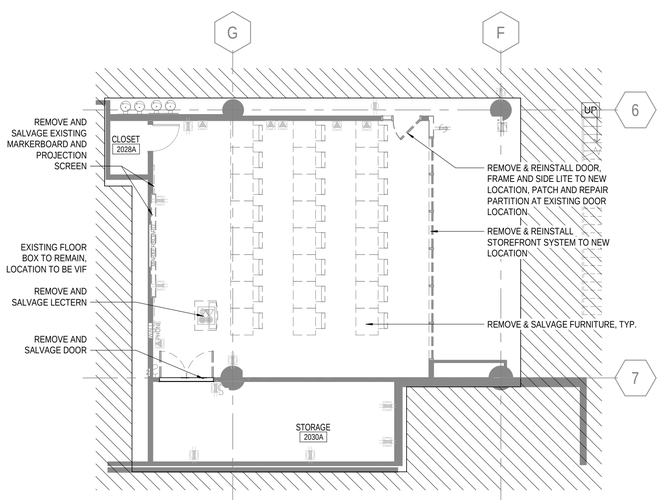


3 LEVEL 02 MEDIA LAB FURNITURE PLAN
1/8" = 1'-0"

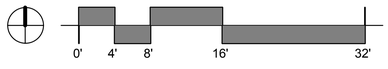


2 LEVEL 02 FLOOR/FINISH PLAN RM 2030 MEDIA LAB
1/8" = 1'-0"



1 LEVEL 02 DEMOLITION FLOOR PLAN RM 2030 MEDIA LAB
1/8" = 1'-0"

FURNITURE PLAN DRAWINGS ARE FOR REFERENCE ONLY



FURNITURE PLAN GENERAL NOTES

1. COORDINATE EXACT LOCATION AND LAYOUT OF FURNITURE WITH ADJACENT CONSTRUCTION.
2. FURNITURE INSTALLER TO PROVIDE LAYOUT OF WORKSTATIONS FOR REVIEW BY ARCHITECT AND GENERAL CONTRACTOR.
3. FURNITURE INSTALLER SHALL COORDINATE LOCATION AND QUANTITY OF WORKSTATION FEEDS WITH GENERAL CONTRACTOR.

FURNITURE PLAN LEGEND

- DENOTED AREA "NOT IN CONTRACT"
- TELE/DATA - EXISTING TO REMAIN
- TELEDATA - NEW
- DUPLEX - NEW
- DUPLEX - EXISTING TO REMAIN
- QUAD - NEW
- QUAD - EXISTING TO REMAIN

DEMOLITION PLAN LEGEND

- DENOTES AREA "NOT IN CONTRACT"
- EXISTING CONSTRUCTION TO REMAIN
- EXISTING CONSTRUCTION TO BE DEMOLISHED
- EXISTING DOOR AND FRAME TO REMAIN
- EXISTING DOOR AND FRAME TO BE DEMOLISHED
- EX — EXISTING FIXTURE TO REMAIN
- ED — EXISTING FIXTURE TO BE DEMOLISHED
- ER — EXISTING FIXTURE TO BE RELOCATED

DEMOLITION PLAN GENERAL NOTES

1. THE CONTRACTOR SHALL FIELD SURVEY THE SITE OF PROPOSED WORK TO DETERMINE THE EXTENT AND NATURE OF THE DEMOLITION WORK. REFER TO ALL CONTRACT DOCUMENTS FOR ADDITIONAL REQUIREMENTS AND SCOPE OF DEMOLITION WORK. REFER TO THE MECHANICAL, ELECTRICAL, AND PLUMBING DRAWINGS FOR ADDITIONAL DEMOLITION REQUIREMENTS.
2. PROTECTION SHALL BE PROVIDED FOR BASE BUILDING CONSTRUCTION AND ALL EXISTING CONSTRUCTION TO REMAIN INCLUDING, BUT NOT LIMITED TO, FLOORING, PARTITIONS, WINDOW TREATMENTS, BASEBOARDS, CONVECTORS, DOORS, FRAMES, SOFFITS, FINISHES, ETC.
3. ALL WASTE MATERIALS OF ALL SUBCONTRACTORS SHALL BE REMOVED ON A DAILY BASIS, AND STRICT CONTROL SHALL BE EXERCISED OVER JOB CLEANING TO PREVENT ANY DIRT, DEBRIS OR DUST FROM AFFECTING ANY FINISHED AREAS WHETHER WITHIN OR OUTSIDE JOB SITE. BUILDING REFUSE FACILITIES SHALL NOT BE USED FOR THIS PURPOSE, UNLESS ARRANGEMENTS ARE MADE WITH LANDLORD DIRECTLY. DO NOT LET DEBRIS, RUBBISH, OR EXCESS CONSTRUCTION MATERIAL ACCUMULATE NOR OBSTRUCT EXITS AND EXIT PASSAGEWAYS.
4. THE CONTRACTOR SHALL REVIEW ALL EXISTING CONDUIT, WIRING, JUNCTION BOXES, ELECTRICAL COMMUNICATION, AND LIFE SAFETY DEVICES WITH THE LANDLORD AND OWNER PRIOR TO THE COMMENCEMENT OF ANY DEMOLITION WORK. ALL EXISTING ITEMS TO REMAIN SHALL BE PROPERLY MARKED AT THE PROJECT SITE IN ACCORDANCE WITH THE REQUIREMENTS OF THE LANDLORD AND OWNER.
5. COORDINATE WITH OWNER TO VERIFY THAT OWNER HAS REMOVED ALL ITEMS SCHEDULED OR PLANNED TO BE REMOVED BY OWNER.
6. THE CONTRACTOR SHALL PREPARE AN INVENTORY OF EXISTING ITEMS TO BE REUSED, RELOCATED, AND/OR RETURNED TO THE LANDLORD OR OWNER. THE CONTRACTOR SHALL COORDINATE WITH THE OWNER AND/OR LANDLORD TO DETERMINE ITEMS TO BE INVENTORIED, AND THE FORMAT OF THE INVENTORY PRIOR TO THE COMMENCEMENT OF WORK. CAREFULLY REMOVE AND NEATLY STORE AND PROTECT FROM DAMAGE ALL ITEMS IN THE CONTRACT DOCUMENTS TO BE REUSED AND OR RELOCATED AND LOCATION OF ON-SITE AND/OR OFF-SITE STORAGE.
7. ALL MATERIALS WHICH ARE NOT REQUIRED TO BE REUSED AND RELOCATED SHALL BECOME THE PROPERTY OF THE CONTRACTOR. THE CONTRACTOR IS TO BE RESPONSIBLE FOR ALL HAULING AND DISPOSAL OF DEBRIS IN ACCORDANCE WITH STATE LAWS AND LOCAL ORDINANCES.
8. REMOVE ALL CONSTRUCTION INDICATED IN THE DOCUMENTS AS EXISTING TO BE REMOVED, INCLUDING, BUT NOT LIMITED TO, FLOOR AND CEILING, HANGERS, STRAPS AND MISCELLANEOUS APPURTENANCES RELATED TO THE ITEMS BEING REMOVED.
9. WHERE PARTITIONS ARE BEING REMOVED, ALL ELECTRICAL OUTLETS AND SWITCHES SHALL BE DISCONNECTED AT SUPPLY JUNCTION BOXES, UNO.
10. WHERE PARTITIONS ARE BEING REMOVED, THERMOSTATS ARE TO BE REMOVED, STORED, AND RELOCATED AS INDICATED.
11. WHERE PLUMBING, WATER LINES, WASTES, AND VENTS ARE REMOVED, THEY SHALL BE DISCONNECTED AND CAPPED AT THE TAP CONNECTION; ADEQUATELY RECESS TO ACCOMMODATE PATCHING AND FINISH OF THE FINISH SURFACE.
12. WHERE EXISTING PARTITIONS ARE TO REMAIN, REMOVE EXISTING FINISH MATERIALS AND SURFACE MOUNTED ELEMENTS WHERE INDICATED.
13. WHERE TACKLESS CARPET AND/OR PAD ARE BEING REMOVED, REMOVE MECHANICAL ATTACHMENTS TO THE FLOOR.
14. WHERE GLUE DOWN CARPET, RESILIENT FLOORING OR OTHER GLUED FLOOR INSTALLATIONS ARE TO BE REMOVED, REMOVE ALL ADHESIVE TO LEAVE THE FLOOR WITH A SMOOTH FINISH.
15. REMOVE ALL LOW VOLTAGE CABLING AND CONNECTORS THAT ARE NOT REQUIRED FOR THE OPERATION OF THE FINAL LOW VOLTAGE SYSTEM.
16. ALL EMPTY CONDUITS TO BE REMOVED.
17. REPAIR DEMOLITION PERFORMED IN EXCESS OF THAT REQUIRED AT NO COST TO OWNER OR ARCHITECT. IMMEDIATELY REPAIR ANY DAMAGES CAUSED TO ADJACENT FACILITIES BY DEMOLITION OPERATIONS.
18. OFFER ALL DOORS AND FRAMES NOT DESIGNATED FOR REUSE TO THE OWNER PRIOR TO DEMOLITION.
19. ALL COVER PLATES TO BE SALVAGED AND REUSED. ANY NOT REUSED TO BE RETURNED TO OWNER.

FINISH PLAN GENERAL NOTES

1. REFER TO SHEET A64-01 FOR FINISH LEGEND.
2. TYPICAL FLOOR FINISH TO BE CPT-1, UNO.
3. TYPICAL WALL FINISH TO BE P-1, UNO.
4. TYPICAL WALL BASE TO BE RB-1, UNO.
5. DIMENSIONS, TARGETS, ETC. THAT ARE TYPICAL FOR MANY AREAS ARE NOTED ONLY ONCE.
6. ALL FINISHES INSIDE COAT AND STORAGE CLOSETS SHALL BE CONSISTENT WITH THE ADJACENT FINISHES, UNO. FLOOR COVERINGS SHALL CONTINUE FROM ADJACENT ROOM INTO CLOSETS.
7. PROVIDE A FINISH AT ALL AREAS THAT ARE EXPOSED BEHIND MILLWORK, FILE CABINETS, PANELING, ETC. DUE TO REVEALS, JOINTS, END CONDITIONS, ETC.

BASE:

10. NEW WALL BASE SHALL BE INSTALLED ON ALL NEW AND EXISTING WALLS AND COLUMNS, UNO.
11. RESILIENT WALL BASE AT ALL CARPETED AREAS SHALL BE STRAIGHT BASE, UNO. RESILIENT WALL BASE AT ALL HARD SURFACE FLOORS SHALL BE COVED BASE, UNO.
12. RESILIENT BASE SHALL BE ROLLED TO MINIMIZE JOINTS. BASE CORNER SECTIONS SHALL NOT BE LESS THAN 6 INCHES IN LENGTH AS MEASURED FROM THE CORNER.

PAINT:

13. PAINT REVEALS AND FILER PANELS TO MATCH ADJACENT FINISHES, UNO.
14. PAINT EXPOSED ELECTRICAL RACEWAYS TO MATCH THE ADJACENT WALL SURFACE.
15. PROVIDE A PRIME PAINT COAT IN UNEXPOSED AREAS COVERED BY MILLWORK, PANELING, AND OTHER FIXED ARCHITECTURAL ELEMENTS UNO.
16. DOORS TO RECEIVE PAINT SHALL BE PAINTED P-1.
17. HOLLOW METAL FRAMES SHALL BE PAINTED P-2.
18. VISION LITE FRAMES SHALL BE PAINTED P-2.
19. FIRE EXTINGUISHER CABINETS SHALL BE PAINTED TO MATCH ADJACENT WALL, UNO.
20. ACCESS PANELS SHALL BE PAINTED TO MATCH ADJACENT SURFACE.

FLOORING:

22. FLOORING TRANSITIONS AT DOORWAYS SHALL BE ALIGNED WITH THE FACE OF THE FRAME'S STOP FACING THE DOOR.

KEYNOTES

SHEET KEYNOTE LEGEND	

FINISH PLAN LEGEND

- DENOTES AREA "NOT IN CONTRACT"

CONSTRUCTION PLAN LEGEND

- DENOTES AREA "NOT IN CONTRACT"
- EXISTING CONSTRUCTION TO REMAIN
- NEW PARTITION
- 101A — DOOR TAG (NEW DOOR)
- EXISTING DOOR
- MILLWORK
- 1B — PARTITION TYPE TAG
- TEMPORARY CONSTRUCTION DUST PARTITION

CONSTRUCTION PLAN GENERAL NOTES

1. ALL NEW PARTITIONS SHALL BE TYPE A-41, UNO; REFER TO SHEET A61-01 FOR MORE INFORMATION. PARTITION TYPES AND FIRE RESISTIVE RATINGS INDICATED ARE TO BE CONTINUOUS FOR THE LENGTH AND HEIGHT OF THE PARTITION.
2. TYPICAL DIMENSIONS ARE TO THE FINISHED FACE OF PARTITION, UNO. PARTITIONS DIMENSIONED TO CENTERLINE OF STUD ARE SO NOTED.
3. LAYOUT PARTITIONS FOR ARCHITECT TO REVIEW FOR DESIGN INTENT. DO NOT PROCEED WITH INSTALLATION OF RUNNERS OR STUDS WITHOUT THIS REVIEW.
4. LOCATE DOORS 4" FROM FACE OF INTERSECTING PARTITION TO INSIDE EDGE OF DOOR FRAME, UNO.
5. THE CONTRACTOR SHALL PATCH AND REPAIR ALL EXISTING AND NEW WALL SURFACES AS REQUIRED PRIOR TO APPLYING FINISHES.
6. WHERE EXISTING WALL BASE OR WALLCOVERING HAS BEEN REMOVED, SKIM COAT WALL SURFACE TO MAKE SMOOTH TO MATCH ADJACENT CONSTRUCTION SO AS NOT TO TELEGRAPH THROUGH FOR NEW FINISH.
7. WHERE NEW PARTITION IS A CONTINUATION OF AN EXISTING PARTITION, THE FACE OF THE NEW PARTITION SHALL BE ALIGNED WITH THE FACE OF THE EXISTING PARTITION
8. WHERE PARTITION IS TO ALIGN WITH THE FACE OF AN EXISTING DRYWALL CORNER OR EDGE, REMOVE THE EXISTING CORNER BEAD, TAPE, APPLY JOINT COMPOUND, AND SAND SMOOTH. NEW AND EXISTING DRYWALL TO BE IN THE SAME PLANE WITH NO VISIBLE JOINTS.
9. THE CONTRACTOR SHALL SURVEY FLOOR ELEVATIONS TO DETERMINE SCOPE OF FLOOR LEVELING AND REMEDIAL REPAIR WORK. THE CONTRACTOR SHALL INCLUDE IN HIS SCOPE OF WORK ALL COSTS THAT ARE ASSOCIATED WITH FLOOR LEVELING AND ASSOCIATED REMEDIAL REPAIR WORK. FLOOR SHALL BE LEVEL WITHIN 1/4" IN 10'-0" RADIUS.
10. OPENINGS IN GYPSUM BOARD FOR ELECTRICAL AND COMMUNICATION RECEPTACLE, PIPING, DUCTWORK, AND OTHER PENETRATIONS SHALL MAINTAIN TIGHT TOLERANCES. EXPOSED EDGES SHALL BE COVERED BY TRIM PLATES OR ESCUTCHEONS.
11. PARTITIONS NOT DIMENSIONED ARE GENERALLY LOCATED BY ONE OF THE FOLLOWING CRITERIA:
A. CENTERLINE: CENTER OF PARTITION ALIGNS WITH THE CENTER OF GRIDLINE OR OBJECT CENTERLINE (SUCH AS A COLUMN OR MULLION). CENTER THE OVERALL PARTITION WIDTH RATHER THAN STUD WIDTH ON THE LINE.
B. ALIGN: LOCATE PARTITION FLUSH WITH FACE OF GYPSUM BOARD, OR OTHER SURFACE INDICATED.
C. MAINTAIN DIMENSIONS NOTED AS 'MINIMUM', 'CLEAR', OR 'HOLD'.
12. ALL EXISTING CONCRETE WALLS AND CONCRETE OR STEEL COLUMNS ARE TO BE FURRED-OUT WITH METAL STUDS OR HAT CHANNELS AS MINIMALLY AS REQUIRED FOR THE INSTALLATION OF CONDUIT, JUNCTION BOXES, ACCESSORIES, BLOCKING, ETC., EXCEPT WHERE THE WALLS AND COLUMN ENCLOSURES ARE REQUIRED TO ALIGN OR ARE DIMENSIONED TO THE CONTRARY.
13. PROVIDE METAL BACKING PLATES OR SOLID WOOD BLOCKING (FIRE TREATED) IN PARTITIONS FOR MILLWORK, FURNITURE AND WALL ATTACHED ITEMS. COORDINATE PLACEMENT OF BLOCKING PRIOR TO CLOSING WALLS.
14. EXPOSED WOOD SHALL BE FINISH GRADE HARDWOOD - FILLED, SANDED, PRIMED AND READY FOR SCHEDULED FINISH.
15. SEAL PENETRATIONS IN GYPSUM BOARD CONSTRUCTION ABOVE FINISHED CEILING TO PREVENT SOUNDS LEAKAGE AT ACOUSTICAL PARTITIONS AND AT DEMISING PARTITIONS, UNO. PENETRATIONS AND OPENINGS ABOVE CEILING IN EXISTING PARTITIONS SHALL BE FILLED OR SEALED TO MATCH EXISTING WALL CONSTRUCTION.
16. OPENINGS IN RATED WALLS, FLOORS, CEILINGS AND ROOF ASSEMBLIES SHALL BE SEALED WITH A FIRE RESISTIVE JOINT SYSTEM OR PROTECTED WITH A FIRE-RATED CHASE.
17. WHEN UNDIMENSIONED PARTITIONS APPEAR IN CONJUNCTION WITH DOOR OPENINGS, DOOR WIDTH AND DOOR FRAME DETAILS DETERMINE LOCATION OF ADJACENT WALLS AND FRAMES.

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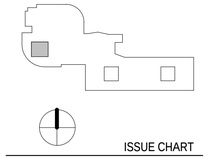
KEYPLAN



ISSUE CHART

MARK	ISSUE	DATE
1	ISSUE FOR BID & PERMIT	07MAY18

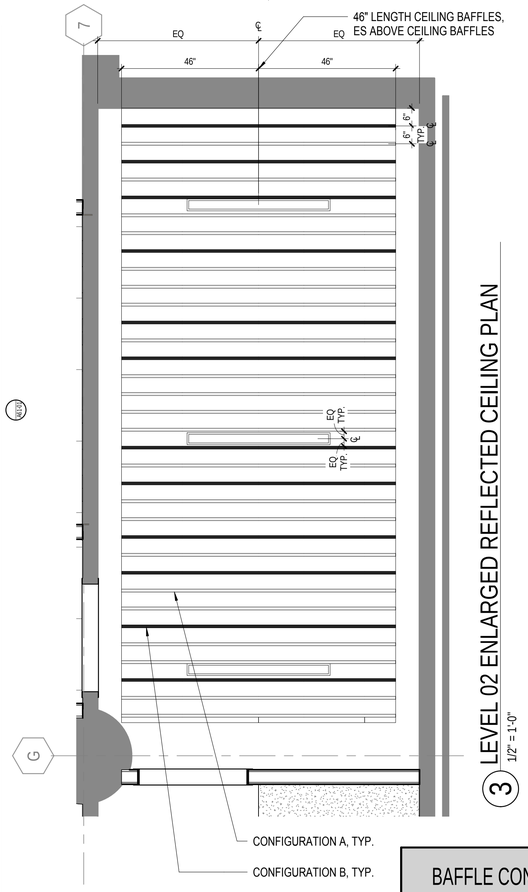
Job Number	024303.009
Drawn	Author
Checked	Checker
Approved	Approver

TITLE

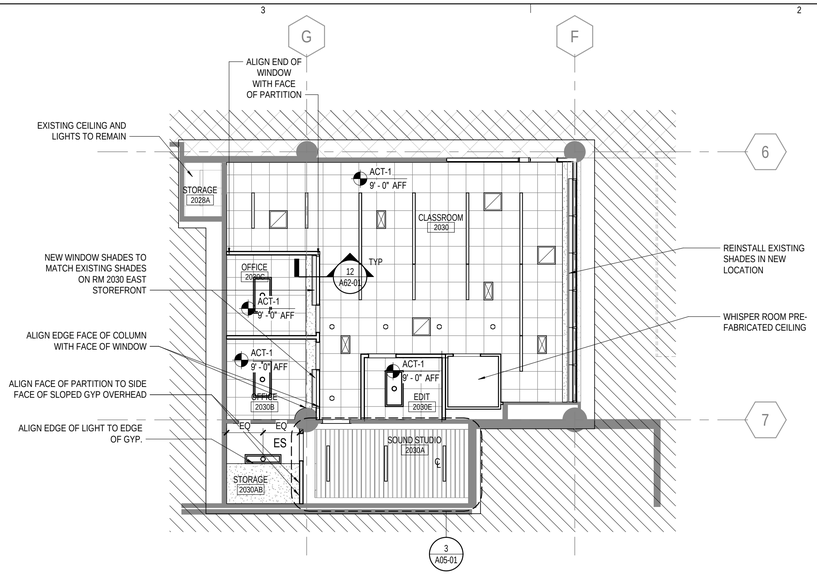
DEMO, CONSTRUCTION & FINISH PLANS

SHEET NUMBER

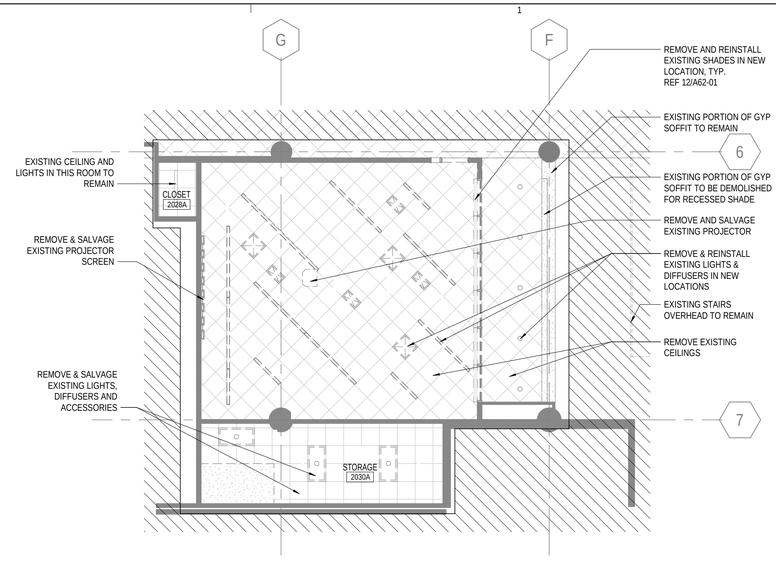
A04-01



3 LEVEL 02 ENLARGED REFLECTED CEILING PLAN
1/2" = 1'-0"



2 LEVEL 02 REFLECTED CEILING PLAN
1/8" = 1'-0"



1 LEVEL 02 DEMOLITION REFLECTED CEILING PLAN
1/8" = 1'-0"

DEMOLITION RCP LEGEND

	DENOTES AREA "NOT IN CONTRACT"
	EXISTING CONSTRUCTION TO REMAIN
	EXISTING CONSTRUCTION TO BE DEMOLISHED
EX	EXISTING FIXTURE TO REMAIN
ED	EXISTING FIXTURE TO BE DEMOLISHED
ER	EXISTING FIXTURE TO BE RELOCATED

DEMOLITION REFLECTED CEILING PLAN GENERAL NOTES

1. THE CONTRACTOR SHALL FIELD SURVEY THE SITE OF PROPOSED WORK TO DETERMINE THE EXTENT AND NATURE OF THE DEMOLITION WORK. REFER TO ALL CONTRACT DOCUMENTS FOR ADDITIONAL REQUIREMENTS AND SCOPE OF DEMOLITION WORK. REFER TO THE MECHANICAL, ELECTRICAL, AND PLUMBING DRAWINGS FOR ADDITIONAL DEMOLITION REQUIREMENTS.

2. PROTECTION SHALL BE PROVIDED FOR BASE BUILDING CONSTRUCTION AND ALL EXISTING CONSTRUCTION TO REMAIN INCLUDING, BUT NOT LIMITED TO, FLOORING, PARTITIONS, WINDOW TREATMENTS, BASEBOARDS, CONVECTORS, DOORS, FRAMES, SOFFITS, FINISHES, ETC.

3. ALL WASTE MATERIALS OF ALL SUBCONTRACTORS SHALL BE REMOVED ON A DAILY BASIS, AND STRICT CONTROL SHALL BE EXERCISED OVER JOB CLEANING TO PREVENT ANY DIRT, DEBRIS OR DUST FROM AFFECTING ANY FINISHED AREAS WHETHER WITHIN OR OUTSIDE JOB SITE. BUILDING REFUSE FACILITIES SHALL NOT BE USED FOR THIS PURPOSE, UNLESS ARRANGEMENTS ARE MADE WITH LANDLORD DIRECTLY. DO NOT LET DEBRIS, RUBBISH, OR EXCESS CONSTRUCTION MATERIAL ACCUMULATE NOR OBSTRUCT EXITS AND EXIT PASSAGEWAYS.

4. THE CONTRACTOR SHALL REVIEW ALL EXISTING CONDUIT, WIRING, JUNCTION BOXES, ELECTRICAL COMMUNICATION, AND LIFE SAFETY DEVICES WITH THE LANDLORD AND OWNER PRIOR TO THE COMMENCEMENT OF ANY DEMOLITION WORK. ALL EXISTING ITEMS TO REMAIN SHALL BE PROPERLY MARKED AT THE PROJECT SITE IN ACCORDANCE WITH THE REQUIREMENTS OF THE LANDLORD AND OWNER.

5. COORDINATE WITH OWNER TO VERIFY THAT OWNER HAS REMOVED ALL ITEMS SCHEDULED OR PLANNED TO BE REMOVED BY OWNER.

6. THE CONTRACTOR SHALL PREPARE AN INVENTORY OF EXISTING ITEMS TO BE REUSED, RELOCATED, AND/OR RETURNED TO THE LANDLORD OR OWNER. THE CONTRACTOR SHALL COORDINATE WITH THE OWNER AND/OR LANDLORD TO DETERMINE ITEMS TO BE INVENTORIED, AND THE FORMAT OF THE INVENTORY PRIOR TO THE COMMENCEMENT OF WORK. CAREFULLY REMOVE AND NEATLY STORE AND PROTECT FROM DAMAGE ALL ITEMS IN THE CONTRACT DOCUMENTS TO BE REUSED AND OR RELOCATED AND LOCATION OF ON-SITE AND/OR OFF-SITE STORAGE.

7. ALL MATERIALS WHICH ARE NOT REQUIRED TO BE REUSED AND RELOCATED SHALL BECOME THE PROPERTY OF THE CONTRACTOR. THE CONTRACTOR IS TO BE RESPONSIBLE FOR ALL HAULING AND DISPOSAL OF DEBRIS IN ACCORDANCE WITH STATE LAWS AND LOCAL ORDINANCES.

8. REMOVE ALL CONSTRUCTION INDICATED IN THE DOCUMENTS AS EXISTING TO BE REMOVED, INCLUDING, BUT NOT LIMITED TO, FLOOR AND CEILING, HANGERS, STRAPS AND MISCELLANEOUS APPURTENANCES RELATED TO THE ITEMS BEING REMOVED.

9. WHERE PLUMBING, WATER LINES, WASTES, AND VENTS ARE REMOVED, THEY SHALL BE DISCONNECTED AND CAPPED AT THE TAP CONNECTION; ADEQUATELY RECESS TO ACCOMMODATE PATCHING AND FINISH OF THE FINISH SURFACE.

10. REMOVE ALL LOW VOLTAGE CABLING AND CONNECTORS THAT ARE NOT REQUIRED FOR THE OPERATION OF THE FINAL LOW VOLTAGE SYSTEM.

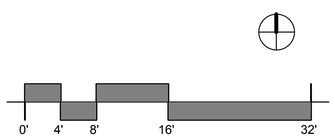
11. ALL EMPTY CONDUITS TO BE REMOVED.

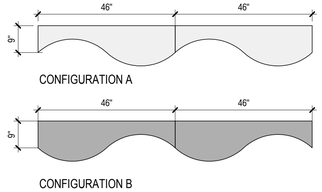
12. REPAIR DEMOLITION PERFORMED IN EXCESS OF THAT REQUIRED AT NO COST TO OWNER OR ARCHITECT. IMMEDIATELY REPAIR ANY DAMAGES CAUSED TO ADJACENT FACILITIES BY DEMOLITION OPERATIONS.

13. ALL LIGHT FIXTURES AND COVER PLATES DESIGNATED FOR DEMOLITION TO BE REUSED, REF: A12-01.

14. ALL UNUSED DEMOLISHED LIGHT FIXTURES TO BE SALVAGED AND RETURNED TO OWNER.

BAFFLE CONFIGURATION





SHEET REFLECTED CEILING PLAN KEYNOTES

SHEET KEYNOTE LEGEND	

REFLECTED CEILING PLAN LEGEND

	DENOTES AREA "NOT IN CONTRACT"
	ACOUSTICAL PANEL CEILING
	GYPSUM PLASTER CEILING
	SUPPLY DIFFUSER
	RETURN GRILLE
S	CEILING MOUNTED SPEAKER
	CEILING MOUNTED PROJECTOR
	EXIT SIGN
ES	EXPOSED STRUCTURE

LIGHT FIXTURE SYMBOLS

	2x4 FIXTURE
	2X2 FIXTURE
	6" DOWNLIGHT
	RECTANGULAR RECESSED WALLWASH
	STRIP FIXTURE
	RECESSED STRIP FIXTURE
	INDIRECT PENDANT FIXTURE

CEILING MATERIAL
XXX-X
1' - 0"
CEILING HEIGHT

CEILING MOUNTED POWER/COMMUNICATION SYMBOLS

V	VOICE/DATA OUTLET
	DUPLEX POWER RECEPTACLE
J	POWER JUNCTION BOX
AV	AUDIO/VISUAL RECEPTACLE
EX	EXISTING FIXTURE TO REMAIN
ER	EXISTING FIXTURE TO BE RELOCATED

SWITCH SYMBOLS

$	SWITCH
$b	SWITCH DESIGNATION FOR SPECIFIED LIGHT FIXTURES
$PS	PROJECTION SCREEN SWITCH
$3W	3-WAY LIGHT SWITCH
$D	DIMMER SWITCH

REFLECTED CEILING PLAN GENERAL NOTES

1. ALL CEILING HEIGHTS TO BE 9'-0", UNO.

2. ALL CEILINGS TO BE ACT-1, UNO.

3. SEE ENGINEERING DRAWINGS FOR LOCATION OF ALL EXIT SIGNS, DIFFUSERS, FIRE PROTECTION SPRINKLER HEADS, SPEAKERS, EMERGENCY LIGHT FIXTURES, ETC.

4. REFER TO POWER AND COMMUNICATION PLANS FOR PLACEMENT OF ADDITIONAL CEILING MOUNTED ELECTRICAL DEVICES. VERIFY WITH ARCHITECT LOCATION OF VISIBLE CEILING ELEMENTS NOT SHOWN ON ARCHITECTURAL DRAWINGS PRIOR TO INSTALLATION.

5. CENTER ALL CEILING MOUNTED LIGHT FIXTURES, LIFE SAFETY DEVICES, SPEAKERS, SPRINKLERS AND OTHER ELEMENTS IN THE CENTER OF THE ACOUSTIC TILE IN BOTH DIRECTIONS, UNO.

6. LIGHTING FIXTURES ARE DIMENSIONED TO CENTER OF FIXTURE, UNLESS OTHERWISE NOTED.

7. ALIGN NEW LIGHT FIXTURES WITH EXISTING LIGHT FIXTURES, TYP.

8. IF LOCATION DIMENSIONS ARE NOT INDICATED, FINAL POSITION OF ANY/ALL EXPOSED ELEMENTS SHALL BE COORDINATED WITH ARCHITECT.

9. CENTER ALL ACT CEILINGS IN ROOM, UNO. CENTER FIXTURES IN CORRIDOR, UNO.

10. COORDINATE EXIT SIGNS W/ DOOR SWINGS.

11. PROJECTORS, SCREENS AND PROJECTION MOUNTING BRACKETS BY OWNER, UNO.

12. FINAL LOCATION OF PROJECTOR TO BE COORDINATED WITH OWNER EQUIPMENT SELECTION & IT DEPARTMENT.

13. PROJECTORS TO BE CEILING MOUNTED, CENTERED ON PROJECTION SCREENS AND FREE FROM OBSTRUCTION BY PENDANT LIGHT FIXTURES, UNO. SEE CONSTRUCTION PLANS FOR DIMENSIONS FOR SCREENS NOT CENTERED IN ROOM.

14. LOCATE ACCESS PANELS AS INDICATED ON THE DRAWINGS. FOR ACCESS PANELS NOT SHOWN BUT REQUIRED BY PROVISIONS OF THE CONTRACT DOCUMENTS, LOCATE IN ACCORDANCE WITH APPLICABLE CODES. FIELD VERIFY LOCATION OF ACCESS PANELS, AND MARK ON SLAB FOR ARCHITECT'S REVIEW.

15. VERIFY THAT CEILING AND ABOVE-CEILING ELEMENTS FIT IN PLENUM AS INDICATED BEFORE PROCEEDING WITH FRAMING CEILING. NOTIFY ARCHITECT IF RELOCATION IS REQUIRED OR IF SHIFTING OF GRID OR OTHER ELEMENT ARE NECESSARY.

16. INSTALL SIGHT BAFFLES AT RETURN AIR SLOTS. PAINT ANY NEW OR EXISTING AREA OR ITEM ABOVE THE CEILING VISIBLE FROM THE ROOM SIDE, INCLUDING DUCTWORK, NON-SPECULAR BLACK.

17. CEILING SUPPORT SYSTEM ARE NOT DESIGNED OR INTENDED TO SUPPORT THE WEIGHT OF ADDITIONAL EQUIPMENT, CABLE, CONDUIT, LIGHTS, MECHANICAL EQUIPMENT OR OTHER CONSTRUCTION. SUPPORT THESE ITEMS INDEPENDENTLY FROM THE STRUCTURE ABOVE.

18. DO NOT HANG (SUPPORT) ANY ITEMS FROM METAL ROOF DECK.

19. REFER TO MOUNTING DIAGRAMS AND ELEVATIONS FOR LOCATION OF SWITCHES, DIMMERS, THERMOSTATS AND OUTLETS.

20. GANG SWITCHES UNDER A SINGLE COVERPLATE. SWITCHES THAT CANNOT BE GANGED TOGETHER SHALL BE LOCATED AS CLOSE TOGETHER AS POSSIBLE AND MOUNTED AT THE SAME HEIGHT.

21. ALL POWER CORDS AND CABLE SUPPORTS FOR PENDANT HUNG LIGHT FIXTURES SHALL BE PLUMB AND TIGHT.

22. WHERE THE EXISTING ACOUSTIC CEILING IS REMOVED, PATCH THE EXISTING CEILING GRID AND PROVIDE CEILING TILES TO MATCH THE EXISTING CEILING TILES THAT REMAIN.

23. THE CONTRACTOR SHALL FIELD SURVEY THE SITE OF THE PROPOSED WORK TO DETERMINE EXTENT AND NATURE OF THE DEMOLITION WORK.

24. WHERE INDICATED OR INFERRED, REMOVE THE EXISTING ACOUSTIC CEILING.

25. WHERE INDICATED OR INFERRED, REMOVE EXISTING LIGHT FIXTURES, SALVAGE FOR REINSTALLATION UNDER THIS CONTRACT; TURN OVER EXCESS FIXTURES TO THE OWNER. COORDINATE WITH ENGINEERING DRAWINGS.

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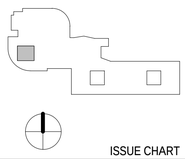
KEYPLAN



ISSUE CHART

MARK	ISSUE	DATE
1	ISSUE FOR BID & PERMIT	07MAY18

Job Number	024303.009
Drawn	Author
Checked	Checker
Approved	Approver

TITLE

DEMO RCP & REFLECTED CEILING PLANS

SHEET NUMBER

A05-01

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FINISH SCHEDULE - BASE

FINISH TYPE	TAG	MANUFACTURER	STYLE	COLOR / FINISH	CONTACT	COMMENTS
RESILIENT BASE	RB-1	JOHNSONITE	TRADITIONAL TOELESS 4"	4" , #63, BURNT UMBER SATIN	Scianna, Enza <Enza.Scianna@tarkett.com>	STRAIGHT AT CARPET, COVE AT HARD SURFACE - MATCH EXISTING

FINISH SCHEDULE - CEILING

FINISH TYPE	TAG	MANUFACTURER	STYLE	COLOR / FINISH	CONTACT	COMMENTS
ACOUSTICAL PANEL CEILING	ACT-1	ARMSTRONG CHICAGO METALLIC	ULTIMA	24 X 24 X 3/4 TEGULAR EDGE, ULTIMA WHITE	Tabitha McCarthy <tsmccarthy@armstrongceilings.com>	NRC 0.70, MATCH EXISTING
ACOUSTICAL BAFFLE CEILING	BAFF-1	UNIKA VAEV	ECOUSTIC ONDULER	PEWTER	Chrissy Thompson <chrissy@therudergroup.com>	NCR 0.50, 2 48" PANEL BOOKEND MATCH

FINISH SCHEDULE - FLOORING

FINISH TYPE	TAG	MANUFACTURER	STYLE	COLOR / FINISH	CONTACT	COMMENTS
CARPET TILE	CPT-3	TANDUS	HAIKU II #02127	DARK CLOUD 23024	Brandstedt, Nicolette <Nicolette.Brandstedt@tarkett.com>	EXISTING TO REINSTALL PLUS NEW, OFCI FOR ADDITIONAL CARPET NEEDED

FINISH SCHEDULE - LAMINATE

FINISH TYPE	TAG	MANUFACTURER	STYLE	COLOR / FINISH	CONTACT	COMMENTS
LAMINATE	PL-1	FORMICA	BASIC METAL	BRUSHED PEWTER ALUMINUM	mindy.sinzheimer@formica.com	COUNTER TOP LAMINATE

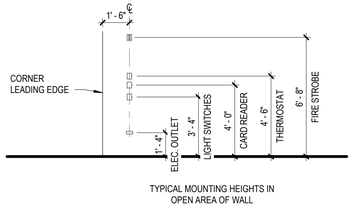
FINISH SCHEDULE - WALL

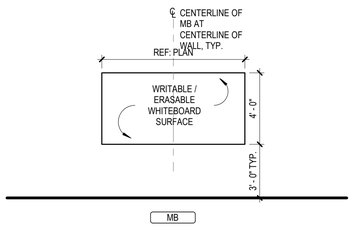
FINISH TYPE	TAG	MANUFACTURER	STYLE	COLOR / FINISH	CONTACT	COMMENTS
WALL COVERING	AWP-1	UNIKA VAEV	E3 TILE - ECOUSTIC FELT, MEDIUM	CREAM & PEWTER	Chrissy Thompson <chrissy@therudergroup.com>	BACKING COLOR TBD BY ARCHITECT
PAINT	P-1	BENJAMIN MOORE	WHITE DOVE	OC-17	jason.walker@benjaminmoore.com	
PAINT	P-2	BENJAMIN MOORE	MANCHESTER TAN	HC-81	jason.walker@benjaminmoore.com	
PAINT	P-4	BENJAMIN MOORE	SANDY HOOK GRAY	HC-108	jason.walker@benjaminmoore.com	
PAINT	P-5	BENJAMIN MOORE	SMOKE GRAY	2120-40	jason.walker@benjaminmoore.com	

MOUNTING DIMENSIONS

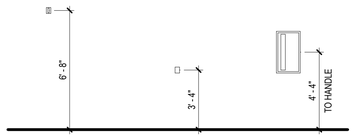
REQUIRED REACH RANGES TO OPERATION
SIDE REACH:
1'-3" TO 4'-0" AFF WITH ≤ 10" DEEP, ≤ 2'-10" HIGH OBSTRUCTION
≤ 3'-10" AFF WHERE 10" - 24" DEEP, ≤ 2'-10" HIGH OBSTRUCTION (E.G. COUNTERTOP)

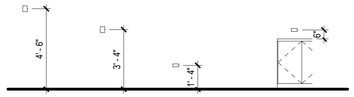
FRONT REACH:
1'-3" TO 4'-0" AFF WHERE NO OBSTRUCTION OCCURS
4'-0" AFF MAX WITH ≤ 1'-8" DEEP OBSTRUCTION (E.G. COUNTERTOP)
3'-8" AFF MAX WITH 1'-8" TO 2'-1" DEEP OBSTRUCTION (E.G. COUNTERTOP)



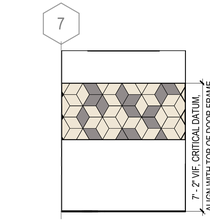


MOUNTING DIMENSIONS

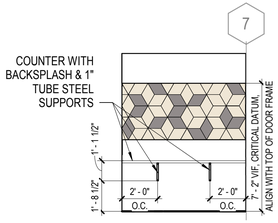




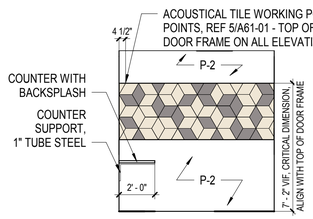
NOTE:
MOUNT ELECTRICAL OUTLETS TO CENTERLINE OF ANY CABINETS, MB OR OTHER ADJACENT BUILT-IN ITEMS, UNO



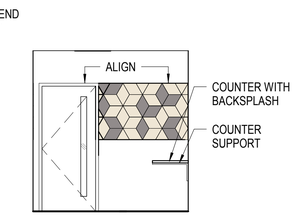
7 2030E WEST
1/4" = 1'-0"



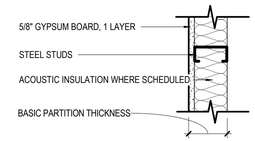
6 2030E EAST
1/4" = 1'-0"



4 2030E SOUTH
1/4" = 1'-0"



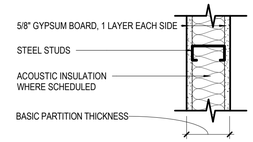
5 2030E NORTH
1/4" = 1'-0"



D

	D1_	STC	D2_	STC	D3_	STC	D4_	STC	D5_	STC	D6_	STC	D7_	STC	D8_	STC	D9_	STC	HEAD DETAIL
NON-RATED WITH GYP BD TO STR ABOVE	D11	27	D21	29	D31	27	D41	30	D51	27	D61	30	D71	27	D81	31	D91	26	3 / A62-01
NON-RATED TO 6" ABOVE CEILING	D12		D22		D32		D42		D52		D62		D72		D82		D92		1 / A62-01
NON-RATED TO FINISHED CEILING	D13		D23		D33		D43		D53		D63		D73		D83		D93		- / ---
STUD SIZE	2 1/2"		2 1/2"		3 5/8"		3 5/8"		4"		4"		6"		6"		1 5/8"		
BASIC PARTITION THICKNESS (EXCLUDING ADDITIONAL FINISHES OR PER NOTE 4)	3 1/8"		3 1/8"		4 1/4"		4 1/4"		4 5/8"		4 5/8"		6 5/8"		6 5/8"		2 1/4"		
ACOUSTICAL INSULATION	NO		YES		NO		YES		NO		YES		NO		YES		YES		
FIRE TEST NUMBER (WHERE APPLICABLE)	-		-		-		-		-		-		-		-		-		

NOTES:
1. STUD SPACING SHALL BE 24" ON CENTER UNLESS NOTED OTHERWISE.
2. STC ARE PREDICTED USING THE "INSUL" COMPUTER PROGRAM AND/OR MANUFACTURER TEST DATA.
3. CONSTRUCTED ASSEMBLY MUST MEET INDICATED STC RATING, WHERE APPLICABLE.



A

	A1_	STC	A2_	STC	A3_	STC	A4_	STC	A5_	STC	A6_	STC	A7_	STC	A8_	STC	HEAD DETAIL
1-HR RATED WITH GYP BD TO STR ABOVE			A20	46	A30	39	A40	47	A50	39	A60	47	A70	40	A80	48	2 / A62-01
NON-RATED W/ GYP BD TO STR ABOVE	A11	39	A21	46	A31	39	A41	47	A51	39	A61	47	A71	40	A81	48	3 / A62-01
NON-RATED TO 6" ABOVE CEILING	A12		A22		A32		A42		A52		A62		A72		A82		1 / A62-01
NON-RATED TO FINISHED CEILING	A13		A23		A33		A43		A53		A63		A73		A83		- / ---
PARTIAL HEIGHT	A14		A24		A34		A44		A54		A64		A74		A84		
STUD SIZE	2 1/2"		2 1/2"		3 5/8"		3 5/8"		4"		4"		6"		6"		
BASIC PARTITION THICKNESS (EXCLUDING ADDITIONAL FINISHES OR PER NOTE 4)	3 3/4"		3 3/4"		4 7/8"		4 7/8"		5 1/4"		5 1/4"		7 1/4"		7 1/4"		
ACOUSTICAL INSULATION	NO		YES		NO		YES		NO		YES*		NO		YES		
FIRE TEST NUMBER (WHERE APPLICABLE)	-		UL #U419		UL #U465		UL #U465		UL #U465		UL #U465		UL #U465		UL #U465		

NOTES:
1. STUD SPACING SHALL BE 24" ON CENTER UNLESS NOTED OTHERWISE.
2. STC ARE PREDICTED USING THE "INSUL" COMPUTER PROGRAM AND/OR MANUFACTURER TEST DATA.
3. CONSTRUCTED ASSEMBLY MUST MEET INDICATED STC RATING, WHERE APPLICABLE.

FIRE-RATED PARTITION NOTES

THE FOLLOWING NOTES APPLY TO ALL PARTITIONS DESIGNATED AS FIRE-RATED:

1. FIRE-RATED PARTITIONS MUST BE CONSTRUCTED TO ENSURE CONTINUITY OF REQUIRED FIRE RATING(S). MORE STRINGENT FIRE RATINGS REQUIRED PRIORITY OF CONTINUITY OVER LESS STRINGENT FIRE RATINGS. FIRE-RATED PARTITION CONSTRUCTION MUST BE COMPLETE PRIOR TO ATTACHMENT OF INTERSECTING NON-RATED PARTITIONS.
2. GAGES, SIZES, FASTENERS, AND OTHER QUANTITATIVE NOTES AND SPECIFICATIONS ARE MINIMUMS FOR FIRE-RATING REQUIREMENTS. IF CONFLICTING WITH OTHER SPECS OR DRAWINGS, THE MORE STRINGENT NOTE/SPEC TAKES PRECEDENCE.
3. HORIZONTAL JOINTS BETWEEN VERTICALLY ORIENTED GYPSUM BOARD SHEETS SHALL BE BACKED WITH HORIZONTAL STUDS SPANNING BETWEEN VERTICAL STUDS. MATCH VERTICAL WALL STUDS IN GAGE, SIZE, AND FASTENING.
4. NON-METALLIC ELECTRICAL OUTLET BOXES SHALL NOT BE INSTALLED ON OPPOSITE SIDES OF FIRE-RATED WALLS UNLESS CLASSIFIED FOR FIRE RESISTANCE AS DEFINED BY UL SECTION "OUTLET BOXES AND FITTINGS CLASSIFIED FOR FIRE RESISTANCE."
5. METALLIC ELECTRICAL OUTLET BOXES SHALL NOT EXCEED 16 SQUARE INCHES WITHIN THE WALL FACE. NOR EXCEED 100 SQUARE INCHES AGGREGATE SURFACE AREA PER 100 SQUARE FEET OF WALL SURFACE. MAINTAIN MAXIMUM OF 1/8" CLEARANCE BETWEEN BOX AND GYPSUM BOARD.
6. ALL PENETRATIONS SHALL BE SEALED PER APPROPRIATE UL TESTED METHODS, AS DEFINED BY UL SECTION "THROUGH-PENETRATION FIRESTOP SYSTEMS."
7. ALL SCREWS SHALL MEET REQUIREMENTS OF ASTM C1002 OR ASTM C954.

ACOUSTICAL PARTITION NOTES

THE FOLLOWING NOTES APPLY TO ALL PARTITIONS DESIGNATED TO HAVE A SOUND TRANSMISSION CLASS (STC) RATING ON THE PARTITION CHARTS.

1. ALL ACOUSTICAL PARTITIONS SHALL BE CONSTRUCTED IN ACCORDANCE TO THE REFERENCED TEST, WHERE APPLICABLE.
2. STAGGER AND SEAL ALL JOINTS ON ALL PARTITIONS WITH MULTIPLE LAYERS OF GYPSUM BOARD.
3. SEAL PARTITIONS AIR TIGHT AT FLOORS, SIDES, AND CEILINGS ON BOTH SIDES WITH NON-HARDENING ACOUSTICAL SEALANT.
4. ALL BATTS AND BLANKETS IN RATED PARTITIONS MUST BEAR THE REQUIRED (IF APPLICABLE) UL CLASSIFICATION MARKING AS TO FIRE-RESISTANCE.
5. AVOID COMPRESSING ACOUSTICAL BATT INSULATION AT BLOCKING AND RECESSED ITEMS IN ACOUSTIC RATED WALLS
6. ACOUSTICALLY SEAL ALL WALL INTERSECTIONS, CONTROL JOINTS, CONDUIT, STRUCTURAL, DUCT AND PIPE PENETRATIONS UNLESS THE PARTITION IS ALSO FIRE-RATED, IN WHICH CASE FIRE-RATED DETAIL REQUIREMENTS TAKE PRECEDENCE FOR PENETRATION SEALING.
7. ELECTRICAL BOXES ON OPPOSITE SIDES OF ACOUSTICAL PARTITIONS SHOULD BE SEPARATED BY A MINIMUM OF ONE STUD AND FULLY SEALED. SEAL PRIOR TO CLOSING IN PARTITIONS AND PRIOR TO INSTALLING DEVICES AND COVER PLATES. VERIFY SEAL COMPLIANCE WITH STC REFERENCE TEST WHERE APPLICABLE.

GENERAL PARTITION NOTES

1. REFER TO A11-01 FOR FINAL FINISHES ON PARTITIONS.
2. WHEN BLOCKING IS PROVIDED IN A PARTITION, USE A MINIMUM 0.033" (20 GA) STUD.
3. ISOLATE NON-LOAD BEARING FRAMING FROM STRUCTURAL ELEMENTS TO PREVENT THE TRANSFER OF LOAD TO PARTITION FRAMING. STOP STUDS 3/4" BELOW CEILING RUNNER (TOP TRACK) TO ALLOW FOR VERTICAL EXPANSION. SET TOP TRACK 1" BELOW DEFLECTION CHANNEL. DO NOT ATTACH STUDS TO TOP TRACK. DO NOT ATTACH GYPSUM BOARD TO THE DEFLECTION TRACK. THIS MAY ALSO BE ACHIEVED, AT THE CONTRACTOR'S OPTION, BY UTILIZING THE PROPRIETARY SYSTEM DESCRIBED IN THE SPECIFICATIONS.

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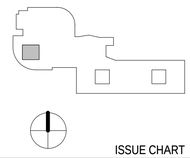
KEYPLAN



ISSUE CHART

MARK	ISSUE	DATE
1	ISSUE FOR BID & PERMIT	07MAY18

Job Number	024303.009
Drawn	Author
Checked	Checker
Approved	Approver

TITLE

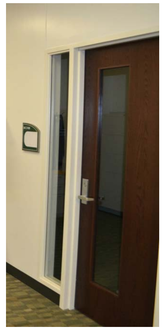
INTERIOR SCHEDULES & PARTITION TYPES

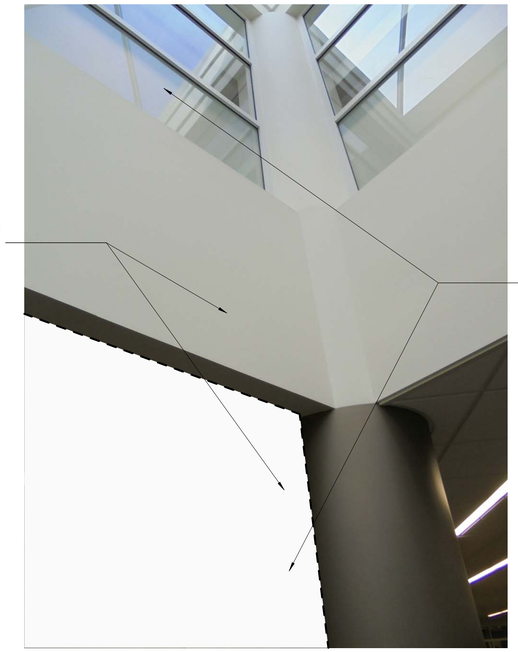
SHEET NUMBER

A61-01

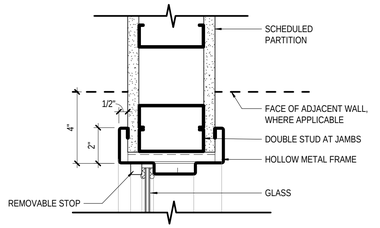
DOOR SCHEDULE

DOOR IDENTIFICATION		DOOR							FRAME						HARDWARE SET NO	REMARKS
DOOR NO	ROOM NAME	SIZE			TYPE	MATL	FINISH	GLZ	TYPE	MATL	FINISH	DETAILS				
		W	HT	THK								HEAD	JAMB	SILL		
2030		3' - 0"	7' - 0"	1 3/4"	N	REUSE EXISTING DOOR AND FRAME	REUSE EXISTING DOOR AND FRAME	REUSE EXISTING DOOR AND FRAME	2 - REUSE EXISTING DOOR AND FRAME	REUSE EXISTING DOOR AND FRAME	PNT				1.0	
2030A	SOUND STUDIO	3' - 0"	7' - 0"	1 3/4"	N	SC:WD	STN	GL-1	3	HM	PNT	4/A62-01	4/A62-01		4.0	
2030AB	STORAGE	3' - 0"	7' - 0"	1 3/4"	F	SC:WD	STN	-	3	HM	PNT	4/A62-01	4/A62-01		2.0	
2030B	OFFICE	3' - 0"	7' - 0"	1 3/4"	F	SC:WD	STN	-	1	HM	PNT	4/A62-01	4/A62-01, 8/A62-01		5.0	REF 12/A62-01 FOR ROLLER SHADE DETAIL AT WINDOW
2030C	OFFICE	3' - 0"	7' - 0"	1 3/4"	F	SC:WD	STN	-	1	HM	PNT	4/A62-01	4/A62-01, 8/A62-01		5.0	REF 12/A62-01 FOR ROLLER SHADE DETAIL AT WINDOW
2030E	EDIT	3' - 0"	7' - 0"	1 3/4"	N	SC:WD	STN	GL-1	3	HM	PNT	4/A62-01	4/A62-01		3.0	

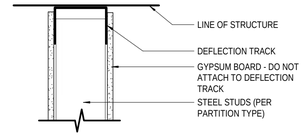




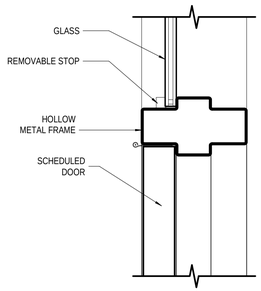
13 ATRIUM VIEW OUTSIDE ROOM - LOCATION OF MOVED STOREFRONT
1 1/2" = 1'-0"



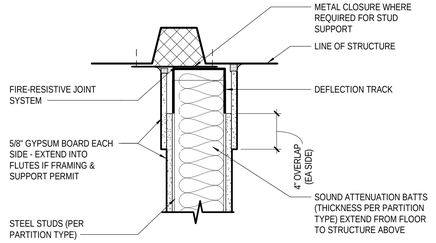
6 HM GLAZING JAMB/HEAD/SILL
3" = 1'-0"



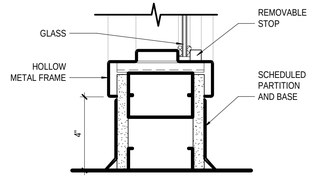
3 PARTITION HEAD SECTION
1 1/2" = 1'-0"



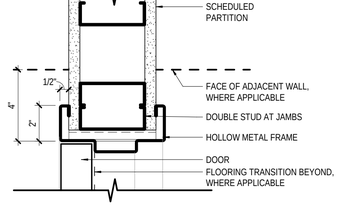
8 HM GLAZING-DOOR JAMB/HEAD
3" = 1'-0"



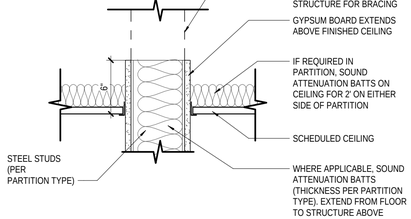
2 PARTITION HEAD SECTION
1 1/2" = 1'-0"



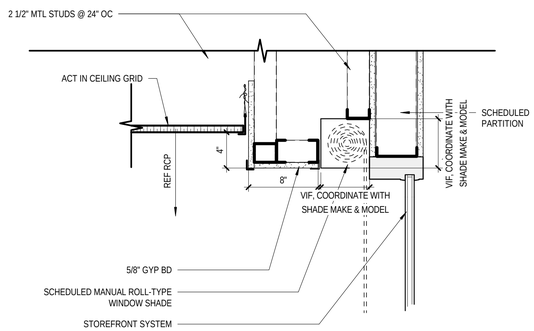
7 HM SILL AT BASE
3" = 1'-0"



4 HM DOOR JAMB/HEAD
3" = 1'-0"



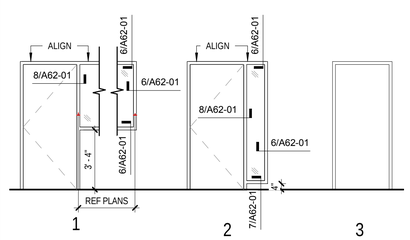
1 PARTITION HEAD SECTION
1 1/2" = 1'-0"



12 CEILING SHADE DETAIL AT STOREFRONT
1 1/2" = 1'-0"

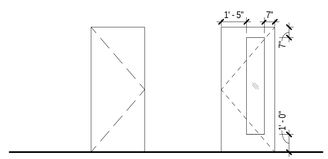
FRAME TYPES LEGEND

KEYED FROM 'FRAME TYPE' COLUMN OF DOOR SCHEDULE.



DOOR TYPES LEGEND

KEYED FROM 'DOOR TYPE' COLUMN OF DOOR SCHEDULE.



GENERAL DOOR NOTES

1. ALL WOOD DOORS SHALL BE 1-3/4" THICK SOLID CORE.
2. COORDINATE KEYING WITH OWNER/TENANT AND LANDLORD.
3. ALL LOCKSETS SHALL HAVE INTERCHANGEABLE CORES.
4. PROVIDE A STRIKE BOX AT ALL DOOR STRIKES.
5. ALL DOORS & HARDWARE SHALL COMPLY WITH ALL APPLICABLE ACCESSIBILITY CODES.
6. COORDINATE SECURITY REQUIREMENTS & PROGRAMMING WITH OWNER/TENANT, SECURITY/POWER DRAWINGS, & SECURITY VENDOR PRIOR TO FABRICATION OF DOORS AND FRAMES.
7. ALL ELECTRIFIED NON-MAGNETIC LOCKSETS SHALL BE FAIL-SECURE UNLESS NOTED OTHERWISE, AND INCLUDE MANUAL KEY OVERRIDE MATCHING BASE BUILDING KEYWAY. SEE NOTE BELOW FOR ELECTRO-MAGNETIC LOCK REQUIREMENTS.
8. PROVIDE Z-BRACKETS FOR ALL IN-SWINGING DOORS WITH ELECTRO-MAGNETIC LOCKS.
9. ALL DOORS WITH ELECTRO-MAGNETIC LOCKS SHALL COMPLY WITH THE FOLLOWING CRITERIA:
   (A) DOOR/LOCK SHALL UNLOCK WITH ACTIVATION OF BULIDING FIRE ALARM/DETECTION SYSTEM SYSTEM.
   (B) DOOR/LOCK SHALL UNLOCK UPON TROUBLE OR ABNORMAL CONDITION IN THE SUPERVISORY SYSTEM OF THE BUILDING FIRE ALARM/DETECTION SYSTEM.
   (C) DOOR/LOCK SHALL BE FAIL-SAFE – UNLOCK WITH LOSS OF POWER TO LOCK OR BUILDING
   (D) DOOR/LOCK SHALL NOT HAVE BACK-UP POWER
   (E) PROVIDE PNEUMATIC BYPASS PUSH BUTTON MARKED "PUSH TO EXIT" WHICH UNLOCKS DOOR BY INTERRUPTING POWER TO THE LOCK FOR MIN 30 SECS. BUTTON SHALL BE WITHIN 5' OF DOOR AND MOUNTED 42" ABOVE FLOOR.
   (F) PROVIDE KEY OVERRIDE AT SECURE SIDE OF THE DOOR
   (G) NO ELECTRO-MAGNETIC LOCKING DEVICES SHALL BE INSTALLED OR OPERATED WITHOUT PRIOR APPROVAL OF THE FIRE PREVENTION BUREAU OR CORRESPONDING AHJ.

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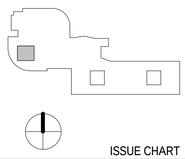
KEYPLAN



ISSUE CHART

MARK	ISSUE	DATE
1	ISSUE FOR BID & PERMIT	07MAY18

Job Number	024303.009
Drawn	Author
Checked	Checker
Approved	Approver

TITLE

DOOR SCHEDULE + DETAILS/INT. DETAILS

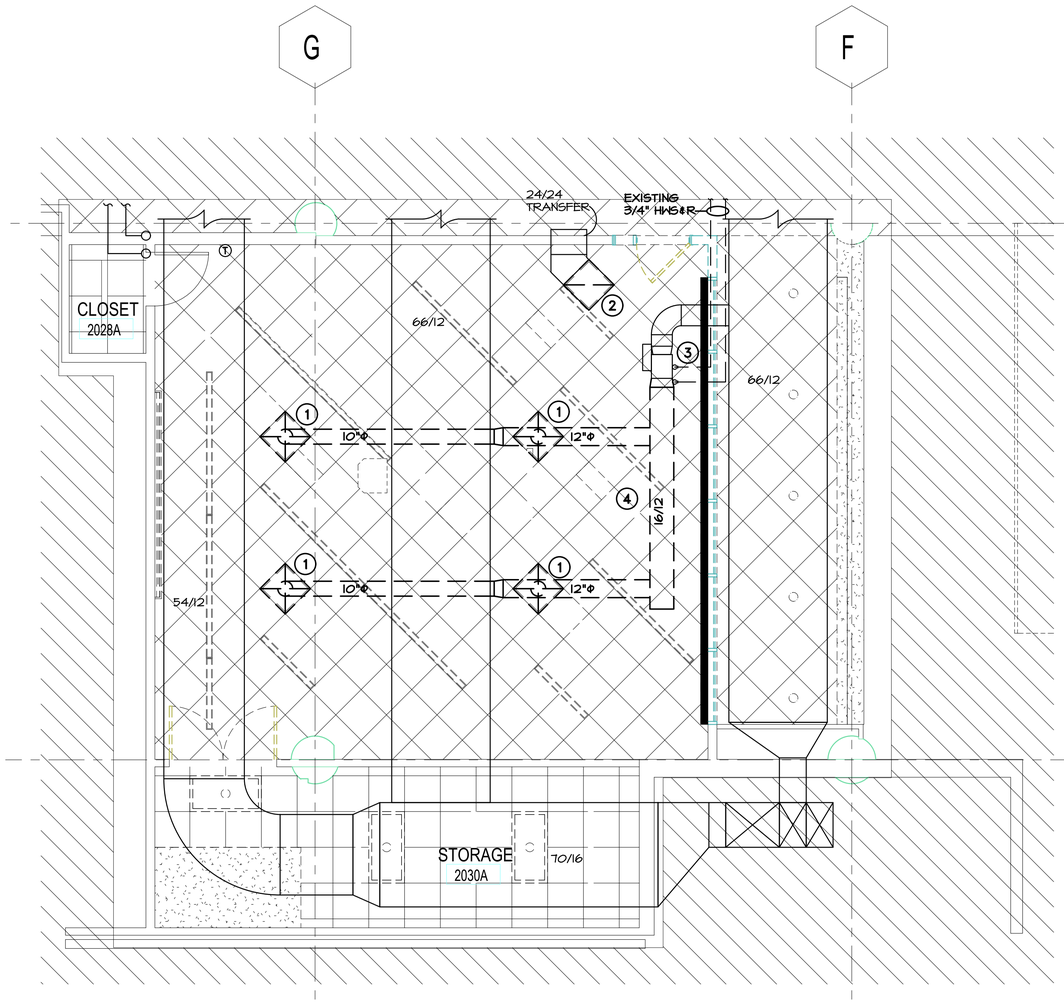
SHEET NUMBER

A62-01

5/7/2018 3:20:38 PM C:\Temp\024303_009-CoD-Media_Lab_R18_chungb.rvt

MECHANICAL DEMOLITION PLAN NOTES:

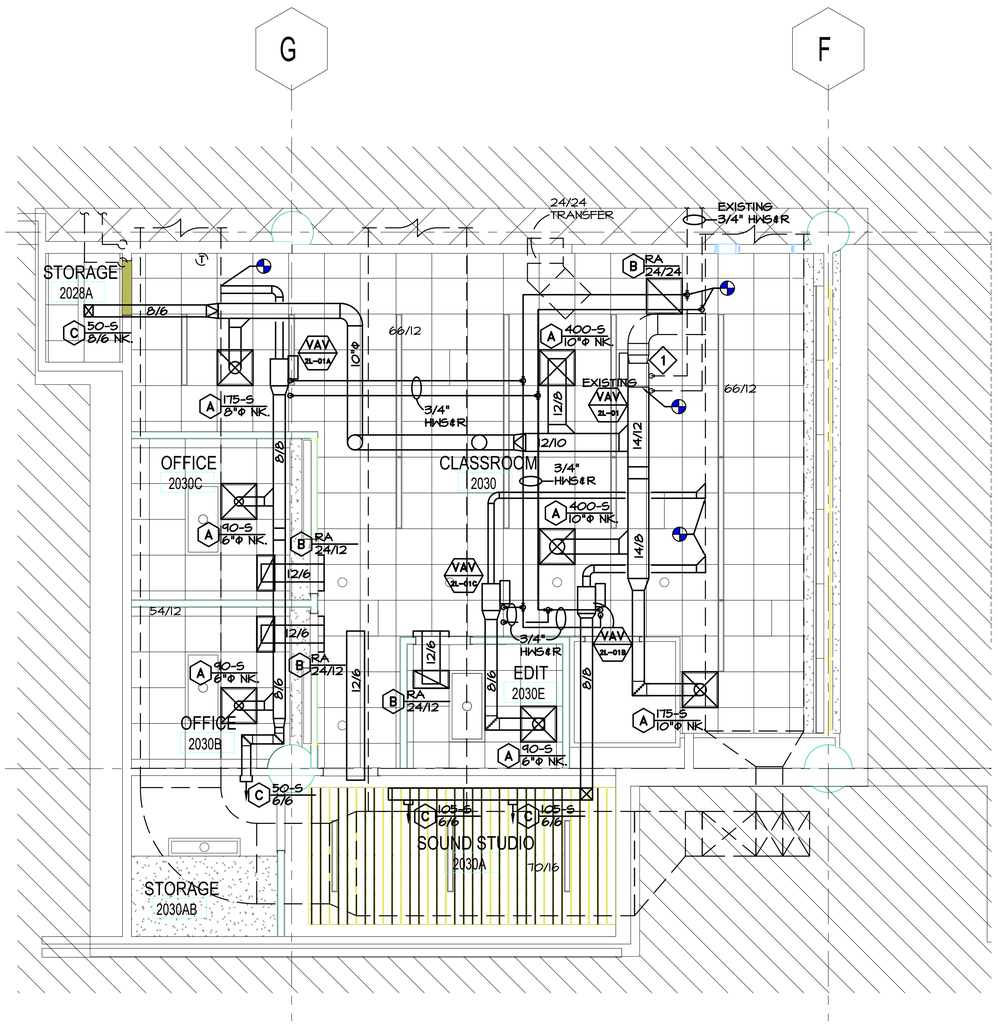
1. DEMOLISH AND REMOVE EXISTING SUPPLY DIFFUSER AND ASSOCIATED DUCTWORK.
2. DEMOLISH AND REMOVE EXISTING TRANSFER GRILLE AND CONNECTION TO TRANSFER DUCT. TRANSFER DUCT TO REMAIN.
3. EXISTING VAV 2L-01 TO REMAIN.
4. DEMOLISH AND REMOVE EXISTING LOW PRESSURE SUPPLY DUCTWORK AS INDICATED.



2 LEVEL 02 MECHANICAL DEMOLITION
1/4" = 1'-0"

MECHANICAL PLAN NOTES:

1. REBALANCE EXISTING VAV 2L-01, TITUS DESV-10 TO 1100 CFM MAXIMUM, 310 CFM MINIMUM



1 LEVEL 02 MECHANICAL NEW WORK
1/4" = 1'-0"

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STATE OF ILLINOIS LICENSE No.
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062.048339

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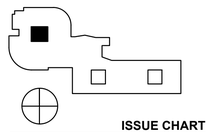
KEYPLAN



ISSUE CHART

MARK	ISSUE	DATE
1	ISSUE FOR BID	07MAY18

Job Number	024303.009
Drawn	
Checked	
Approved	

TITLE

MECHANICAL DEMOLITION & NEW WORK

SHEET NUMBER

M04-01

MECHANICAL SPECIFICATIONS

1) CONTRACTOR SHALL BE RESPONSIBLE FOR VISITING THE SITE AND VERIFYING ALL EXISTING FIELD CONDITIONS PRIOR TO SUBMISSION OF HIS BID.
   A) CONTRACTOR SHALL FIELD VERIFY ALL EXISTING DUCTWORK AND PIPE SIZES. NO EXTRA COMPENSATION WILL BE ALLOWED FOR THE CONTRACTOR FAILING TO DO SO.
   B) CONTRACTOR SHALL FIELD VERIFY LOCATIONS, SIZES AND CAPACITIES OF ALL EXISTING EQUIPMENT, APPARATUS AND DEVICES, INCLUDING BUT NOT LIMITED TO TERMINAL UNITS, FANS, CONVECTORS, FANS, ETC.
   C) CONTRACTOR SHALL FAMILIARIZE THEMSELVES WITH PROCESS FOR ACCESSING SITE, FLOOR AND SPACE. CONTRACTOR SHALL USE ELEVATOR DESIGNATED BY FACILITY AND SHALL NOT CUT ANY HOLES, IN FAÇADE, ROOF, FLOORS, ETC. UNLESS COMPLETELY NECESSARY AND WITH PRIOR APPROVAL FROM THE OWNER AND ARCHITECT. CONTRACTOR SHALL BE RESPONSIBLE FOR ALL COSTS INCLUDING PATCHING AND REPAIR REQUIRED TO RETURN TO ORIGINAL CONDITION.

2) THE CONTRACT DOCUMENTS ARE DIAGRAMMATIC IN NATURE AND INDICATE APPROXIMATE LOCATION OF EXISTING DUCTWORK, PIPING AND EQUIPMENT. THE CONTRACTOR SHALL BE RESPONSIBLE FOR DETERMINING THE ACTUAL LOCATIONS, SIZES AND ROUTING OF THE EXISTING DUCTS, PIPING, ETC.
   A) CONTRACTOR SHALL REMOVE EXISTING EQUIPMENT AND MATERIALS PERTAINING TO HIS CONTRACT AS SPECIFIED OR AS REQUIRED WHETHER SHOWN ON THE DRAWINGS OR NOT, TO PREPARE FOR THE NEW WORK. OWNER TO BE PROVIDED WITH RIGHT OF REFUSAL FOR SALVAGE VALUE OR ATTIC STOCK. IF OWNER REFUSES CONTRACTOR SHALL REMOVE ALL DEMOLISHED EQUIPMENT AND MATERIALS FROM THE SITE AND PROPERLY DISPOSE.
   B) CONTRACTOR SHALL PROVIDE LABOR, MATERIALS AND EQUIPMENT AND INSTALL SAME AS REQUIRED TO ACCOMPLISH WORK AND PROVIDE COMPLETE AND FULLY FUNCTIONING SYSTEMS.

3) CONTRACTOR IS RESPONSIBLE FOR COORDINATING HIS WORK WITH THE WORK OF ALL OTHER TRADES AND MAKING ANY NECESSARY MODIFICATIONS TO HIS WORK AT NO ADDITIONAL COST, INCLUDING ALL OFFSETS.

4) CONTRACTOR SHALL BE RESPONSIBLE FOR RELOCATION OF ANY EXISTING MINOR INTERFERENCES, INCLUDING CONDUIT, HANGERS, ETC., AT NO ADDITIONAL COST.

5) ALL WORK SHALL BE IN ACCORDANCE WITH 2015 INTERNATIONAL MECHANICAL CODE AND THE 2015 ILLINOIS ENERGY CONSERVATION CODE. THESE CODES SHALL BE FOLLOWED AS MINIMUM PROVIDING HIGHER GRADES OF MATERIAL AND WORKMANSHIP WHERE REQUIRED BY THESE DOCUMENTS. PROVIDE ALL TESTS REQUIRED BY LOCAL CODES.

6) ALL PERMITS, FEES, LICENSES, APPROVALS AND OTHER ARRANGEMENTS FOR WORK SHALL BE OBTAINED BY THE CONTRACTOR AT HIS OWN EXPENSE.

7) SUBMITTALS
   A) SUBMIT EQUIPMENT SPECIFICATIONS AND CUTS FOR REVIEW AND APPROVAL.
   B) SUBMIT ASSEMBLED PRINTED INSTRUCTIONS FOR THE OPERATION AND MAINTENANCE OF EACH ITEM INSTALLED ALONG WITH EQUIPMENT CUTS AND CONTROL WIRING DIAGRAMS.
   C) SUBMIT COORDINATED SHOP DRAWINGS FOR REVIEW. THE SHOP DRAWINGS SHALL INDICATE PIPING, DUCT, DIFFUSER, LIGHT FIXTURE, STRUCTURE AND THERMOSTAT LOCATIONS AND MUST BE SUBMITTED PRIOR TO FABRICATION AND INSTALLATION.
   D) CONTRACTOR SHALL SUBMIT CERTIFIED BALANCE REPORTS FOR APPROVAL.
   E) SUBMIT CAD AS-BUILT DRAWING INDICATING A NUMBERING SYSTEM WHICH CORRELATES TO OWNERS SYSTEM AND WITH BALANCE REPORT, VAV BOXES, ETC.
   F) CONTRACTOR TO SUBMIT AS-BUILT DRAWINGS FOR DUCTWORK AND PIPING, INCLUDING SENSOR LOCATIONS.

8) CONTRACTOR SHALL GUARANTEE ALL WORK AND MATERIAL FOR ONE YEAR AFTER FINAL ACCEPTANCE AGAINST ALL DEFECTS OF MATERIAL, EQUIPMENT AND WORKMANSHIP.

9) PROVIDE COMPETENT OPERATING TECHNICIAN TO INSTRUCT THE OWNER IN THE OPERATION AND MAINTENANCE OF THE INSTALLED EQUIPMENT.

10) CONTRACTOR SHALL CONTRACT WITH AN INDEPENDENT TEST AND BALANCING COMPANY CERTIFIED WITH NEEB OR AABC TO BALANCE THE AIR AND WATER SYSTEMS.
   A) BALANCE AIR SYSTEMS WITHIN 5% OF INDICATED DESIGN QUANTITY.
   B) BELTS AND SHEAVE CHANGES REQUIRED TO MEET SPECIFIED AIR VOLUMES SHALL BE DONE AT NO ADDITIONAL COST. CONTRACTOR REQUIRED TO VISIT SITE PRIOR TO BID TO DETERMINE EXACT SCOPE.
   C) BALANCE WATER SYSTEMS WITHIN 10% OF INDICATED DESIGN QUANTITY.

11) THE DRAWING INDICATES GENERAL CHARACTER AND LOCATION OF WORK INCLUDED, BUT HAVING MINOR SPECIALTIES OMITTED WHICH ARE TO BE PROVIDED AND INSTALLED WITHOUT EXTRA COST.

12) CEILING SPACE IS USED AS A RETURN AIR PLENUM. ALL MATERIALS IN CEILING SPACE SHALL BE RATED FOR RETURN AIR PLENUM PER THE 2015 INTERNATIONAL MECHANICAL CODE. COORDINATE WITH ALL TRADES.

13) ALL EQUIPMENT SHALL HAVE TOTALLY ENCLOSED MOTORS AND BE RATED TO OPERATE IN PLENUM CEILINGS.

14) ALL DUCTWORK SHALL BE CONSTRUCTED IN ACCORDANCE WITH SMACNA AND ASHRAE RECOMMENDATIONS FOR PRESSURE CLASS.
   A) DUCTWORK SHALL BE CONSTRUCTED OF G90 GALVANIZED SHEET METAL
   B) TRANSVERSE JOINTS AND LONGITUDINAL SEAMS SHALL BE CONSTRUCTED IN ACCORDANCE WITH ASHRAE AND SMACNA GUIDELINES FOR PRESSURE CLASS.
   C) DUCTWORK LOCATED UPSTREAM OF VAV TERMINAL UNITS SHALL BE CONSTRUCTED AND SEALED AS MEDIUM PRESSURE CLASS 11 DUCTWORK(GREATER THAN2 INCHES WG, UP TO 4INCHES WG)
   D) SUPPLY DUCTWORK LOCATED DOWNSTREAM OF VAV TERMINAL UNITS SHALL BE CONSTRUCTED AND SEALED AS LOW PRESSURE DUCTWORK, CLASS 1(2 INCHES WG AND BELOW)
   E) RETURN, EXHAUST AND TRANSFER DUCTWORK SHALL BE CONSTRUCTED AS LOW PRESSURE CLASS 1.
   F) ALL NEW DUCT TURNS, ELBOWS, ETC., SHALL BE INSTALLED WITH TURNING VANES OR MINIMUM 1-1/2 RADIUS ELBOWS.
   G) LOCKING TYPE VOLUME DAMPERS SHALL BE PROVIDED AT ALL DUCTWORK BRANCH TAKE-OFFS.

15) FLEXIBLE DUCTWORK IS NOT PERMITTED IN OPEN CEILING(EXPOSED) AREAS.

16) INSULATED FLEXIBLE DUCTWORK AT INLET OF VAV BOX AND DIFFUSER CONNECTIONS SHALL BE THERMA-FLEX M-KC OR UL LISTED APPROVED EQUAL. MAXIMUM LENGTH OF 5'-0".

17) UNINSULATED FLEXIBLE DUCTWORK SHALL BE THERMA-FLEX S-TL

18) PROVIDE 1" THICK 1-1/2 LB. DENSITY DUCT LINING IN DISCHARGE OF VAV TERMINAL UNITS. DUCT SIZES SHOWN ARE NET CLEAR DIMENSIONS.

19) PROVIDE LOCKING VOLUME DAMPERS ON ALL BRANCH TAKE-OFFS.

20) PROVIDE ALL CORES, OPENINGS, SLEEVES AND CAULKING FOR INSTALLATION OF THIS WORK. CAULKING TO CONFORM TO FIRE RATING OF WALLS.

21) VERIFY EXACT LOCATION OF TEMPERATURE SENSORS WITH OWNER AND ARCHITECT PRIOR TO INSTALLATION.

22) CONTRACTOR SHALL CUT ALL OPENINGS REQUIRED FOR HIS WORK. ALL OPENINGS SHALL BE SEALED AIR TIGHT. CONTRACTOR SHALL ALSO PATCH AND SEAL ANY EXISTING OPENINGS LEFT UNUSED AS A RESULT OF THIS WORK.

23) EXTEND EXISTING CONTROL SYSTEM AS REQUIRED FOR NEW WORK. PROVIDE AND INSTALL TEMPERATURE SENSORS, CONDUIT, CABELING AND NECESSARY LOCAL AND NETWORK CONTROLLERS REQUIRED FOR A FULLY OPERATING SYSTEM. INCORPORATE NEW WORK, USING OWNER STANDARD SEQUENCES FOR SIMILAR SYSTEMS AND PROVIDE NEW GRAPHICS, ALARMS, ETC. TO MEET OWNER'S STANDARD.

Room No.	Room Description	Room Purpose	Floor Area (Square Feet)	Occupant Density	OA Rate in Breathing Zone	OA Rate in Breathing Zone	Code Required OA	Code Required EA			Airflow Provided				Remarks
				per 1000 SF	Per person	Per SF	CFM	CFM/Fixture	CFM per SF	Total CFM	Supply Air	Zp	Outside Air	Exhaust Air From Room	
2028A	Storage	Storage	25	0	0	0.12	3.00	0.00	0.00	0	50.0	0.06	14.9	0.0	
2030	Media Lab	Computer Lab	830	25	10	0.12	307.10	0.00	0.00	0	1050.0	0.29	311.9	0.0	
2030A	Sound Studio	Media Center	160	25	10	0.12	59.20	0.00	0.00	0	210.0	0.28	62.4	0.0	
2030B	Office	Office	90	5	5	0.06	7.65	0.00	0.00	0	90.0	0.09	26.7	0.0	
2030C	Office	Office	90	5	5	0.06	7.65	0.00	0.00	0	90.0	0.09	26.7	0.0	
2030E	Edit	Office	60	5	5	0.06	5.10	0.00	0.00	0	90.0	0.06	26.7	0.0	
2030AB	Storage	Storage	72	0	0	0.12	8.64	0.00	0.00	0	50.0	0.17	14.9	0.0	
	Sub-Total		1327								1630		484	0	
						Vou =	398				Max Zp=	0.29			
	Code required Outside Air: Vot = Vou/Ev =		498								Ev=0.8				
	Design Percentage OA = 0.305														

VARIABLE AIR VOLUME BOX SCHEDULE

TAG	MANUFACTURER MODEL NUMBER	SIZE	VALVE (C.F.M.)		HOT WATER REHEAT COIL					REMARKS
			MAX.	MIN.	E.A.T.	L.A.T.	C.F.M.	M.B.H.	G.P.M.	
EXISTING VAV EL-01	TITUS DESV	10	1100	310	55° F	75° F	310	6.7	0.75	1, 2, 3, 4, 5, 6
VAV EL-01A	TITUS DESV	5	230	40	55° F	75° F	40	2.5	0.25	1, 2, 3, 4, 5
VAV EL-01B	TITUS DESV	5	210	40	55° F	75° F	40	2.5	0.25	1, 2, 3, 4, 5
VAV EL-01C	TITUS DESV	4	90	30	55° F	75° F	30	2.5	0.25	1, 2, 3, 4, 5

REMARKS:
1. V.A.V. BOXES SHALL HAVE FIELD INSTALLED D.D.C. CONTROLS.
2. HEATING HOT WATER TEMPS: 165 E.W.T., 145 L.W.T.
3. VAV BOXES TO BE PROVIDED WITH HOT WATER REHEAT COIL.
4. BOXES ARE TO BE PRESSURE INDEPENDENT WITH AVERAGING AIR FLOW SENSOR AND GASKETED ENCLOSURE.
5. BOXES TO BE LINED WITH 1/2" DUAL DENSITY INSULATION WHICH COMPLIES WITH UL181 AND NFPA 90A. ALL EXPOSED EDGES TO BE SEALED.
6. EXISTING VAV BOX, TO REMAIN, CLEAN INTERIOR LINING & HEATING COIL. VERIFY CONTROLS ARE WORKING PROPERLY PRIOR TO RELOCATING.

GRILLE, DIFFUSER & REGISTER SCHEDULE

TAG	MANUFACTURER	MODEL NUMBER	S/R	DESCRIPTION	OBD	REMARKS
A	TITUS	OMNI-AA	S	SQ FACE ALUMINUM ADJUSTABLE DIFFUSER. (SEE PLANS FOR SIZE & CEILING TYPE)	Y	1, 2
B	TITUS	4FL	R	ALUMINUM RETURN/EXHAUST REGISTER. (SEE PLANS FOR SIZE & CEILING TYPE)	Y	1, 2, 3
C	TITUS	300FL	S	ALUMINUM DOUBLE DEFLECTION SUPPLY REGISTER. (SEE PLANS FOR SIZE & CEILING TYPE)	Y	1

REMARKS:
1. FINISH & COLOR BY ARCHITECT.
2. LAY-IN FULL FACE; 23-5/8" X 23-5/8" PANEL SIZE- UNLESS SHOWN OTHERWISE ON PLANS. COORDINATE WITH ARCHITECTURAL CEILING DRAWINGS.
3. OBD CAN BE ELIMINATED ON TRANSFER GRILLES.

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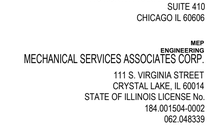
KEYPLAN



ISSUE CHART

MARK	ISSUE	DATE
1	ISSUE FOR BID	07MAY18

Job Number 024303.009
Drawn
Checked
Approved

TITLE

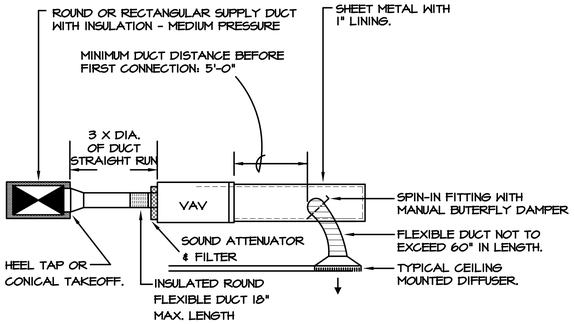
MECHANICAL EQUIPMENT SCHEDULES & SPECIFICATIONS

SHEET NUMBER

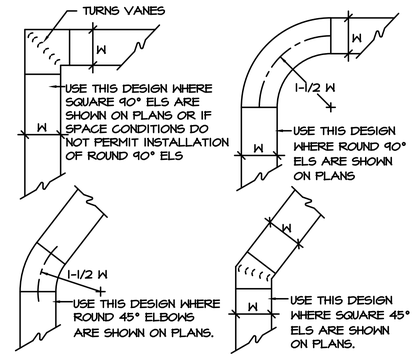
M20-01

GENERAL MECHANICAL SYMBOLS

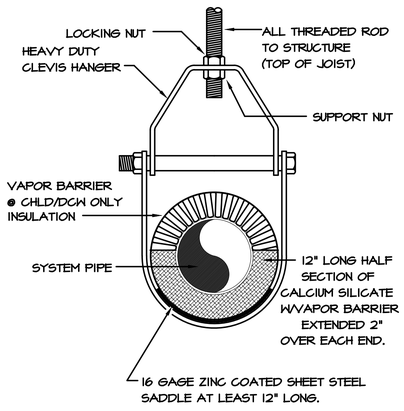
SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
CFM	CUBIC FEET PER MINUTE		SUPPLY DUCT
CH	CABINET HEATER		RETURN/EXHAUST DUCT
EA	EXHAUST AIR		OUTSIDE AIR
EF	EXHAUST FAN		REINFORCED/INSULATED FLEX
FC	FLEX CONNECTION		SUPPLY DIFFUSER
RA	RETURN AIR		RETURN REGISTER
SA	SUPPLY AIR		45 DEGREE TAP
OA	OUTSIDE AIR		CAP
T	THERMOSTAT		GATE VALVE
H	HUMIDISTAT		B & G CIRCUIT SETTER
UH	UNIT HEATER		CHECK VALVE
VD	VOLUME DAMPER		TEMP. CONTROL VALVE
WG	WITH GUARD		CONNECTION POINT
O.A.C.	OPENING ABOVE CEILING		BUTTERFLY VALVE
	SUPPLY UP – DOWN		STRAINER
	RETURN/EXHAUST UP – DN.		ELBOW UP
	OUTSIDE AIR UP – DOWN		ELBOW DOWN



VAV AIR DISTRIBUTION CONNECTIONS
NO SCALE



SHEET METAL DUCT DETAILS
NO SCALE



CLEVIS HANGER DETAIL
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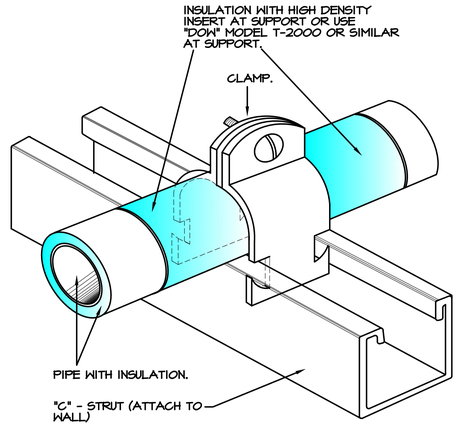
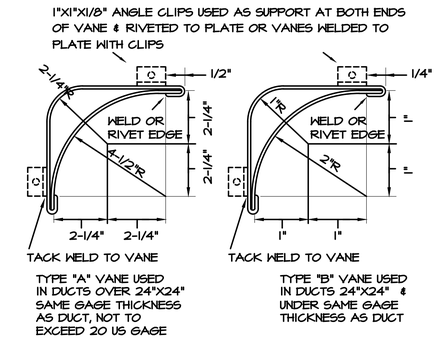
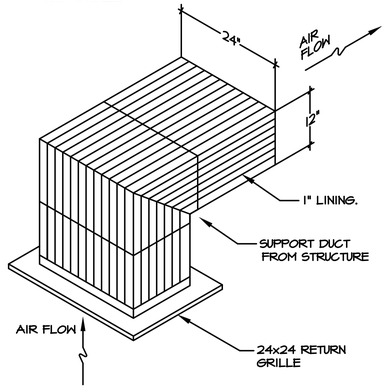


PIPE SUPPORT AT UNISTRUT
NO SCALE



SQUARE DUCT ELBOWS
NO SCALE



TRANSFER GRILLE DETAIL
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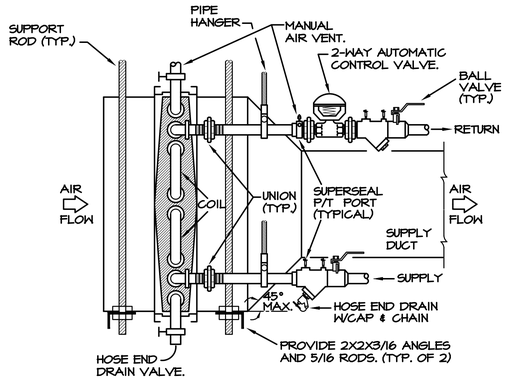
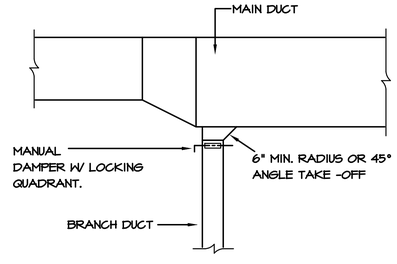


VAV BOX HOT WATER REHEAT COIL DETAIL
NO SCALE



BRANCH DUCT CONNECTION
NO SCALE

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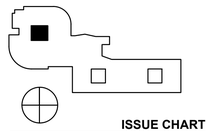


ISSUE CHART

MARK	ISSUE	DATE
1	ISSUE FOR BID	07MAY18

Job Number	024303.009
Drawn	
Checked	
Approved	

TITLE

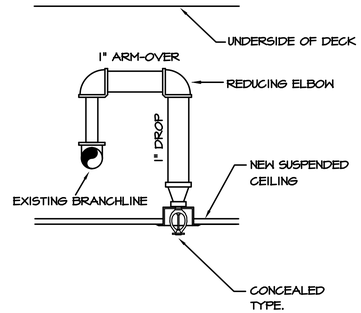
MECHANICAL DETAILS & SYMBOL LIST

SHEET NUMBER

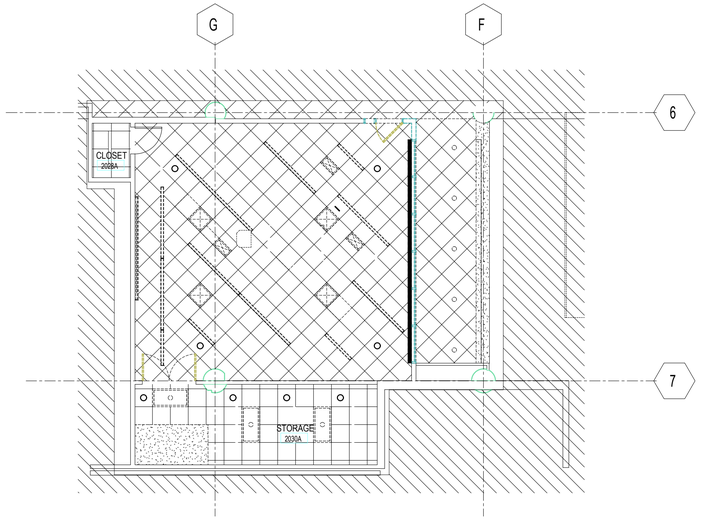
M30-01

FIRE SUPPRESSION SPECIFICATIONS

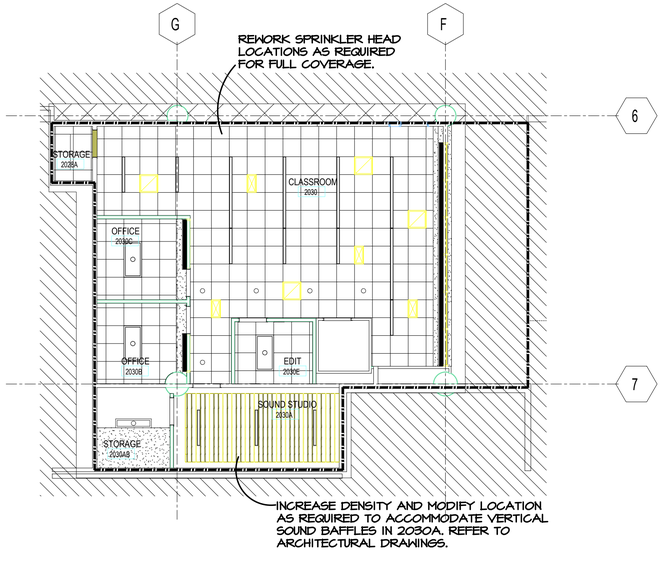
1. CONTRACTOR SHALL BE RESPONSIBLE FOR VISITING THE SITE AND VERIFYING ALL EXISTING FIELD CONDITIONS PRIOR TO SUBMISSION OF HIS BID. THE CONTRACT DOCUMENTS INDICATE APPROXIMATE LOCATION OF EXISTING PIPING, FIRE HOSE VALVE CABINETS, ETC., AND ARE DIAGRAMMATIC IN NATURE. THE CONTRACTOR SHALL BE RESPONSIBLE FOR DETERMINING THE ACTUAL LOCATION AND ROUTING OF THE EXISTING PIPING.
2. EACH SPRINKLER HEAD OUTLET SHALL FEED A SINGLE SPRINKLER HEAD.
3. ALL NEW MATERIAL AND EQUIPMENT SHALL BE LISTED BY U.L. AND APPROVED BY F.M.
4. IN THE FINISHED CEILING AREAS SPRINKLER HEADS SHALL BE QUICK RESPONSE CONCEALED PENDENT TYPE EQUAL TO VIKING'S MODEL MIRAGE WITH WHITE COVERPLATE.
5. MAINTAIN MINIMUM CLEARANCE OF 18 INCHES OR GREATER BETWEEN SPRINKLER HEAD DEFLECTOR AND THE TOP OF STORAGE.
6. CONTRACTOR IS RESPONSIBLE FOR COORDINATING HIS WORK WITH THE WORK OF ALL OTHER TRADES AND MAKING ANY NECESSARY MODIFICATIONS TO HIS WORK AT NO ADDITIONAL COST, INCLUDING ALL OFFSETS.
7. CONTRACTOR SHALL REMOVE EXISTING EQUIPMENT AND MATERIALS PERTAINING TO HIS CONTRACT AS SPECIFIED OR AS REQUIRED WHETHER SHOWN ON THE DRAWINGS OR NOT, TO PREPARED FOR THE NEW WORK.
8. CONTRACTOR SHALL INSTALL SPRINKLER SYSTEM IN ACCORDANCE WITH THE REQUIREMENTS OF NFPA-13, THE 2015 INTERNATIONAL FIRE CODE AND LOCAL AUTHORTIY HAVING JURISDICTION.
9. ALL PERMITS, FEES, LICENSES, APPROVALS AND OTHER ARRANGEMENTS FOR WORK SHALL BE OBTAINED BY THE CONTRACTOR AT HIS OWN EXPENSE.
10. SUBMIT COORDINATED SHOP DRAWINGS TO ARCHITECT, LOCAL AUTHORITY HAVING JURISDICTION AND OWNER'S INSURANCE UNDERWRITERS FOR REVIEW AND APPROVAL PRIOR TO THE WORK. THE SHOP DRAWINGS SHALL INCLUDE AND SHOW THE BASIS OF COMPLIANCE WITH THE DESIGN DENSITY, THE SPECIFIC ARRANGEMENT OF THE SYSTEM. THE DETAILS ON THE SHOP DRAWINGS SHALL INCLUDE HANGER LOCATIONS, EXISTING AND NEW PIPE SIZING, DUCT, DIFFUSER, LIGHT FIXTURE AND SPRINKLER HEAD LOCATIONS AND MUST BE SUBMITTED PRIOR TO FABRICATION AND INSTALLATION. THE SHOP DRAWIINGS SUBMITTAL SHALL INCLUDE MANUFACTURER'S INSTALLING INSTRUCTIONS FOR ANY SPECIALLY LISTED EQUIPMENT INCLUDING DESCRIPTIONS, LIMITATIONS FOR ANY SPRINKLER DEVICES, AND FITTINGS.
11. CONTRACTOR SHALL GUARANTEE ALL WORK AND MATERIAL FOR ONE YEAR AFTER COMPLETION AGAINST ALL DEFECTS OF MATERIAL, EQUIPMENT AND WORKMANSHIP.
12. PROVIDE COMPETENT OPERATING TECHNICIAN TO INSTRUCT THE OWNER IN THE OPERATION AND MAINTENANCE OF THE INSTALLED EQUIPMENT.
13. THE DRAWING INDICATES DIAGRAMMATICALLY THE EXTENT, GENERAL CHARACTER AND LOCATION OF WORK INCLUDED, BUT HAVING MINOR DETAILS OMITTED WHICH ARE TO BE PROVIDED WITHOUT EXTRA COST.
14. CONTRACTOR IS RESPONSIBLE FOR COORDINATING SPRINKLER HEAD LOCATIONS WITH ARCHITECT'S REFLECTED CEILING PLANS. SPRINKLER HEAD LOCATIONS ON THE SHOP DRAWINGS ARE SUBJECT TO APPROVAL BY THE ARCHITECT.
15. SPRINKLERS SHALL BE PLACED IN THE CENTER OF CEILING TILES IN BOTH DIRECTIONS.
16. ALL PIPE SHALL BE MARKED CONTINUOUSLY ALONG IT'S LENGTH BY THE MANUFACTURER IN SUCH A WAY AS TO PROPERLY IDENTIFY THE TYPE OF PIPE.
17. FITTINGS SHALL BE RATED FOR 175 PSI. EXTRA HEAVY PATTERN, FITTINGS SHALL BE USED WHERE SYSTEM PRESSURE EXCEEDS 175 PSI.
18. SUPPORT NEW PIPING IN ACCORDANCE WITH THE REQUIREMENTS OF NFPA-13. WHEN THE MAXIMUM PRESSURE AT THE SPRINKLER EXCEEDS 100 PSI, THE UNSUPPORTED LENGTH BETWEEN THE END SPRINKLER IN A PENDENT POSITION OR DROP NIPPLE OR ARMOVER AND THE LAST HANGER ON BRANCH LINE SHALL NOT BE GREATER THAN 12 INCHES.
19. ALL NEW PIPING PENETRATIONS THROUGH FIRE-RATED CONSTRUCTION SHALL BE PROPERLY SEALED WITH U.L. LISTED FIRE STOPPING MATERIALS TO MAINTAIN THE REQUIRED FIRE RESISTANCE RATING, REGARDLESS IN THE EXPOSED CONSTRUCTION AREAS OR ABOVE DROPPED-CEILING AREAS.
20. CONTRACTOR SHALL SIZE SPRINKLER PIPING HYDRAULICALLY IN ACCORDANCE WITH THE REQUIREMENTS OF NFPA-13, UNLESS NOTED OTHERWISE.
21. ALL SPRINKLER AND STANDPIPE SYSTEMS SHALL BE TESTED HYDROSTATICALLY IN ACCORDANCE WITH THE REQUIREMENTS OF NFPA-13 AND LOCAL AUTHORITY HAVING JURISDICTION. SUBMIT A SIGNED COPY OF CONTRACTOR'S MATERIAL AND TEST CERTIFICATE BY THE OWNER'S REPRESENTATIVE AND THE INSTALLING CONTRACTOR. ADDITIVES, CORROSIVE CHEMICALS SUCH AS SODIUM SILICATE OR DERIVATIVE OF SODIUM SILICATE, BRINE OR OTHER CHEMICALS SHALL NOT BE USED WHILE HYDROSTATICALLY TESTING SYSTEMS OR FOR STOPPING LEAKS.
22. POOLING OF CUTTING OILS OR OTHER PETROLEUM BASED PRODUCTS IN THE SPRINKLERS MUST BE AVOIDED. ALWAYS CUT AND THREAD PIPE WITHOUT THE SPRINKLER PIPING BEING ATTACHED AND BE SURE TO CHECK AND DRAIN THE DROPS OF ANY EXCESSIVE OIL PRIOR TO INSTALLATION OF THE SPRINKLERS.
23. ALL WORK TO BE INSTALLED ABOVE ESTABLISHED FINISHED CEILING.
24. CONTRACTOR SHALL CAD SUBMIT AS-BUILT DRAWINGS FOR ALL PIPING AFTER INCORPORATING ALL THE CHANGES MADE IN FIELD.



NIPPLE & REDUCING ELBOW SUPPLYING SPRINKLER BELOW CEILING
NO SCALE



2 LEVEL 02 FIRE PROTECTION DEMOLITION
1/8" = 1'-0"



1 LEVEL 02 FIRE PROTECTION NEW WORK
1/8" = 1'-0"

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STATE OF ILLINOIS LICENSE No.
184.001504-0002
062.048339

PROJECT

MEDIA LAB
425 FARWELL ST.
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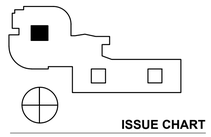
College of DuPage

COLLEGE OF DuPAGE

KEYPLAN



ISSUE CHART

MARK	ISSUE	DATE
1	ISSUE FOR BID	07MAY18

Job Number	024303.009
Drawn	
Checked	
Approved	

TITLE

FIRE PROTECTION DEMOLITION & NEW WORK

SHEET NUMBER

FP04-01

GENERAL ELECTRICAL DEMOLITION NOTES:

NOTES RE: EXISTING CONDITIONS:

1. VERIFY EXISTING CONDITIONS AND LOCATIONS IN FIELD PRIOR TO SUBMITTING PROPOSAL. FAILURE TO DO SO SHALL NOT RELIEVE CONTRACTOR FROM PERFORMING THE WORK REQUIRED UNDER THIS CONTRACT.
2. MAKE NECESSARY MODIFICATIONS AND ADJUSTMENTS TO ALL ELECTRICAL ITEMS AND EQUIPMENT, BOTH NEW AND EXISTING, AS MAY BE REQUIRED BY THESE ALTERATIONS AND ADDITIONS.
3. DISCONNECT AT SOURCE AND REMOVE EXISTING ELECTRICAL MATERIALS AND EQUIPMENT AND ALL OTHER ELECTRICAL ITEMS WHICH ARE RENDERED OBSOLETE BY THESE ALTERATIONS AND ADDITIONS. THESE ARE THE PROPERTY OF THE OWNER AND SHALL EITHER BE REMOVED FROM THE SITE OR RETURNED TO THE OWNER'S STOCK AT THE DISCRETION OF THE OWNER.
4. DISCONNECT, REMOVE AND RELOCATE EXISTING ELECTRICAL MATERIALS AND EQUIPMENT, AND ALL OTHER ELECTRICAL ITEMS WHICH INTERFERE OR ARE INTERFERED WITH, OBSTRUCT OR ARE OBSTRUCTED BY THESE LOCATIONS AS DIRECTED. RECONNECT SUCH ITEMS IN PROPER OPERATING CONDITION AT NEW LOCATIONS.
5. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO MAINTAIN THE EXISTING BUILDING IN ELECTRICAL OPERATION AT ALL TIMES DURING THE ENTIRE CONSTRUCTION PERIOD. IF IT IS ABSOLUTELY NECESSARY TO SHUT DOWN THE FACILITY AT ANY TIME, THE CONTRACTOR SHALL CONSULT WITH THE OWNER AND MAKE ARRANGEMENTS TO DO SO AT THE OWNER'S CONVENIENCE. 48-HOUR PRIOR NOTICE SHALL BE GIVEN.
6. COORDINATE WORK WITH OTHER TRADES TO AVOID CONFLICTS AND DELAYS.
7. ALL CUTTING AND PATCHING AS REQUIRED FOR NEW WORK & ABANDONED DEVICES TO BE BY THE CONTRACTOR.
8. WHERE EXISTING CONDUITS HAVE BEEN MADE OBSOLETE BY THESE ALTERATIONS AND ADDITIONS AND IT IS IMPRACTICAL TO REMOVE SAME, CONTRACTOR SHALL:
   a. CUT CONDUITS OFF AT SLAB OR WALL LINE
   b. CAP ALL OBSOLETE CONDUIT.
9. WHERE THE EXISTING WIRING & CONDUIT SERVING ANY EXISTING ELECTRICAL EQUIPMENT IN AREA OF EXISTING BUILDING NOT BE ALTERED IS INTERFERED WITH, CONTRACTOR SHALL REROUTE AND RECONNECT ALL SUCH CONDUIT & WIRING.

NOTES RE: INSPECTING EXISTING BUILDING:

1. THE CONTRACTORS SHALL VISIT AND INSPECT THE EXISTING BUILDING AND SHALL THOROUGHLY FAMILIARIZE THEMSELVES WITH ACTUAL JOB CONDITIONS BEFORE SIGNING CONTRACTS. NO EXTRAS WILL BE ALLOWED FOR WORK WHICH MIGHT HAVE BEEN REASONABLY FORESEEN BY AN INSPECTION OF THESE PREMISES.
2. WHILE THE SIZE AND LOCATION OF NEW WORK AND EQUIPMENT IN THE EXISTING BUILDING HAS BEEN INDICATED ON THE DRAWINGS AS ACCURATELY AS POSSIBLE, CONTRACTOR SHALL ADJUST HIS WORK AS REQUIRED TO AVOID EXISTING DUCTS, PIPES, CONDUITS AND BEAMS NOT SHOWN ON PLANS. CONTRACTOR SHALL ADAPT HIS WORK TO MEET ALL ACTUAL CONDITIONS ON THE EXISTING PREMISES.
3. CONTRACTOR SHALL INSPECT THE PREMISES AND MAKE A DETAILED EXAMINATION OF ALL LOCATIONS WHERE NEW WORK IS TO BE INSTALLED AND SHALL EXAMINE EXISTING PIPING, CONDUITS, STRUCTURAL SUPPORTING BEAMS, ETC.
4. CONTRACTOR AFTER INSPECTING THE PREMISES AND THE DRAWINGS SHALL CALL TO THE ATTENTION OF THE ARCHITECT ANY LACK OF ANY NECESSARY SPACE OR CLEARANCE REQUIRED BY THE VARIOUS EQUIPMENT BEFORE CONTRACT IS SIGNED. CONTRACTOR SHALL BE RESPONSIBLE FOR ALL CHANGES NECESSARY IF HE NEGLECTS TO DO SO.

NOTE:
ALL DEVICES SHOWN DOTTED, DASHED, OR INDICATED WITH A PLAN NOTE (INDICATING REMOVAL) ARE EXISTING TO BE REMOVED. ALL DEVICES SHOWN SOLID ARE EXISTING TO REMAIN. IF THE CONTRACTOR DEEMS IT NECESSARY FOR A DEVICE TO BE REMOVED, THEY SHALL COORDINATE IN FIELD WITH THE ARCHITECT/ENGINEER FOR APPROVAL.

GENERAL ELECTRICAL NOTES:

1. PRIOR TO SUBMITTING THIS BID, THE CONTRACTOR SHALL VISIT THE PROJECT SITE AND THOROUGHLY ACQUAINT THEMSELVES WITH ALL EXISTING CONDITIONS AND DETERMINE HOW THEY EFFECTIVELY WORK. THEY SHALL INCLUDE IN THEIR BID ANY ALTERATION, RELOCATION, REROUTING, ETC... OF EXISTING FACILITIES, WIRING, CONDUIT, PANELBOARDS REQUIRED FOR INSTALLATION OF NEW WORK. UNDER NO CIRCUMSTANCES WILL THE CONTRACTOR BE GIVEN CONSIDERATION FOR ADDITIONAL COMPENSATION DUE TO THEIR NEGLECT TO COMPLY WITH FOREGOING REQUIREMENTS.
2. ALL WORK SHALL BE DONE IN ACCORDANCE WITH THE FOLLOWING CODES:
   2009 INTERNATIONAL BUILDING CODE
   2011 NATIONAL ELECTRICAL CODE
   2009 INTERNATIONAL MECHANICAL CODE
   2009 INTERNATIONAL FIRE CODE
   ILLINOIS ACCESSIBILITY CODE
   2015 INTERNATIONAL ENERGY CONSERVATION CODE
   IN ADDITION TO THE ABOVE, FOLLOW ALL LOCAL CODES AND AMENDMENTS, UTILITY COMPANY REQUIREMENTS AND ANY OTHER REQUIREMENTS APPLICABLE TO THIS JOB. ELECTRICAL CONTRACTOR SHALL SUBMIT ANY REQUIRED DRAWINGS FOR APPROVAL TO ANY AGENCIES REQUIRING THEM AND OBTAIN NECESSARY PERMITS AT NO ADDITIONAL BID COSTS. ALL EQUIPMENT SHALL BE NEMA STANDARDS AND SHALL BE U.L. LISTED.
3. MOUNT RECEPTACLES, DATA JACKS AND TELEPHONE JACKS AT 18" AFF TO CENTER.

   REFER TO TECHNOLOGY NOTES AND DETAILS FOR ADDITIONAL INFORMATION ON DATA AND TELEPHONE JACKS.
4. MOUNT WALL SWITCHES AT 48" AFF TO CENTER. USE MULTI-GANG SWITCH BOXES, INSTALL COMPARTMENT DIVIDERS TO REDUCE VOLTAGE CONTACT TO 277VOLT OR LESS.
5. REFER TO ALL ARCHITECTURAL AND CASEWORK DRAWINGS DURING INSTALLATION OF ALL SWITCHES, RECEPTACLES, TELEPHONE JACKS, DATA JACKS, JUNCTION BOXES, CLOCKS, VISUAL STROBES/SPEAKER DEVICES, PULL STATIONS AND OTHER DEVICES SO THAT NO CONFLICTIONS WILL BE ENCOUNTERED. INFORM ARCHITECT OF ANY CONFLICTS THAT DO OCCUR BEFORE THE INSTALLATION OF ABOVE LISTED DEVICES.
6. MOUNT CONDUIT AND ELECTRICAL DEVICES FROM THE TOP CHORD OF BAR JOISTS ONLY. DO NOT RUN CONDUITS ABOVE TOP CHORD OF BAR JOIST, THROUGH WEB OF ROOF DECKING MATERIAL ABOVE OR WITHIN 6" OF ROOF DECK SO AS TO PREVENT DAMAGE FROM ROOFING NAILS.
7. THE ELECTRICAL CONTRACTOR SHALL USE THE FOLLOWING COLOR CODING SCHEME FOR CONDUITS RELATED TO POWER, LIGHTING, FIRE ALARM AND EMERGENCY CIRCUITS:
   BLUE - POWER
   YELLOW - LIGHTING
   GREEN - GROUNDING SYSTEM
   ORANGE - EMERGENCY
   RED - FIRE ALARM
   THERE SHALL BE NO DEVIATION FROM THIS REQUIREMENT. VERIFY WITH THE OWNER PRIOR TO ORDERING.
8. MINIMUM SIZE OF CONDUCTORS SHALL BE #12 AWG FOR POWER AND LIGHTING BRANCH CIRCUITS. USE #10 AWG MINIMUM IF RUNS ARE OVER 75 FEET. MINIMUM SIZE FOR "EMERGENCY CIRCUITS" SUCH AS EXIT SIGN AND EMERGENCY/NIGHT LIGHTS SHALL BE MINIMUM #10 AWG. SIZE ALL CONDUCTORS IN ACCORDANCE WITH N.E.C. SECTION 310-15. MAINTAIN PROPER CONDUIT FILL CAPACITIES AND SIZE CONDUCTORS IN ACCORDANCE WITH ADJUSTMENT FACTORS LISTED IN N.E.C. 310-15 TABLE NOTE #8a (MORE THAN THREE CURRENT CARRYING CONDUCTORS IN A RACEWAY). USE MULTIPLE PARALLEL RACEWAYS TO AVOID DERATING OF CONDUCTOR CAPACITIES, OTHERWISE INCREASE SIZE OF CONDUCTORS SO AS TO FOLLOW N.E.C. REQUIREMENTS.
9. ELECTRICAL CONTRACTOR SHALL SIZE ALL CONDUCTORS OVER 75 FEET SO AS TO MAINTAIN A VOLTAGE DROP EQUAL TO OR LESS THAN 2%.
10. BALANCE ALL PHASE WIRES WITHIN 20%.
11. INSTALL A SEPARATE DEDICATED NEUTRAL CONDUCTOR FOR EACH PHASE OF BOTH LIGHTING AND POWER MULTI-WIRE BRANCH CIRCUITS. IF A MULTI-WIRE BRANCH CIRCUIT CONTAINS THREE PHASE WIRES, THE CIRCUIT WILL REQUIRE THREE DEDICATED NEUTRALS.
12. INSTALL GROUNDING WIRE TO ALL DEVICES. USE GREEN WIRE.
13. STUB CONDUITS FOR ALL TELEPHONE/DATA JACKS, AUDIO/VIDEO JACKS, ETC... OUT TO ABOVE ACCESSIBLE CEILING. INSTALL END BUSHINGS AND FITTINGS ON END OF EACH CONDUIT STUB IN ORDER TO PROTECT CABLING. MINIMUM SIZE 3/4" CONDUIT AND PER N.E.C. FILL RATE REQUIREMENTS.
14. ALL JUNCTION BOXES ABOVE CEILINGS SHALL HAVE PANEL AND CIRCUIT INFORMATION IDENTIFIED ON OUTSIDE OF COVERPLATE. ALL RECESSED WALL MOUNTED/FLOOR MOUNTED JUNCTION BOXES SHALL HAVE PANEL AND CIRCUIT INFORMATION IDENTIFIED ON THE INSIDE OF THE JUNCTION BOX TOWARD FRONT OF BOX LIP SO AS TO BE VISIBLE WITHOUT REMOVING WIRING DEVICE.
15. SLEEVE AND FIREPROOF ALL PENETRATIONS THROUGH WALLS AND FLOORS. ALL CORING BY CONTRACTOR SHALL BE COORDINATED WITH ARCHITECT. PROVIDE AND INSTALL EXPANSION FITTINGS ON ALL CONDUITS AT BUILDING EXPANSION JOINTS. REFER TO ARCHITECTURAL.
16. CONTRACTOR WILL BE RESPONSIBLE FOR PROVIDING TEMPORARY ELECTRICAL SERVICE TO THE AREA. CONTRACTOR SHALL COORDINATE POWER REQUIREMENTS WITH ALL OTHER TRADES FOR AMOUNT OF TEMPORARY POWER REQUIRED. CONTRACTOR SHALL PROVIDE DISTRIBUTION PANEL AND RELATED WIRING FOR TEMPORARY RECEPTACLES AND LIGHT FIXTURES FOR ALL TRADES. CONTRACTOR SHALL MEET ALL O.S.H.A., N.E.C. AND LOCAL CODE REQUIREMENTS.
17. FOR EXISTING ELECTRICAL PANELBOARDS AFFECTED BY NEW WORK, CONTRACTOR SHALL REVIEW EXISTING PANEL CARD DIRECTORIES AND VERIFY CORRECTNESS BY TRACING BRANCH CIRCUITS. UPDATE AND RECORD INFORMATION ON NEW PANEL CARD DIRECTORY. VERIFY CURRENT ROOM NAMES AND NUMBERS IN THE FIELD. DO NOT USE ROOM NAMES AND NUMBERS INDICATED ON THE DRAWINGS.
18. INSTALL BLANK PREFINISHED STAINLESS STEEL COVERPLATES ON ALL JUNCTION BOXES IN FINISHED AREAS NO LONGER USED AND CREATED BY DEMOLITION. USE BLANK GALVANIZED STEEL COVERPLATES FOR ALL BOXES ABOVE CEILINGS OR IN EXPOSED NON-FINISHED AREAS.
19. WHERE EXISTING CONDUIT AND WIRE CONFLICTS WITH NEW LIGHT FIXTURES BEING INSTALLED, CONTRACTOR SHALL REROUTE AROUND NEW LIGHT FIXTURE. EXTEND CONDUIT AND WIRING AS REQUIRED.
20. CONTRACTOR SHALL NOT DISTURB EXISTING COMPUTER/DATA CABLING UNLESS OTHERWISE INDICATED ON DRAWINGS.
21. ANY PORTIONS OF EXISTING CEILINGS TO BE REMOVED BY CONTRACTOR FOR INSTALLATION OF THEIR WORK SHALL BE RETURNED TO THEIR ORIGINAL CONDITION. MATCH EXISTING CEILING MATERIAL. PATCH AND PAINT AS REQUIRED.
22. ALL EXPOSED RACEWAYS INSTALLED IN FINISHED AREAS SHALL BE OF THE METALLIC WIREMOLD TYPE. EXPOSED CONDUIT WILL ONLY BE INSTALLED BY PERMISSION OF THE ARCHITECT. ALL EXPOSED CONDUIT INSTALLED IN FINISHED AREAS SHALL BE PAINTED TO MATCH SURROUNDING AREAS.
23. CONTRACTOR SHALL REFER TO ARCHITECTURAL CUTTING AND PATCHING SPECIFICATIONS FOR INFORMATION REGARDING PERFORMANCE STANDARDS AND PROCEDURES.
24. REFER TO ARCHITECTURAL REFLECTED CEILING PLANS FOR EXACT LIGHT FIXTURE ORIENTATION AND PLACEMENT. VERIFY EXACT LOCATION OF ALL CEILING DEVICES (I.E. FIRE ALARM DEVICES, CEILING SPEAKERS) WITH ARCHITECTURAL REFLECTED CEILING PLANS FOR COORDINATION PRIOR TO INSTALLATION.
25. ELECTRICAL CONTRACTOR SHALL FURNISH AND INSTALL ALL LIGHT FIXTURE MOUNTING HARDWARE INCLUDING PENDANTS, CANOPIES, TONG HANGERS, FLANGES, SAFETY CHAINS AND UNI-STRUT. WHEN PENDENT MOUNTING CONTINUOUS ROWS OF 4 FOOT FIXTURES, CONTRACTOR SHALL UTILIZE UNI-STRUT. PAINT OUT PENDANTS AND UNI-STRUT TO MATCH LIGHT FIXTURES. WIPE OIL FROM PENDANTS AND UNI-STRUT WITH CHEMICAL CLEANER PRIOR TO PAINTING.

GENERAL ELECTRICAL SYMBOLS

SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
	CONCEALED CONDUIT & WIRING	C C2 C3	COMPUTER OUTLET/JUNCT.BOX AND STUB	FACP	FIRE ALARM CONTROL PANEL
	HOMERUN	▼ ▽	TELEPHONE OUTLET AND STUB	FAAP	FIRE ALARM ANNUNCIATOR PNL
	CONDUIT/WIRING UNDER SLAB	CP C_P_	COMBINATION COMPUTER/PHONE JACKS AND STUB	NAC	FIRE ALARM "NAC" PANEL
	EXPOSED RACEWAY & WIRING	TV	TV OUTLET/JUNCTION BOX AND STUB	(H)	HEAT DETECTOR
	GROUND/NEUTRAL/HOT WIRING	AV AVT	AUDIO/VISUAL STATION OUTLET	(S)	SMOKE DETECTOR
	3/4"C STUBBED ABOVE CEIL.	WAP	WIRELESS ACCESS POINT		FIRE ALARM PULL STATION
	JUNCT. BOX & FLEX CONDUIT	DC	DIGITAL CLOCK		FIRE ALARM HORN
PB	PULL BOX	S	SPEAKER		FIRE ALARM VISUAL STROBE
	POWER/LIGHTING PANEL	(C)	SPEAKER FLUSH TO CEILING		FIRE ALARM HORN/STROBE
	SYSTEMS PANEL	M	MICROPHONE OUTLET		PULL STATION, HORN/STROBE
T	TRANSFORMER	$V	VOLUME CONTROL SWITCH	V	CEILING MOUNTED SPEAKER/STROBE DEVICE
	SINGLE RECEPTACLE	$	WALL SWITCH	V	CEILING MOUNTED SPEAKER DEVICE
	DUPLEX RECEPTACLE	$3	3 WAY WALL SWITCH	V	WALL MOUNTED SPEAKER/STROBE DEVICE
	QUAD-RECEPTACLE	$4	4 WAY WALL SWITCH	V	WALL MOUNTED SPEAKER DEVICE
	SINGLE RCPT FLUSH TO FLR	$DIM	DIMMER SWITCH		
	DUPLEX RCPT FLUSH TO FLR	$K	KEY OPERATED WALL SWITCH		
	QUAD-RCPT FLUSH TO FLR		SINGLE FACE EXIT SIGN		
	SPECIAL RECEPTACLE		DOUBLE FACE EXIT SIGN		
GFI	GROUND FAULT INTERUPTER		EM LIGHT WITH BATTERY PACK		
AC	RECEPTACLE ABOVE COUNTER		EM BATTERY PACK WITH REMOTE MOUNTED EM LIGHT		
	PLUG MOLD/ WIRE MOLD		RECESSED CAN/ DOWN LIGHT		
	MOTOR/SWITCH DISC./ H.P.		RECESSED 2 X 4 FLUOR. LAMP		
	MOTOR/FUSED DISC./STARTER		RECESSED 2 x 2 FLUOR. LAMP		
	FUSED DISCONNECT SWITCH		RECESSED 1 X 4 FLUOR. LAMP		
NF	NON-FUSED DISCON. SWITCH		SURFACE 2 X 4 FLUOR. LAMP		
	MAGNETIC STARTER - F.V.N.R., H.O.A.		SURFACE 2 x 2 FLUOR. LAMP		
	FUSED DISCON. WITH STARTER		SURFACE 1 X 4 FLUOR. LAMP		
VFD	VARIABLE FREQUENCY DRIVE		SURFACE STRIP FLUOR. LAMP		
ER	EXISTING DEVICE TO REMAIN		LAMP ON EMERGENCY CIRCUIT		
R&R	REMOVE & REPLACE DEVICE		EMERGENCY/ NIGHT LIGHT		

ALL DEVICES BEING REMOVED (I.E. LIGHTS, SENSORS, RECEPTACLES, SWITCHES, SPEAKERS, FIRE ALARM DEVICES, CLOCKS, ETC...) SHALL BE RE-USED FOR NEW WORK SHOWN. ALL DEVICES NOT RE-USED SHALL BE TURNED OVER TO THE OWNER. IF OWNER DOES NOT DESIRE THE DEVICES, THEY SHALL BE DISPOSED OF PER E.P.A. REQUIREMENTS. ONCE THE EXISTING DEVICES HAVE BEEN DEPLETED, THE CONTRACTOR SHALL FURNISH AND INSTALL NEW DEVICES AS SPECIFIED. ALL EXISTING DEVICES TO BE RE-USED SHALL BE CLEANED AND TESTED FOR PROPER OPERATION. ANY DEVICES FOUND NON-OPERATIONAL SHALL BE REPLACED WITH NEW DEVICES TO MATCH EXISTING.

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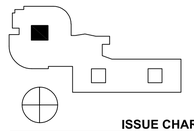

ISSUE CHART

MARK	ISSUE	DATE
1	ISSUE FOR BID	07MAY18

Job Number	024303.009
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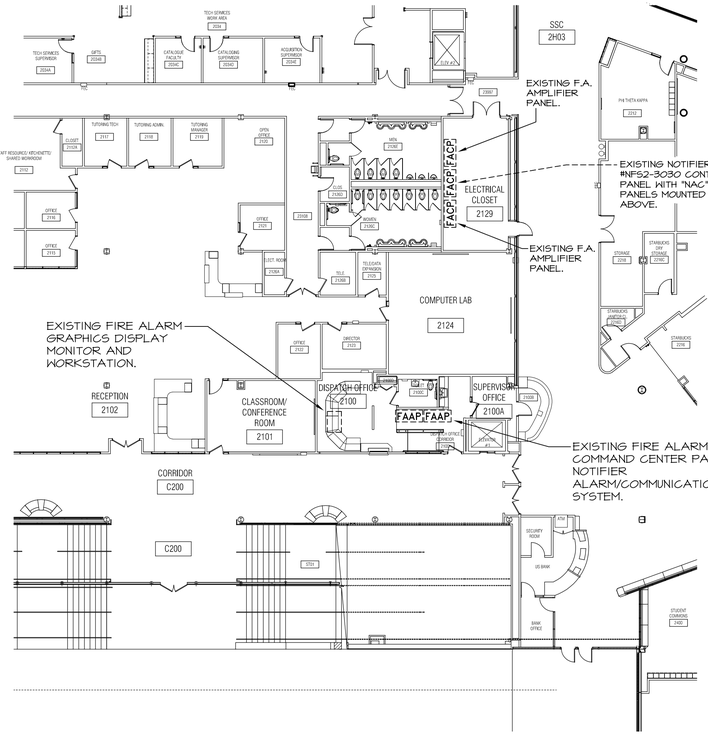
TITLE

ELECTRICAL NOTES AND DETAILS

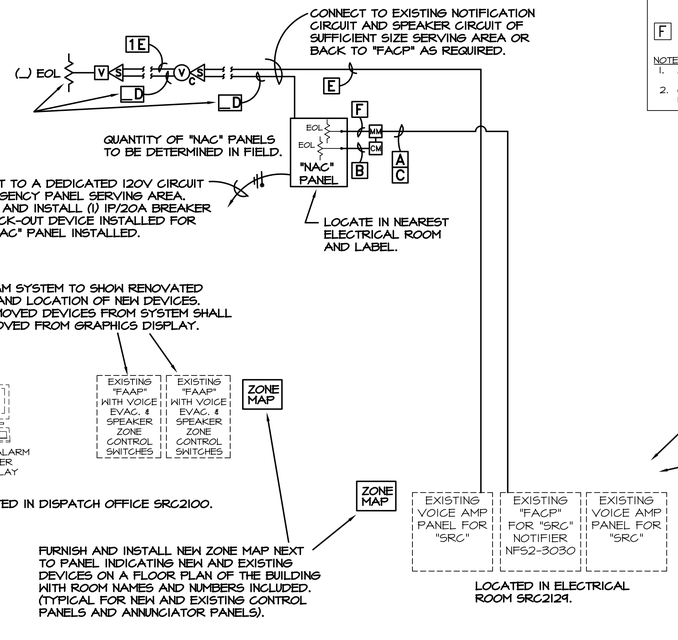
SHEET NUMBER

E00-01



1 LEVEL 02 - PARTIAL AREA A - FIRE ALARM SYSTEM

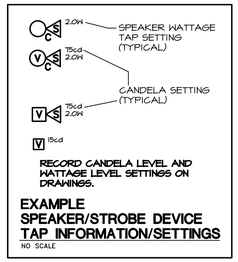
1/16" = 1'-0"

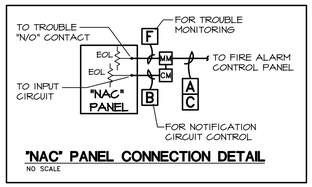


2nd FLOOR

TYPICAL PARTIAL FIRE ALARM RISER DIAGRAM

NO SCALE





FIRE ALARM SYSTEM WIRE SCHEDULE

A	(1) #16 GA. TWISTED (SIZE AS NEEDED), 2 CONDUCTOR UN-SHIELDED CABLE - (1) BLACK, (1) RED (ZONE INITIATED CIRCUIT) ADDRESSABLE NETWORK. COORDINATE WIRE SIZE AND SHIELDING REQUIREMENTS WITH SYSTEM MANUFACTURER.
B	(2) #14 GA. WIRE (REMOTE RELAY CONTROL CIRCUIT)
C	(2) #14 GA. WIRE - (1) BLACK, (1) RED (CONTROL ZAM, REMOTE LED, DUCT SMOKE & SPRINKLER BELL POWER AND C.O. DETECTOR POWER)
D	(2) #12 GA. OR #14 GA. WIRE AS REQUIRED - (1) BLACK, (1) RED (HORN, STROBE, HORN/STROBE POWER)
E	(1) #16 GA. TWISTED SHIELDED (SIZE AS NEEDED), 2 CONDUCTOR CABLE WIRE (VOICE CIRCUIT). SPEAKER WIRE SHALL BE COORDINATED WITH EACH FIRE ALARM MANUFACTURER. IN SOME CASES SHIELDED WIRE IS NOT REQUIRED AND WIRING ONLY NEEDS TO BE TWISTED PAIR. IN OTHER CASES MANUFACTURERS MAY REQUIRE BOTH CONTINUOUS SHIELDED AND TWISTED PAIR. COORDINATE FINAL WIRE TYPE WITH MANUFACTURER PRIOR TO SUBMITTING SHOP DRAWINGS.
F	(2) #18 GA. WIRE - (1) BLACK, (1) RED (ZONE INITIATING CIRCUIT)

NOTES:
1. ALL CABLING TO BE PLENUM RATED FIRE PROTECTION LISTED.
2. COORDINATE CABLING TYPES WITH MANUFACTURER FOR COMPATIBILITY PRIOR TO ORDERING.

FIRE ALARM DEVICE SCHEDULE

TAG	MANUFACTURER	MODEL NUMBER	DESCRIPTION	REMARKS
FACP	NOTIFIER	EXISTING NFS2-3030 SERIES	EXISTING ADDRESSABLE FIRE ALARM CONTROL PANEL WITH VOICE NOTIFICATION (REFER TO SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS)	PROVIDE 24 HR. BATTERY BACK UP IN STAND-BY, THEN 30 MINUTES OF EMERGENCY ALARM OPERATION AT MAXIMUM LOAD. INCLUDE ADDITIONAL: SLC LOOPS CARDS, POWER SUPPLIES, VOICE CARDS, AMPLIFIERS (PRIMARY AND BACK-UP), ETC... AS REQUIRED.
FAAP	NOTIFIER	EXISTING	EXISTING FIRE ALARM ANNUNCIATOR PANEL WITH VOICE NOTIFICATION	
(2)(1) NAC AS REQUIRED	NOTIFIER	FCPS-24S SERIES	N.A.C. POWER EXTENDER	POWER SUPPLY PANEL WITH 24 HR BATTERY BACK-UP AND THEN 30 MINUTES OF ALARM OPERATION AT MAXIMUM LOAD. MONITOR ALL "NAC'S" FOR TROUBLE.
V S	NOTIFIER	SPSW SERIES TO MATCH OWNER EXISTING DEVICES	WALL MOUNTED (WHITE) SPEAKER/STROBE DEVICE MULTI-CANDELA / MULTI-AUDIO	U.L. 1971 LISTED, USE SYNCHRONIZED DEVICES COORDINATE COLOR WITH FIRE DEPARTMENT, OWNER. WITH WORD "FIRE".
V S C	NOTIFIER	SPSCW SERIES TO MATCH OWNER EXISTING DEVICES	CEILING MOUNTED (WHITE) SPEAKER/STROBE DEVICE MULTI-CANDELA / MULTI-AUDIO	U.L. 1971 LISTED, USE SYNCHRONIZED DEVICES COORDINATE COLOR WITH FIRE DEPARTMENT, OWNER. WITH WORD "FIRE".
EOL -VVV-	NOTIFIER		END OF LINE RESISTOR	AS REQUIRED
INTERIOR NOTIFICATION CABLES	WEST PENN OR BELDEN EQUAL	60495B - 12 GA. 1 PAIR 60493B - 14 GA. 1 PAIR	UNSHIELDED PLENUM RATED	UTILIZE PROPER SIZE TO AVOID EXCESSIVE VOLTAGE DROP.
INTERIOR VOICE CABLES	WEST PENN OR BELDEN EQUAL	60490B - 16 GA. 1 PAIR	SHIELDED PLENUM RATED	UTILIZE PROPER SIZE TO AVOID EXCESSIVE VOLTAGE DROP.

FIRE ALARM DEVICE SCHEDULE NOTES

(1) OBTAIN 120 VOLT POWER FROM EXISTING EMERGENCY PANEL "EM" IN THE ELECTRICAL ROOM.

(2) FURNISH AND INSTALL VOICE AMPLIFIERS AND "NAC" PANELS TO COVER ALL SPEAKER STROBE LOADS AFTER FINAL BALANCING OF SYSTEM AND AT LEAST 30% FUTURE GROWTH.

ALL DEVICES NEED TO COMPLY WITH U.L. 864 9th EDITION.

COORDINATE EXACT MODEL NUMBERS WITH MANUFACTURER PRIOR TO ORDERING.

FIRE ALARM SYSTEM GENERAL NOTES:

1. FIRE ALARM CONTRACTOR TO PROVIDE AND INSTALL NEW FIRE ALARM DEVICES IN LOCATIONS GIVEN AND WIRE BACK TO EXISTING FIRE ALARM CONTROL PANEL.

   FIRE ALARM WIRING SHALL BE PLENUM RATED AND MAY BE INSTALLED EXPOSED ABOVE ACCESSIBLE CEILINGS. ALL EXPOSED WIRING IN UNFINISHED AREAS TO BE INSTALLED IN RACEWAY UP TO CEILING STRUCTURE FOR PROTECTION. ALL WIRING INSTALLED EXPOSED IN FINISHED AREAS WILL BE INSTALLED IN IVORY METALLIC WIREMOLD TYPE RACEWAY. ALL RACEWAYS SHALL BE STUBBED OUT TO ABOVE ACCESSIBLE CEILINGS. ALL EXPOSED WIRING INSTALLED ABOVE ACCESSIBLE CEILINGS SHALL BE SUPPORTED WITH J-HOOKS. ALL RACEWAYS STUBS SHALL BE PROVIDED WITH END BUSHINGS/FITTINGS TO PROTECT THE CABLING. ALL WIRING INSTALLED ABOVE NON-ACCESSIBLE CEILINGS SHALL BE INSTALLED IN CONDUIT. ALL CABLING INSTALLED IN AREAS SUBJECT TO DAMAGE (I.E. MECHANICAL ROOMS, STORAGE ROOMS, ETC..) SHALL BE INSTALLED IN RACEWAY. TYPE TO BE SELECTED BY THE OWNER/ENGINEER. DO NOT INSTALL CABLING ABOVE TOP CHORD OF BAR JOISTS OR WITHIN 6" OF ROOF DECK SO AS TO PREVENT DAMAGE BY ROOFING NAILS. ALL EXPOSED CONDUIT AND INSTALLED IN FINISHED AREAS SHALL BE PAINTED OUT TO MATCH AREA COORDINATE WORK WITH THE ARCHITECT. ALL CONDUIT AND BOXES BEING USED SHALL BE RED IN COLOR.
2. PRIOR TO SUBMITTING BID, CONTRACTOR SHALL WALK BUILDING AND BECOME FAMILIARIZED WITH THE BUILDING CONSTRUCTION. TAKE NOTE TO ALL CEILING AND WALL MATERIALS PRIOR TO BIDDING. NO ADDITIONAL COST WILL BE INCURRED BY THE OWNER FOR WORK THAT COULD HAVE BEEN REASONABLY DETERMINED AND/OR AVOIDED HAD THE CONTRACTOR FIELD VERIFIED EXISTING BUILDING CONSTRUCTION TYPE AND CONDITIONS PRIOR TO BIDDING.
4. FIRE ALARM CONTRACTOR SHALL VERIFY THAT ALL FIRE ALARM DEVICES CONFORM TO ILLINOIS ACCESSIBILITY CODE REQUIREMENTS, ADA, IFC 2009 AND NFPA 2009 AND UL1971 REQUIREMENTS.
5. FIRE ALARM CONTRACTOR TO PROVIDE AND INSTALL FIRE ALARM ZONE MAP IN A PLEXI-GLASS FRAME. MAPS TO BE MOUNTED NEXT TO CONTROL AND ANNUNCIATOR PANELS. GIVE (5) COPIES TO OWNER. SHOW ALL INITIATING DEVICES AND NAC PANELS.
6. EACH SIGNAL CIRCUIT SHALL NOT EXCEED 1.3 AMPS. ADJUST WIRE SIZES TO LIMIT VOLTAGE DROP AS PER NFPA 72 AND LOCAL CODE.
7. PROVIDE AND INSTALL ADDITIONAL POWER SUPPLIES/EXTENDER PANELS ("NAC" PANELS) AND AMPLIFIER PANELS AS REQUIRED FOR PROPER OPERATION OF NOTIFICATION CIRCUITS (STROBES AND SPEAKERS) AND TO MINIMIZE WIRING RUNS TO FIRE ALARM CONTROL PANEL AND TO MEET SLC CIRCUIT DISTANCE LIMITATIONS. "NAC" AND AMPLIFIER PANELS SHALL BE INSTALLED IN JANITOR CLOSETS OR STORAGE ROOMS IF APPROVED BY THE OWNER. "NAC" AND AMPLIFIER PANELS WILL NOT BE INSTALLED ABOVE CEILINGS OR IN CEILING SPACES. "NAC" AND AMP PANELS SHALL BE SUPERVISED. INSTALL DETECTOR AT EACH LOCATION TO PROTECT PANEL.
8. PROVIDE AND INSTALL RED PRE-FINISHED BACK BOX WHERE SURFACE MOUNTED BOXES ARE REQUIRED. INSTALL MANUFACTURER TRIM PLATE AS REQUIRED. COORDINATE COLOR PRIOR TO ORDERING. ALL EXTERIOR BOXES SHALL BE WEATHERPROOF "WP" LISTED.
9. CONTRACTOR SHALL MAINTAIN AN OPERABLE FIRE ALARM SYSTEM AT ALL TIMES. AT NO TIME SHALL THE BUILDING BE LEFT UNPROTECTED WITHOUT NOTIFICATION IN WRITING TO OWNER AND FIRE DEPARTMENT. MINIMUM 48 HOURS ADVANCED NOTICE IS REQUIRED. CONTRACTOR SHALL HIRE FIRE DEPARTMENT APPROVED GUARD/FIRE DEPARTMENT PERSONNEL TO WATCH BUILDING WHEN LEFT UNPROTECTED. MINIMIZE SYSTEM DOWN TIME TO THE FULLEST EXTENT POSSIBLE. PROVIDE TEMPORARY DETECTION THROUGHOUT BUILDING DURING CONSTRUCTION TO PROTECT BUILDINGS.
   FIRE ALARM SYSTEM IS TO BE KEPT ACTIVE THROUGHOUT THE PROJECT. THERE MAY BE TIMES DURING THE DAY WHEN WORK IS BEING PERFORMED, THAT THE FIRE MONITORING SYSTEM HAS TO BE TAKEN OUT OF SERVICE. IF AND WHEN THIS SITUATION ARISES, THE FIRE DEPARTMENT NEEDS TO BE CONTACTED AND THE CORRESPONDING PANEL TAKEN OUT OF SERVICE. IT WILL BE THE RESPONSIBILITY OF THE CONTRACTOR TO ENSURE SYSTEM IS ACTIVE EACH DAY AND TO TAKE THE STATED STEPS NECESSARY TO TAKE THE SYSTEM OUT OF SERVICE IF NEEDED, WHETHER IT IS REQUIRED FOR THEIR OWN WORK OR AS DIRECTED BY THE CONSTRUCTION MANAGER FOR ANOTHER TRADES WORK. IN ADDITION SMOKE DETECTORS ARE TO BE PROVIDED OR KEPT IN SERVICE AT MINIMUM IN ORDER TO LEAVE THE BUILDING PROTECTED DURING WORK HOURS AND AFTER HOURS. THE REMAINDER OF THE SYSTEM IS TO BE KEPT UP AND RUNNING AS LONG AS POSSIBLE.
10. CONTRACTOR SHALL PROVIDE BATTERY BACKUP IN ORDER TO OBTAIN 60 HOURS OF STANDBY IN THE EVENT OF A POWER FAILURE AND 15 MINUTES PLUS 25% SPARE CAPACITY OF EMERGENCY OPERATION AT MAXIMUM LOAD.
11. SET EACH INITIATING DEVICE WITH ADDRESSABLE STATION NUMBER AS REQUIRED. LABEL EACH DEVICE WITH ADDRESS NUMBER. PROVIDE LIST OF ADDRESSABLE DEVICE LOCATION NUMBERS TO OWNER. LABEL EACH NOTIFICATION DEVICE WITH CIRCUIT INFORMATION. INCLUDE BAR CODE ON EACH DEVICE AS WELL. SEE SPECIFICATIONS.
12. CONTRACTOR SHALL TURN OVER ALL SMOKE DETECTOR DUST CAPS TO OWNER UPON COMPLETION OF PROJECT.
13. SMOKE AND/OR HEAT DETECTORS SHALL BE INSTALLED A MINIMUM OF 6 FEET AWAY FROM AIR SUPPLY OR AIR RETURN DIFFUSER GRILLES SO AS PREVENT FALSE ALARMS.
14. IN FINISHED AREAS WHERE EXISTING SURFACE MOUNTED BACKBOXES, WIREMOLD OR CONDUIT HAVE BEEN REMOVED, PATCH AND PAINT WALLS AND/OR CEILINGS TO MATCH SURROUNDING AREAS. COORDINATE WITH THE ARCHITECT AND OWNER. NEW DEVICES AND RACEWAYS MAY BE MOUNTED AT NEW LOCATIONS.
15. REMOVE AND REPLACE CEILING SYSTEMS AS REQUIRED FOR INSTALLATION OF RACEWAYS AND CABLING. REINSTALL CEILING SYSTEM WHEN COMPLETE. REPLACE ALL DAMAGED CEILING TILES WITH TYPE TO MATCH EXISTING.
16. ALL WALL AND FLOOR PENETRATIONS SHALL BE SLEEVED AND FIREPROOFED.
17. CONTRACTOR SHALL SUBMIT SHOP DRAWINGS PER SPECIFICATIONS. INCLUDE ONE LINE RISER DIAGRAMS AND POINT-TO-POINTS. INCLUDE ACTUAL BUILDING WIRING PLANS SHOWING WIRING OF ALL DEVICES AND LOCATIONS OF ALL T-TAPS.
18. FIRE ALARM CONTRACTOR SHALL BE A LICENSED STATE OF ILLINOIS FIRE ALARM CONTRACTOR HOLDING AT LEAST A NICET LEVEL 2 CERTIFICATION.
19. SYSTEM INSTALLATION SHALL BE TESTED AND CERTIFIED PER NFPA 72 REQUIREMENTS. SYSTEM TESTING MUST BE REVIEWED AND ACCEPTED BY THE LOCAL FIRE DEPARTMENT.

NOTE:
OWNERS FIRE ALARM REPRESENTATIVE IS COMMERCIAL ALARM SYSTEMS, LLC.
CONTACT JAMES MCCOLLAM (630) 832-2844; jmccollam@casystemsllc.com
CONFORM TO STYLE-4 WIRING SCHEME.

QUANTITIES INDICATED ARE FOR INFORMATION ONLY AND ARE NOT INTENDED TO INDICATE ALL DEVICES AND/OR CIRCUITS. CONTRACTOR IS RESPONSIBLE FOR DETERMINING ALL FINAL QUANTITIES OF DEVICES AND CIRCUITS REQUIRED.

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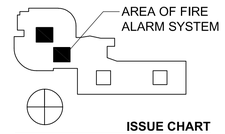
KEYPLAN



ISSUE CHART

MARK	ISSUE	DATE
1	ISSUE FOR BID	07MAY18
Job Number		024303.009
Drawn		JD
Checked		MC
Approved		MC

TITLE

FIRE ALARM SYSTEM NOTES AND DETAILS

SHEET NUMBER

E00-02

COLLEGE OF DUPAGE - MEDIA CENTER - LIGHT FIXTURE SCHEDULE

TAG	MANUFACTURER	MODEL NUMBER	LAMPS / LUMINARIES QTY	LAMPS / LUMINARIES TYPE	LAMPS / LUMINARIES WATTS	LAMPS / LUMINARIES VOLTS	BALLASTS BALLAST TYPE	BALLASTS BAL. FACTOR "BF"	MOUNTING	DESCRIPTION	REMARKS
F1	AXIS LIGHTING OR MARK LIGHTING	BBR-(S or F)-FL-20-T8-2-(NO DOWN LIGHT)-W-UNV-ERS-E (EMERGENCY SECTION)-1-TB15 - * FIXTURE TO MATCH EXISTING FIXTURES BEING RE-USED IN THE SPACE. CONTRACTOR SHALL VERIFY THE EXACT TYPE/MANUFACTURER, DIMENSIONS, LAMP QUANTITY, LENS TYPE, FIXTURE COLOR, ETC... IN THE FIELD PRIOR TO ORDERING THE FIXTURE.	2	32W T8 4100˚ K	56 PER 4 FOOT	120/277V 1 PH	PHILLIPS OPTANIUM PROGRAM RAPID START <10% THD	STANDARD B.F. 0.88	RECESSED	RECESSED LINEAR FIXTURE	(1) ELECTRONIC BALLAST VERIFY LAMP COLOR WITH EMERGENCY SECTION FIXTURE TO MATCH EXISTING FIXTURES BEING RE-USED IN THE SPACE. CONTRACTOR SHALL VERIFY THE EXACT TYPE/MANUFACTURER, DIMENSIONS, LAMP QUANTITY, LENS TYPE, FIXTURE COLOR, ETC... IN THE FIELD PRIOR TO ORDERING THE FIXTURE.
F2	AXIS LIGHTING	BBDLED-1000-90-40-SO-4-(COLOR BY ARCHITECT)-UNV-DP-1-(VERIFY MOUNTING AND STEM LENGTH IN FIELD)-F	LED	1000 LUMEN PER FOOT 4100˚ K	38	120/277V 1 PH			PENDANT	PENDANT LINEAR FIXTURE	VERIFY LAMP COLOR PROVIDE POWED AND NON-POWERED CANOPIES. COORDINATE EXACT TYPE REQUIRED IN THE FIELD.
F3	LITHONIA	SBL4-4800LM-80CRI-40K-MIN1-MVOLT	LED	4800 LUMEN 4100˚ K	40.5	120/277V 1 PH			SURFACE	SURFACE MOUNTED FIXTURE	VERIFY LAMP COLOR

* CONTRACTOR SHALL INCLUDE POWER PLUG CONNECTOR FOR ALL LIGHT FIXTURES TO MATCH OWNER'S CURRENT LIGHT FIXTURE PLUG CONFIGURATION. INCLUDE MATCHING RECEPTACLE FOR FLEX FEED END. ALL PLUG/RECEPTACLES SHALL BE U.L. LISTED FOR PLENUM ENVIRONMENT.

NOTES:

1 OTHER MANUFACTURERS ONLY ALLLOWED UPON ARCHITECT/OWNER'S PRIOR APPROVAL.

2 LAMPS AND BALLASTS MUST CONFORM WITH "DCEO" (ILLINOIS DEPARTMENT OF COMMERCE AND ECONOMIC OPPORTUNITY) REQUIREMENTS IN ACCORDANCE WITH "CEE - COMMERCIAL LIGHTING". REFER TO "CEE - COMMERCIAL LIGHTING" WEB SITE (http://www.cee.org/com/com-lt/com-lt-main.php3) FOR APPROVED LAMPS AND BALLASTS TO BE UTILIZED. ALL MANUFACTURERS NOT LISTED IN PROJECT SPECIFICATION MANUAL SECTION 265100 WILL NOT BE ALLOWED.

3 32W FLUORESCENT LAMPS SHALL BE A MINIMUM OF 3100 LUMENS, 85 CRI, 30,000 HOURS BASED UPON PHILLPS ADVANTAGE T8 LAMPS #F32T8/ADV***/ALTO SERIES LAMPS. LAMP COLOR TO BE COORDINATED WITH THE OWNER PRIOR TO ORDERING.

4 LIGHT FIXTURES SHALL BE INDEPENDANTLY SUPPORTED TO THE BUILDING STRUCTURE FROM THE CEILING SYSTEM. REFER TO SPECIFICATIONS SECTION 265100 FOR ADDITIONAL INFORMATION.

5 REFER TO SPECIFICATIONS SECTION 265100 FOR ADDITIONAL INFORMATION. LIGHT FIXTURES INSTALLED IN AREAS CONTROLLED BY OCCUPANCY SENSORS SHALL HAVE PROGRAMMED RAPID START BALLASTS (WIRED IN PARALLEL) INSTALLED. LIGHT FIXTURES INSTALLED IN AREAS NOT CONTROLLED BY OCCUPANCY SENSORS SHALL HAVE INSTANT START BALLASTS INSTALLED.

6 REFER TO ARCHITECTURAL DRAWINGS FOR EXACT LOCATION OF FIXTURES.

7 FURNISH AND INSTALL ALL LIGHT FIXTURE MOUNTING HARDWARE REQUIRED FOR A COMPLETE INSLALLATION OF LIGHT FIXTURES (IE. PENDANTS, FLANGE KITS, CANOPIES, TONG HANGERS, SAFETY CHAINS, UNI-STRUT, ETC.)

8 CATALOG NUMBERS MAY NOT REFLECT ALL OF THE REQUIREMENTS INCLUDED IN THE DRAWINGS AND SPECIFICATIONS. COORDINATE EXACT REQUIREMENTS WITH MANUFACTURER.

9 CUSTOM COLOR, DIFFUSER OR OTHER OPTIONS TO BE DETERMINED/SELECTED BY ARCHITECT.

LIGHT FIXTURE INSTALLATION:

1 SUPPORT FOR LIGHTING FIXTURES IN OR ON GRID-TYPE SUSPENDED CEILINGS:

INSTALL A MINIMUM OF FOUR CEILING SUPPORT SYSTEM RODS OR WIRES FOR EACH FIXTURE. LOCATE NOT MORE THAN 6 INCHES FROM LIGHTING FIXTURE CORNERS. RODS/WIRE MUST BE INSTALLED FROM STRUCTURE AND SIZED IN ORDER TO SUPPORT EACH FIXTURE INDEPENDENTLY OF GRID. WIRE SHALL HAVE BREAKING STRENGTH OF THE WEIGHT OF THE FIXTURE AT A SAFETY FACTOR OF 3 TIMES UNITS WEIGHT. PROVIDE NO MORE THAN 2" OF SLACK IN EACH FIXTURE SUPPORT CABLE AFTER FIXTURES HAVE BEEN INSTALLED WITHIN GRID.

SUPPORT CLIPS: FASTEN TO LIGHTING FIXTURES AND TO CEILING GRID MEMBERS AT OR NEAR EACH FIXTURE CORNER WITH CLIPS THAT ARE UL LISTED FOR THE APPLICATION, PER NEC 410-16-C.

FIXTURES OF SIZES LESS THAN CEILING GRID: INSTALL AS INDICATED ON REFLECTED CEILING PLANS OR CENTER IN ACOUSTICAL PANEL, AND SUPPORT FIXTURES INDEPENDENTLY WITH AT LEAST TWO 3/4-INCH METAL CHANNELS SPANNING AND SECURED TO CEILING TEES. INSTALL AT LEAST ONE INDEPENDENT SUPPORT ROD OR WIRE FROM STRUCTURE TO A TAB ON EACH END OF LIGHTING FIXTURE. WIRE OR ROD SHALL HAVE BREAKING STRENGTH OF THE WEIGHT OF FIXTURE AT A SAFETY FACTOR OF 3.

2 SUSPENDED LIGHTING FIXTURE SUPPORT:

PENDANTS AND RODS: WHERE LONGER THAN 48 INCHES, BRACE TO LIMIT SWINGING.

STEM-MOUNTED, SINGLE-UNIT FIXTURES: SUSPEND WITH TWIN-STEM HANGERS.

CONTINUOUS ROWS: USE TUBING OR STEM FOR WIRING AT ONE POINT AND TUBING OR ROD FOR SUSPENSION FOR EACH UNIT LENGTH OF FIXTURE CHASSIS, INCLUDING ONE AT EACH END. UTILIZE UNI-STRUT IN ORDER TO KEEP INDIVIDUAL FIXTURES IN A ROW UNIFORM IN MOUNTING HEIGHTS. REFER TO DRAWINGS FOR ADDITIONAL INFORMATION. PAINT OUT TO MATCH SURROUNDING AREA.

CONTINUOUS EXTRUDED ROWS: SUSPEND FROM STRUCTURE WITH AIRCRAFT CABLE LISTED BY MANUFACTURER FOR APPLICATION. DO NOT FASTEN TO GRID CEILING.

3 ALL JUNCTION BOXES USED FOR SUPPORTING LIGHT FIXTURES WILL BE HEAVY DUTY UL LISTED FOR THE APPLICATION. DO NOT SUPPORT FROM CEILING GRID. SUPPORT FROM STRUCTURE AND USE GRID TO STABILIZE UNIT.

4 PROVIDE FLANGE KITS FOR ALL FIXTURES RECESSED MOUNTED IN GYPSUM CEILINGS.

LOW VOLTAGE OCCUPANCY SENSOR SCHEDULE

TAG	MANUFACTURER	MODEL NUMBER	DESCRIPTION	REMARKS
OSC	LEVITON	OSC__-MOW SERIES	MULTI-TECHNOLOGY LOW VOLTAGE CEILING MOUNT SENSOR STANDARD / EXTENDED COVERAGE	CEILING MOUNTED SENSOR. COORDINATE FINAL LOCATION AND COVERAGE TYPE REQUIRED IN THE FIELD TO PROVIDE PROPER COVERAGE OF SPACE. SET INITIAL OFF TIME DELAY TO 10 MINUTES UTILIZE POWER PACK #OPP20-RD4 POWER PACK WIRED FOR AUTO-ON / AUTO-OFF.
WS	LEVITON	OSSMT-MD SERIES	MULTI-TECHNOLOGY DECORATOR WALL SWITCH SENSOR AUTO-ON / AUTO-OFF	SET FOR AUTO-ON / AUTO-OFF WALL MOUNT IN SWITCH BOX. SET INITIAL OFF TIME DELAY TO 5 MINUTES, COORDINATE WITH THE OWNER. COLOR SELECTED BY ARCHITECT/OWNER.
WSVAC	LEVITON	OSSMT-MD SERIES	MULTI-TECHNOLOGY DECORATOR WALL SWITCH SENSOR MAUNAL-ON / AUTO-OFF	SET FOR MANUAL-ON / AUTO-OFF WALL MOUNT IN SWITCH BOX. SET INITIAL OFF TIME DELAY TO 5 MINUTES, COORDINATE WITH THE OWNER. COLOR SELECTED BY ARCHITECT/OWNER.
PP PP2	LEVITON	OPP20-RD4 SERIES	POWER PACK - 1 POLE POWER PACK - 2 POLE (AS REQUIRED)	277 VOLT RATED MOUNT IN JUNCTION BOX ABOVE CEILING. LABEL JUNCTION BOX COVERPLATE.
REM	LOW VOLTAGE SYSTEMS, INC.	EPC-A SERIES	EM LIGHTING RELAY MODULE	
$ 0-10V DIM	LEVITON	IPT10LF	0-10V LED DIMMER SWITCH	COORDINATE COLOR WITH ARCHITECT

LOW VOLTAGE MOTION/OCCUPANCY SENSOR SCHEDULE NOTES

PROVIDE MULTIPLE POWER PACKS AS REQUIRED IN ORDER TO CONTROL LIGHT FIXTURES IN AREAS SUPPLIED WITH MULTIPLE LIGHTING CIRCUITS AND/OR WITH MULTIPLE SWITCHING CIRCUITS/PATTERNS.

POWER PACKS INSTALLED ABOVE CEILINGS OR EXPOSED BELOW CEILINGS SHALL BE INSTALLED IN JUNCTION BOX. UTILIZE TWO (2) JUNCTION BOXES (ONE FOR POWER PACK AND ONE FOR WIRING). ALL WIRE CONNECTIONS (LINE VOLTAGE AND LOW VOLTAGE) SHALL BE MADE INSIDE OF JUNCTION BOX. DO NOT MIX LINE VOLTAGE AND LOW VOLTAGE IN THE SAME BOX. UTILIZE PRE-FINISHED JUNCTION BOXES IN EXPOSED AREAS.

NOTE:
ALL WORK SHALL BE WARRANTED FOR (5) YEARS. COVERAGE TO COVER ALL PARTS, LABOR AND REPOSITIONING OF SENSORS FOR PROPER OPERATION. FOLLOW ALL MANUFACTURERS INSTALLATION INSTRUCTIONS. DO NOT MOUNT NEAR HEATING VENTS. TEST SYSTEM UPON COMPLETION OF WORK. ADJUST AS REQUIRED FOR PROPER OPERATION.

MANUFACTURERS REPRESENTATIVE SHALL COME TO THE SITE TO ASSIST THE ELECTRICAL CONTRACTOR IN TUNING THE ENTIRE OCCUPANCY SYSTEM FOR PROPER OPERATION.

ALL SENSOR LOCATIONS AND COVERAGES MUST BE COORDINATED AND VERIFIED WITH SYSTEM MANUFACTURER. PROVIDE MANUFACTURER SHOP DRAWINGS SHOWING SENSOR LOCATIONS, TYPE OF SENSOR AND COVERAGE AREAS FOR EACH SPACE AFFECTED BY NEW WORK. ADDITIONAL SENSORS NOT SHOWN ON DRAWINGS REQUIRED TO ADEQUATELY COVER EACH SPACE SHALL BE PROVIDED AT NO ADDITIONAL COST TO THE OWNER. CONDUIT AND WIRING SHALL BE INCLUDED FOR A COMPLETE WORKING SYSTEM. ALL LOW VOLTAGE WIRING SHALL BE CLASS-2, PLENUM RATED, 18-22 AWG COPPER PER MANUFACTURERS REQUIREMENTS.

INSTALL CONTROL WIRING IN RACEWAY WHEN EXPOSED IN FINISHED AREAS OTHER EXPOSED AREAS SUBJECT TO DAMAGE.

ALL WIRING SHALL COMPLY WITH 2015 INTERNATIONAL ENERGY CONSERVATION CODE.

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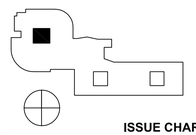
KEYPLAN



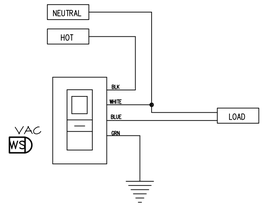
ISSUE CHART

MARK	ISSUE	DATE
1	ISSUE FOR BID	07MAY18

Job Number	024303.009
Drawn	JD
Checked	MC
Approved	MC

TITLE
LIGHT FIXTURE SCHEDULE AND LIGHTING CONTROL NOTES AND DETAILS

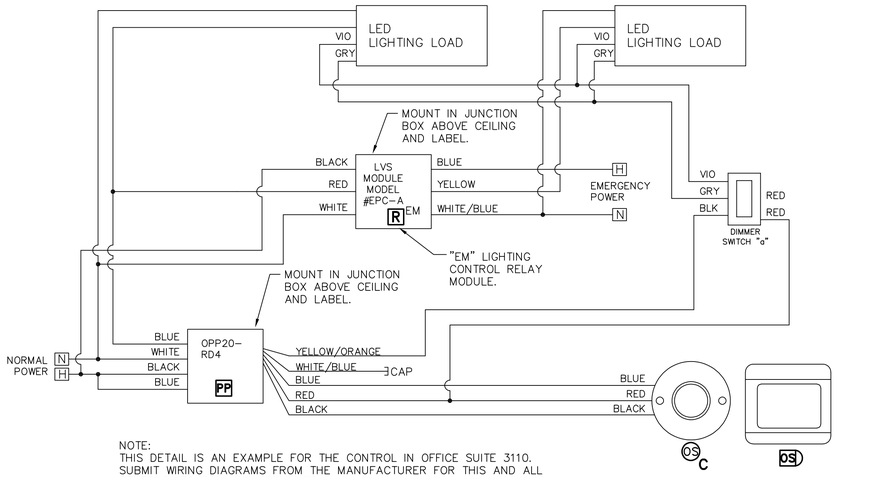
SHEET NUMBER
E00-03



VACANCY SENSOR WALL SWITCH

COORDINATE FINAL WIRING DIAGRAMS WITH MANUFACTURER INSTALLATION INSTRUCTIONS.

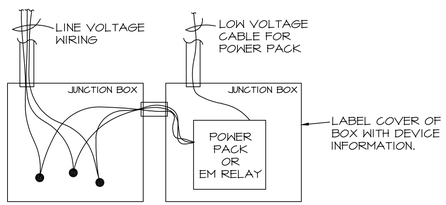
WALL SWITCH SENSOR DETAIL
NO SCALE



NOTE:
THIS DETAIL IS AN EXAMPLE FOR THE CONTROL IN OFFICE SUITE 3110. SUBMIT WIRING DIAGRAMS FROM THE MANUFACTURER FOR THIS AND ALL OTHER SWITCHING ARRANGEMENTS

CEILING/WALL MOUNTED OCCUPANCY SENSORS AUTO ON–AUTO OFF

OCCUPANCY SENSOR DETAIL
LED LIGHT FIXTURES WITH DIMMER AND AN "EM" RELAY
NO SCALE

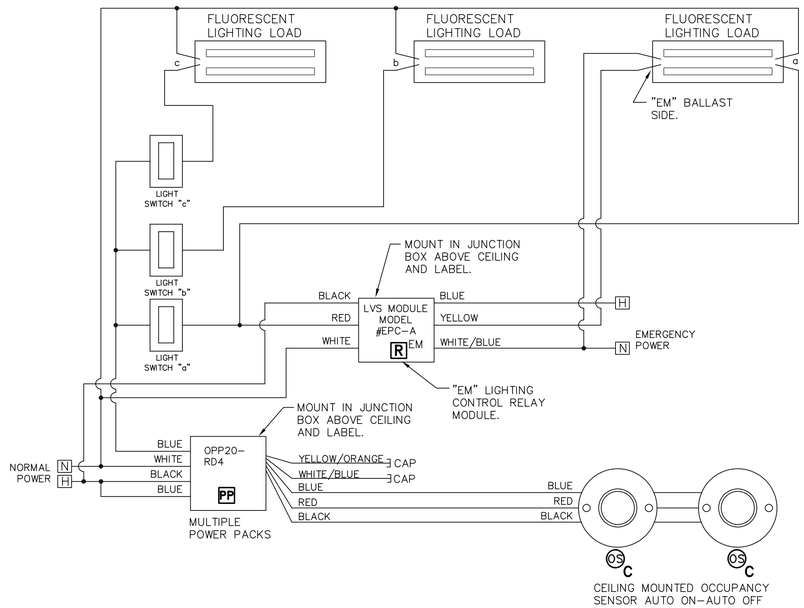


POWER PACK OR EM RELAY INSTALLATION

NOTE:
EM RELAY REQUIRED MINIMUM 3" DEEP JUNCTION BOX, 4–11/16" SIZE WITH COVER.

COORDINATE FINAL WIRING DIAGRAMS WITH MANUFACTURER INSTALLATION INSTRUCTIONS.

POWER PACK DETAIL
NO SCALE



MULTIPLE POWER PACKS

CEILING MOUNTED OCCUPANCY SENSOR AUTO ON–AUTO OFF

NOTE:
THIS DETAIL IS AN EXAMPLE FOR THE CONTROL IN OFFICES. SUBMIT WIRING DIAGRAMS FROM THE MANUFACTURER FOR THIS AND ALL OTHER SWITCHING ARRANGEMENTS

OCCUPANCY SENSOR DETAIL WITH IN-BOARD/OUT-BOARD AND EM RELAY
NO SCALE

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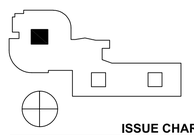

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MARK	ISSUE	DATE
1	ISSUE FOR BID	07MAY18

Job Number	024303.009
Drawn	JD
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Approved	MC

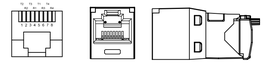
TITLE
LIGHT FIXTURE SCHEDULE AND LIGHTING CONTROL NOTES AND DETAILS

SHEET NUMBER

E00-04

COLOR	CATALOG # T568B WIRING
DATA - CAT-6 - BLACK	CJ688TGBL

T568B (AT&T)



WIRING FORMAT

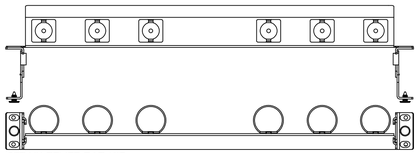
NOTES:
1. JACKS ARE U.L. AND CSA LISTED.
2. JACK CONTACTS ARE BERYLLIUM COPPER AND GOLD PLATED.
3. MODULAR JACKS MEET OR EXCEDE F.C.C. PART 68.5.
4. JACK HOUSINGS ARE MADE OF HIGH IMPACT, 94 V-O ABS RATED THERMOPLASTIC.
5. COMPATIBLE WIRE SIZES, 22-24 AWG AND A MAX. INSULATION SIZE OF .050 INCH. SEE ABOVE FOR WIRING FORMATS.
6. FOR MORE INFORMATION CONTACT YOUR CUSTOMER SERVICE REPRESENTATIVE.

PANDUIT MINI-COM TX6 PLUS SERIES MODULAR JACKS

NO SCALE

NETWORK DATA CABLE SCHEDULE

CABLE TYPE	MANUFACTURER	MODEL NUMBER	DESCRIPTION	REMARKS
CAT-6 COPPER CABLE	PANDUIT	DATA CABLE: #PUP6004BU-UY BLUE	CAT-6 NETWORK CABLE PLENUM RATED 4-PAIR, #23 AWG UTP	COLORS TO BE VERIFIED WITH OWNER PRIOR TO ORDERING.
COAX CABLE	MOHAWK	RG6 COAX CABLE: #M1002 BLACK	RG6 COAX VIDEO CABLE PLENUM RATED #18 AWG	
CONTRACTOR SHALL FURNISH AND INSTALL CABLES AND CONNECTORS AS SPECIFIED TO INTERCONNECT ALL AS NOTED ON DRAWINGS AND RISER DETAILS. DETERMINE ALL REQUIRED LENGTHS OF CABLES IN FIELD PRIOR TO ORDERING. UPON COMPLETION OF WORK, CONTRACTOR SHALL TEST AND CERTIFY EACH CONNECTION FOR PROPER OPERATION.				



STRAIN RELIEF BAR KIT

24 PORT PATCH PANEL

48 PORT PATCH PANEL

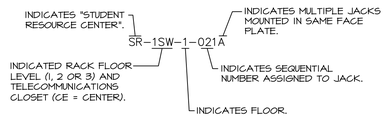
PANDUIT P/N	USE
DP24688TGY	CAT-6, 24 PORT PATCH PANEL
DP48688TGY	CAT-6, 48 PORT PATCH PANEL
SRBBRM-KIT	STRAIN RELIEF BAR KIT WITH TAK-TY HOOK AND LOOP CABLE TIES AND QUICK RELEASE BRACKETS

NOTES:
1. SEE CURRENT CATALOG FOR VARIOUS APPLICATIONS AS WELL AS OPTIONAL ICONS.
2. PATCH PANEL KIT INCLUDES THE FOLLOWING:
   - LABEL SET 1-24
   - LABEL SET 25-48
   - BLANK LABEL
   - LABEL HOLDERS
   - STRAIN RELIEF BAR
   - DP6 48 PORT PATCH PANEL
   - 12-24 X 1/2" ROUND HEAD SCREWS
   - M6x1 X 15mm METRIC SCREWS
3. MATERIAL:
   - PANEL HOUSING: STEEL
   - RJ45 MODULE: THERMOPLASTIC RESIN UL94V-0
   - PUNCHDOWN BLOCKS: THERMOPLASTIC RESIN UL94V-0
   - BEZEL ASSEMBLY: THERMOPLASTIC RESIN UL94H-B
   - RETENTION CAP: THERMOPLASTIC RESIN UL94V-0
   - STRAIN RELIEF BAR: STEEL BAR STOCK
   - LABEL: VINYL
   - LABEL HOLDER: CLEAR VINYL
4. 48 PORT PATCH PANEL 8 POSITION 8 WIRE.
5. THE PATCH PANEL AND STRAIN RELIEF BAR ARE DESIGNED FOR MOUNTING TO 19" UNIVERSAL RACKS.
6. USE 110 STYLE TERMINATION TOOL FOR PUNCHDOWN.
7. RETENTION CAPS (ONE PER CONNECTOR) PROVIDED FOR SNAP-IN ON TERMINATED CONNECTORS.

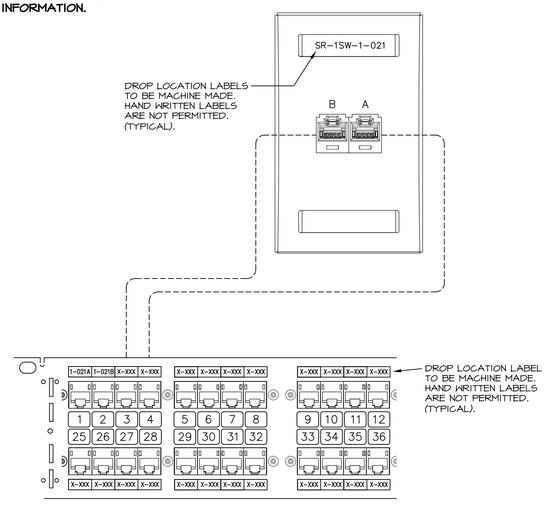
CONTRACTOR SHALL LABEL ALL PORTS AS REQUIRED TO REFLECT INSTALLATION. COORDINATE WITH OWNER FOR LABELING REQUIREMENTS.

PANDUIT #DP SERIES CAT-6 24 & 48 PORT PATCH PANEL

NO SCALE



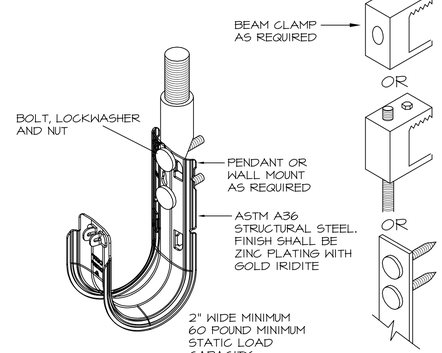
COORDINATE EXACT LABELING DESIGNATIONS WITH THE OWNER PRIOR TO LABELING. REFER TO SPECIFICATIONS FOR ADDITIONAL INFORMATION.



LABELING NOTES:
1. CONFIRM ALL ROOM NUMBERS WITH THE OWNER PRIOR TO LABELING.
2. USE THE FOLLOWING FORMAT FOR ALL OUTLET AND PATCH PANEL LABELING. SEE DETAIL.
3. BROTHER P-TOUCH, CASIO EZ LABEL, BRADY OR PRIOR APPROVED EQUAL SELF-ADHESIVE LABELS SHALL BE UTILIZED FOR ALL OUTLET AND PATCH PANEL LABELING. A SAMPLE OF EACH INFORMATION OUTLET WITH 1' MINIMUM OF EACH CABLE TERMINATED SHALL BE REQUIRED FOR APPROVAL.
4. PLACE LABELS ON FACEPLATES AND INSIDE OUTLET BOXES FOR ALL OUTLET LOCATIONS.
5. LABEL ALL PATCH PANEL TERMINATIONS WITH THE IDENTICAL NUMBER USED AT OUTLET LOCATIONS.
6. LABEL ENDS OF ALL CABLING RUNS WITH PANDUIT #PAN-TY, BRADY OR EQUAL LABELS IN PERMANENT MARKER.
7. LABEL ALL PATCH CORDS WITH PANDUIT #PAN-TY, BRADY OR EQUAL LABELS IN PERMANENT MARKER.
8. LABELS ON FACEPLATES, PATCH PANELS AND BOTH ENDS OF CABLES SHALL MATCH.

DATA JACK AND PATCH PANEL LABELING DETAIL

NO SCALE



USE MULTIPLE TIERS FOR SEPERATION OF SYSTEMS. (PAGING, VIDEO, PHONE, DATA, ETC...)

CADDY #CAT HP SERIES J-HOOK DETAIL

NO SCALE

FOR INSTALLATION ABOVE CEILINGS

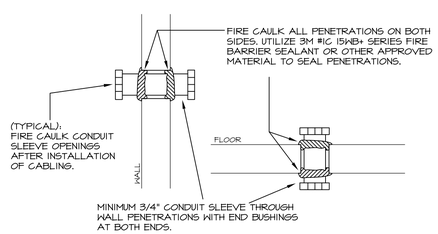
LABEL CABLE AT EACH END WITH DEVICE BEING SERVED. LABELS TO MATCH ROOM COVERPLATE AND PATCH PANEL LABELS. COORDINATE EXACT VERBAGE FOR CABLES IN THE FIELD WITH THE OWNER AND ENGINEER PRIOR TO LABELING CABLES.

SR-1SW-1-021A

LABELS SHALL BE SELF-LAMINATING TYPE TYPICAL TO PANDUIT SELF-LAMINATING POLYESTER LABELS. TEXT SHALL BE TYPE ONTO LABEL. HAND-WRITTEN LABELS WILL NOT BE ACCEPTABLE.

CABLE LABEL DETAIL

NO SCALE



WALL/FLOOR PENETRATION DETAIL

NO SCALE

DATA/PHONE CABLE & DATA/PHONE JACK NOTES:

1. CABLES:
   REFER TO "NETWORK DATA CABLE SCHEDULE" FOR DATA CABLE INFORMATION.

   LEAVE 5'-0" OF SLACK OUT OF EACH STATION FOR TERMINATION ON JACK. LEAVE 15'-0" OF SERVICE LOOP ABOVE CEILING FOR POTENTIAL FUTURE JACK RELOCATION. MAINTAIN PROPER BEND RADIUS.
2. ALL DATA CABLES TO BE RUN BACK TO LOCAL AREA RACK (REFER TO RISER DIAGRAM). MAINTAIN A MINIMUM CLEARANCE OF 5" AWAY FROM LIGHT FIXTURES.
3. JACKS:
   DATA JACKS TO BE PANDUIT MINI-COM TX6 PLUS #CJ688TGBL CAT-6, RJ45 MODULAR JACK WITH 110 TERMINATION. COLOR TO BE BLACK.
4. FACE PLATES:
   REFER TO FACEPLATE DETAILS FOR FACEPLATE INFORMATION.

   ALL COMPUTER JACKS INDICATED BY "C2" SHALL RECEIVE A PANDUIT #CFPL2EI FLUSH WALL PLATE WITH (2) RJ45 CAT-6 JACKS AND CABLES.

   PROVIDE EQUAL AMOUNTS OF IBLU50 BLUE ICONS AND IYEL50 YELLOW ICONS AS AMOUNT OF JACKS.
5. EXISTING "IDF" RACK:
   FURNISH AND INSTALL ENOUGH PATCH PANELS TO COVER ALL CABLING AND HAVE A MINIMUM OF (15) SPARE PORTS. PATCH PANELS SHALL BE CAT-6, 110, PATCH PANEL PANDUIT #DP___688TGY (48 PORT OR 24 PORT AS REQUIRED) WITH EQUAL AMOUNTS OF BLUE ICONS, YELLOW ICONS AS AMOUNT OF PORTS AVAILABLE AND PANDUIT #SRBBRM-KIT STRAIN RELIEF BAR KIT BEHIND EACH PATCH PANEL. FURNISH AND INSTALL PANDUIT #CMPHH2 CABLE MANAGEMENT PANELS ABOVE AND BELOW EACH PATCH PANEL. TERMINATE ALL DATA CABLES ON PATCH PANELS. PROVIDE PANDUIT LABELING KITS TO OWNER UPON COMPLETION OF WORK. PROVIDE BLUE 110 CAPS AND CLEAR DUST COVER ON ALL JACKS. UTILIZE PANDUIT #HLTP2I-XO (PLENUM RATED) TAK-TY HOOK AND LOOP STRAPS AS REQUIRED FOR PATCH PANEL CABLE MANAGEMENT.
6. PATCH CORDS:
   PATCH CORDS TO BE FURNISHED AND INSTALLED BY THE OWNER.
7. RUN ALL CABLE ABOVE CEILING THROUGH CADDY CABLECAT "ORIGINAL" J-HOOKS (NO MORE THAN 3'-0" SPACING) SUITABLE FOR CAT-6 CABLING AND CABLE TIES (DO NOT OVER FASTEN). HOOKS TO BE WIDE BASE DESIGN WITH MINIMUM 2" BEARING SURFACE.
8. PROVIDE 15 SPARE RJ45 JACKS TO OWNER UPON COMPLETION OF JOB.
9. ALL SYSTEMS SHALL MEET OR EXCEED STATE OR LOCAL CODES AND ORDINANCES AND U.L. STANDARDS. THE ENTIRE PANDUIT SYSTEM SHALL BE PROVIDED WITH A 25 YEAR PANDUIT PAN-NET PERFORMANCE GUARANTEE WARRANTY AND SYSTEM PERFORMANCE GUARANTEE PROGRAM. INSTALLER SHALL THEREFORE FOLLOW TIA/EIA CAT-6 STANDARDS.
10. INSTALLER SHALL BE A PANDUIT CERTIFIED COMPETENT INSTALLER IN THE FIELD OF COMPUTER DATA WIRING INSTALLATION.
11. INSTALLER SHALL HAVE A MINIMUM OF THREE YEARS OF EXPERIENCE INSTALLING UTP CABLING FOR COMPUTER DATA SYSTEMS.
12. SHOP DRAWINGS SHALL BE SUBMITTED FOR APPROVAL.
13. PROVIDE ONE SET OF REPRODUCIBLE DRAWINGS INDICATING RECORD CONDITIONING OF EQUIPMENT LOCATION AND CABLING.
14. PROVIDE ALL NECESSARY WIRING, HARDWARE, ETC., FOR A COMPLETE SYSTEMS INSTALLATION. PATCH CORDS TO BE FURNISHED AND INSTALLED BY THE OWNER.
15. PROVIDE ALL NECESSARY WIRING, AS NOTED ON DRAWINGS. ALL EXPOSED WIRING SHALL BE RUN IN WIREMOLD, NO WIRING SHALL BE RUN EXPOSED ON CEILINGS, FLOORS, OR WALLS UNLESS APPROVED BY ARCHITECT OR INDICATED OTHERWISE ON DRAWINGS.
16. ALL JACKS, PATCH PANELS, WIRES (BOTH ENDS) AND OTHER ACCESSORIES SHALL BE CLEARLY & PERMANENTLY IDENTIFIED AND LABELED. REFER TO LABELING DETAIL FOR ADDITIONAL INFORMATION. PROVIDE A WIRING LOG BOOK SHOWING ALL TERMINATION AND WIRING CORRESPONDING TO EACH ROOM. COORDINATE WITH OWNER.
17. CONDUCT CHANNEL TESTS & INSPECTIONS AFTER INSTALLATION HAS BEEN COMPLETED TO ASSURE THE OWNER'S REQUIREMENTS FOR INSTALLATION HAVE BEEN MET (FOLLOW TIA/EIA TSB 67 & 72 STANDARDS). UPON REQUEST, PRIOR TO OWNER'S ACCEPTANCE, ALLOW ACCESS BY THE OWNER TO TEST THE EQUIPMENT & WIRING SYSTEM. THE CONTRACTOR SHALL BE RESPONSIBLE FOR CHANNEL TESTING EACH RUN "END-TO-END" AND CERTIFYING, IN WRITING, THAT THE CABLING MEETS CATEGORY/LEVEL 6 UTP SPECIFICATIONS AND IS IN PROPER WORKING CONDITION. EACH UTP CABLE SHALL BE FULLY TESTED. A MICROTEST/CATEGORY-6 TESTER, OR EQUIVALENT, SHALL BE USED TO TEST/CERTIFY EACH UTP CABLE (USE A LEVEL 3 OMNI SCANNER TESTER). THE OUTPUT FROM EACH UTP CABLE TEST/CERTIFICATION SHALL BE PRINTED AND PROVIDED TO OWNER.
    a. REQUIRED TEST DATA FOR UTP SHALL INCLUDE WIRE MAP, LENGTH, ATTENUATION, NEXT (BOTH ENDS), LINK TESTS, CHANNEL TESTS, AND PROVIDE A PRINT OUT AND DISKETTE TO ENGINEER AND HUBBELL SALES REPRESENTATIVE. TEST DATA MUST BE PROVIDED FOR BOTH HORIZONTAL AND BACKBONE LINKS.

   ALL UTP CABLES FROM ROOM LOCATIONS TO COMMUNICATIONS RACK PATCH PANELS MUST BE WITHIN THE CAT-6 DISTANCE OF 295 FEET. THE CONTRACTOR SHALL NOTIFY OWNER OF ANY LOCATIONS THAT EXCEED THE CATEGORY 6 UTP DISTANCE LIMITATION.

   THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING COMPLETE DETAILED DOCUMENTATION OF "AS INSTALLED" FOR THE DATA NETWORK WIRING SYSTEM. THE CONTRACTOR SHALL BE RESPONSIBLE FOR COMPLETING DOCUMENTATION CHECKLISTS PROVIDED BY THE OWNER.
18. THE CONTRACTOR SHALL PROVIDE A (25) TWENTY FIVE YEAR GUARANTEE OF THE INSTALLED SYSTEM AGAINST DEFECTS IN MATERIAL AND WORKMANSHIP. ALL LABOR AND MATERIALS SHALL BE PROVIDED AT NO EXPENSES TO THE OWNER. GUARANTEE PERIOD SHALL BEGIN ON THE DAY OF ACCEPTANCE BY THE OWNER/ENGINEER.
19. CONTRACTOR SHALL CORE WALLS AS REQUIRED FOR INSTALLATION OF DATA CABLING. VERIFY ALL LOCATIONS OF CORES WITH ARCHITECT IN FIELD. ALL CORES SHALL BE SLEEVED & FIRE PROOFED AS REQUIRED. FIELD VERIFY ALL EQUIPMENT & PIPING LOCATIONS BEFORE MAKING CORES. UNDER NO CIRCUMSTANCES WILL ANY STRUCTURAL MEMBER BE CUT IN THIS PROCESS.
20. NOTIFY OWNER OF ALL FLOOR CORE LOCATIONS PRIOR TO CORING FLOOR SO THAT FLOOR CONTENTS CAN BE VERIFIED.
21. ALL CEILINGS SHALL BE REMOVED, REINSTALLED AND/OR REPLACED BY CONTRACTOR FOR INSTALLATION OF NEW CABLING. REPLACE ALL DAMAGED TILES WITH TYPE/STYLE TO MATCH EXISTING.
22. FURNISH AND INSTALL CONDUIT SLEEVES THROUGH WALLS AS REQUIRED FOR INSTALLATION OF NEW DATA CABLING. REFER TO DRAWINGS FOR LOCATIONS AND SIZE OF CONDUITS. CONTRACTOR SHALL INCLUDE ADDITIONAL CONDUITS SLEEVES AS REQUIRED THAT ARE NOT INDICATED ON THE DRAWINGS.
    ALL CONDUIT SLEEVE PENETRATIONS SHALL BE MADE FIRE PROOFED. FURNISH AND INSTALL FITTINGS AND END BUSHINGS AT ENDS OF SLEEVES IN ORDER TO PROTECT CABLING.
23. INSTALLATION PRACTICES:

    STRIP BACK ONLY AS MUCH CABLE JACKET AS IS REQUIRED FOR TERMINATION AND MAINTAIN PAIR TWISTS AS CLOSE AS POSSIBLE TO THE POINT OF MECHANICAL TERMINATION. AT A MINIMUM, NEVER ALLOW UNTWISTING OF CATEGORY 6 PAIRS TO EXCEED 0.5" MAXIMUM. MAINTAIN A MAXIMUM BEND RADIUS OF 4X THE CABLE DIAMETER (4-PAIR CABLES). 6X IF IN CONDUIT. APPLY CABLE TIES LOOSELY AND AT RANDOM INTERVALS. TRY TO MINIMIZE THE AMOUNT OF JACKET TWISTING. AVOID STRETCHING THE CABLE. USE APPROPRIATE METHODS FOR DRESSING AND SECURING CABLES (I.E. CABLE TIES, WIRE MANAGEMENT PANELS, CABLE SUPPORT BAR, RESEALABLE VELCRO STRAPS).

    NEVER EXCEED A 90 DEGREE BEND. DO NOT OVER TIGHTEN CABLE TIES. DO NOT OVER TWIST CABLE (IT CAN LEAD TO TORN JACKETS). DO NOT EXCEED 25 lbs. OF PULLING TENSION. DO NOT USE STAPLE GUNS TO POSITION OR FASTEN CABLES.

DATA CABLE RUNS SHALL NOT EXCEED 100 METERS IN LENGTH PER EIA/TIA LIMITATIONS

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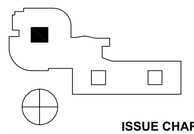

ISSUE CHART

MARK	ISSUE	DATE
1	ISSUE FOR BID	07MAY18

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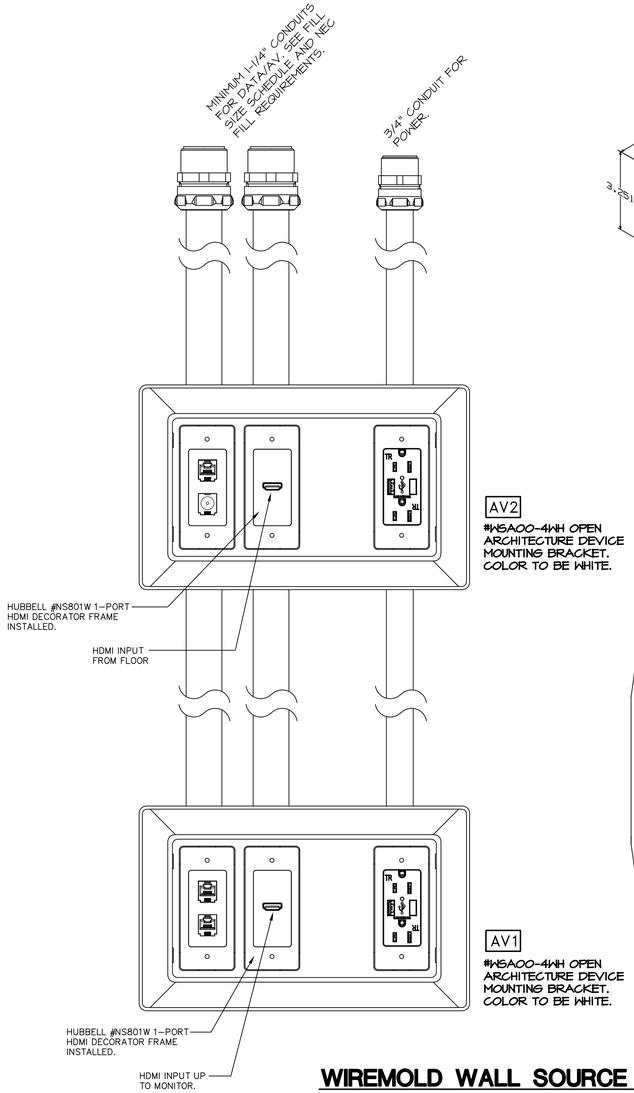
TECHNOLOGY SYSTEM NOTES AND DETAILS

SHEET NUMBER

E00-05



AV2

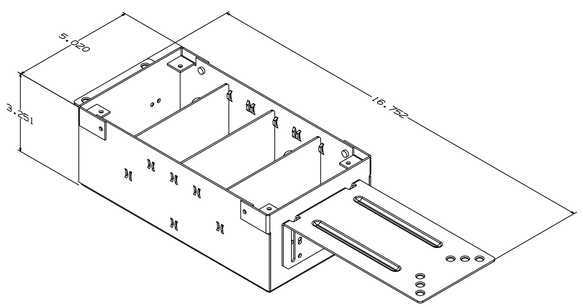
#WSA00-4WH OPEN ARCHITECTURE DEVICE MOUNTING BRACKET. COLOR TO BE WHITE.

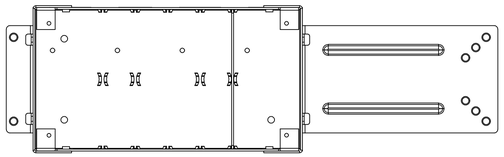
AV1

#WSA00-4WH OPEN ARCHITECTURE DEVICE MOUNTING BRACKET. COLOR TO BE WHITE.

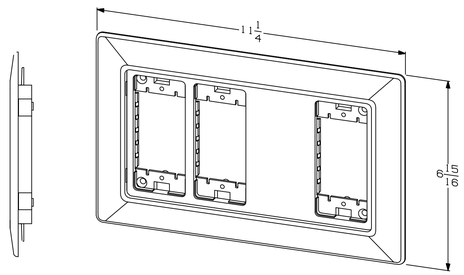
WIREMOLD WALL SOURCE MULTI SERVICE BOX

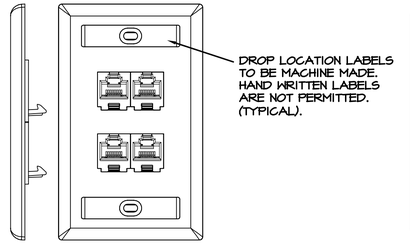
NO SCALE





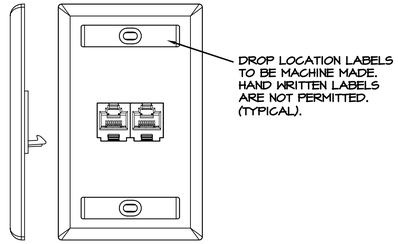
#WSA42-2 WALL SOURCE BOX WITH DIVIDE BETWEEN POWER AND LOW VOLTAGE DEVICES.





C4 CLASSIC SERIES SINGLE-GANG FACEPLATE. PANDUIT #CFPL4IW FACE PLATE WITH (4) CAT-6 DATA JACKS INSTALLED. MOUNT ON A TWO-GANG BACKBOX WITH SINGLE GANG MUD RING AND 2-3/4" CONDUITS STUBBED UP TO ABOVE CEILING.

DROP LOCATION LABELS TO BE MACHINE MADE. HAND WRITTEN LABELS ARE NOT PERMITTED. (TYPICAL).

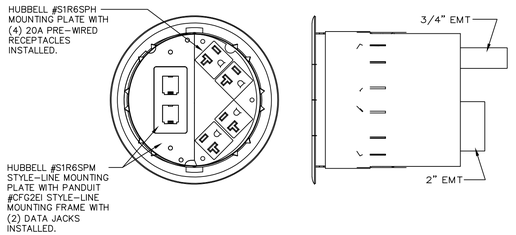


C2 CLASSIC SERIES SINGLE-GANG FACEPLATE. PANDUIT #CFPL2IW FACE PLATE WITH (2) CAT-6 DATA JACKS INSTALLED. MOUNT ON A TWO-GANG BACKBOX WITH SINGLE GANG MUD RING AND 2-3/4" CONDUITS STUBBED UP TO ABOVE CEILING.

DROP LOCATION LABELS TO BE MACHINE MADE. HAND WRITTEN LABELS ARE NOT PERMITTED. (TYPICAL).

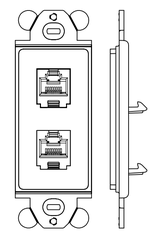
PANDUIT MINI-COM CLASSIC SERIES FACEPLATES

NO SCALE

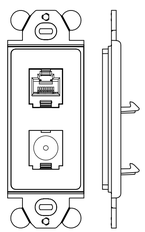


POKE THRU "PT1" HUBBELL #S1R6 SERIES 6 INCH POKE-THRU

NO SCALE



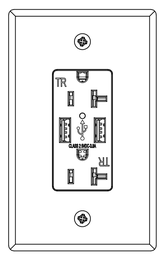
AV1 INSTALL PANDUIT STYLE-LINE FRAME #CFG2EI SERIES WITH (2) CAT-6 DATA JACKS INSTALLED. COLOR TO BE WHITE.



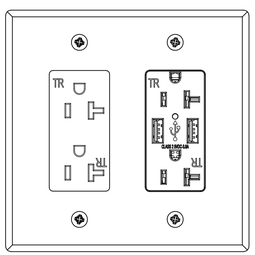
AV2 INSTALL PANDUIT STYLE-LINE FRAME #CFG2EI SERIES WITH (1) CAT-6 DATA JACK AND (1) COAX VIDEO JACK INSTALLED. COLOR TO BE WHITE.

PANDUIT MINI-COM 2-PORT MOUNTING FRAME

NO SCALE



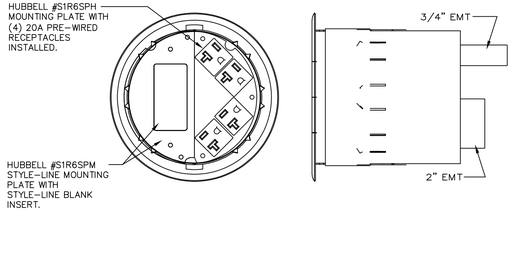
USB HUBBELL #USB20A5___ SERIES USB CHARGER TAMPER-RESISTANT DUPLEX RECEPTACLE 20 AMP RATED. COLOR SELECTED BY THE ARCHITECT.



USB HUBBELL WITH (1) 20 AMP RATED "GFI" TAMPER-RESISTANT DUPLEX RECEPTACLE AND (1) HUBBELL #USB20A5___ SERIES USB CHARGER TAMPER-RESISTANT DUPLEX RECEPTACLE 20 AMP RATED. COLOR SELECTED BY THE ARCHITECT.

RECEPTACLE MOUNTING DETAIL

NO SCALE



POKE THRU "PT2" HUBBELL #S1R6 SERIES 6 INCH POKE-THRU

NO SCALE

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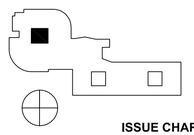

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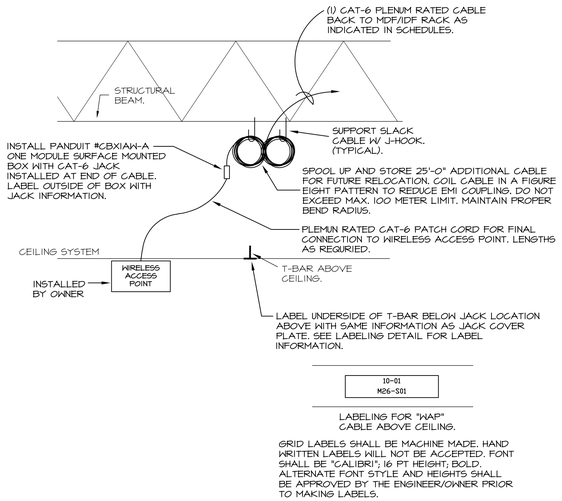
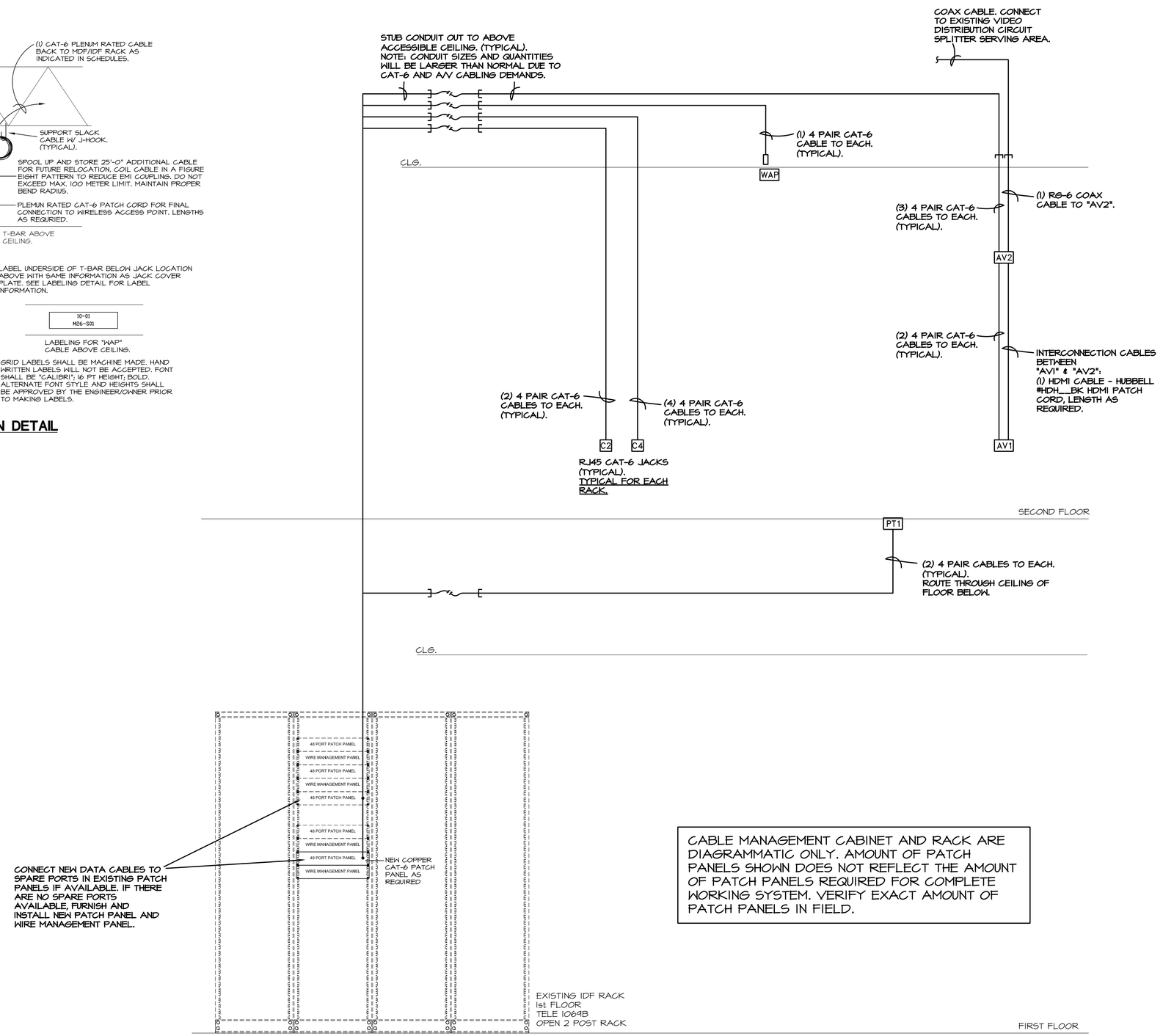


"WAP" CONNECTION DETAIL

NO SCALE



CABLE MANAGEMENT CABINET AND RACK ARE DIAGRAMMATIC ONLY. AMOUNT OF PATCH PANELS SHOWN DOES NOT REFLECT THE AMOUNT OF PATCH PANELS REQUIRED FOR COMPLETE WORKING SYSTEM. VERIFY EXACT AMOUNT OF PATCH PANELS IN FIELD.

PARTIAL DATA RISER DIAGRAM

NO SCALE

ALL DATA AND A/V CABLES TO BE PLENUM RATED WHEN RUN ABOVE CEILING; OTHERWISE INSTALL IN RACEWAY.

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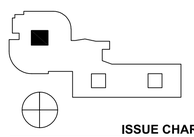

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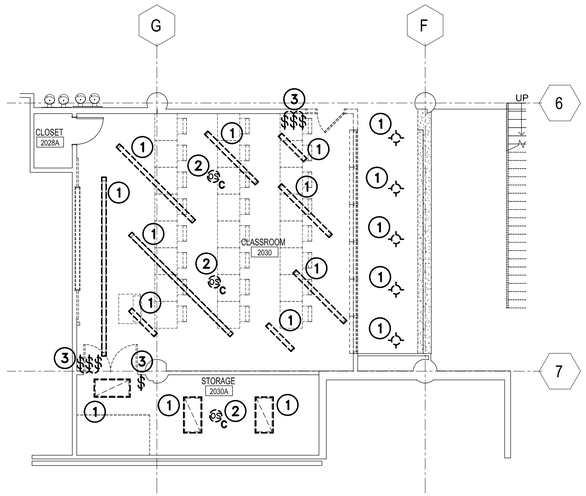
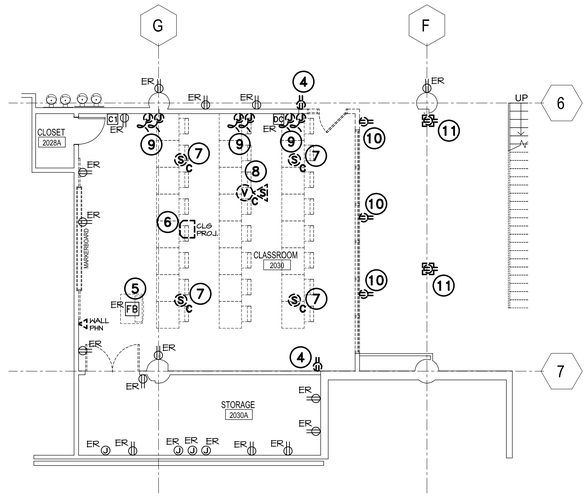


2 LEVEL 02 LIGHTING DEMOLITION

1/8" = 1'-0"



1 LEVEL 02 ELECTRICAL DEMOLITION

1/8" = 1'-0"

GENERAL ELECTRICAL DEMOLITION NOTES:

NOTES RE: EXISTING CONDITIONS:

1. VERIFY EXISTING CONDITIONS AND LOCATIONS IN FIELD PRIOR TO SUBMITTING PROPOSAL. FAILURE TO DO SO SHALL NOT RELIEVE CONTRACTOR FROM PERFORMING THE WORK REQUIRED UNDER THIS CONTRACT.
2. MAKE NECESSARY MODIFICATIONS AND ADJUSTMENTS TO ALL ELECTRICAL ITEMS AND EQUIPMENT, BOTH NEW AND EXISTING, AS MAY BE REQUIRED BY THESE ALTERATIONS AND ADDITIONS.
3. DISCONNECT AT SOURCE AND REMOVE EXISTING ELECTRICAL MATERIALS AND EQUIPMENT AND ALL OTHER ELECTRICAL ITEMS WHICH ARE RENDERED OBSOLETE BY THESE ALTERATIONS AND ADDITIONS. THESE ARE THE PROPERTY OF THE OWNER AND SHALL EITHER BE REMOVED FROM THE SITE OR RETURNED TO THE OWNER'S STOCK AT THE DISCRETION OF THE OWNER.
4. DISCONNECT, REMOVE AND RELOCATE EXISTING ELECTRICAL MATERIALS AND EQUIPMENT, AND ALL OTHER ELECTRICAL ITEMS WHICH INTERFERE OR ARE INTERFERED WITH, OBSTRUCT OR ARE OBSTRUCTED BY THESE LOCATIONS AS DIRECTED. RECONNECT SUCH ITEMS IN PROPER OPERATING CONDITION AT NEW LOCATIONS.
5. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO MAINTAIN THE EXISTING BUILDING IN ELECTRICAL OPERATION AT ALL TIMES DURING THE ENTIRE CONSTRUCTION PERIOD. IF IT IS ABSOLUTELY NECESSARY TO SHUT DOWN THE FACILITY AT ANY TIME, THE CONTRACTOR SHALL CONSULT WITH THE OWNER AND MAKE ARRANGEMENTS TO DO SO AT THE OWNER'S CONVENIENCE. PRIOR NOTICE SHALL BE GIVEN.
6. COORDINATE WORK WITH OTHER TRADES TO AVOID CONFLICTS AND DELAYS.
7. ALL CUTTING AND PATCHING AS REQUIRED FOR NEW WORK & ABANDONED DEVICES TO BE BY THE CONTRACTOR.
8. WHERE EXISTING CONDUITS HAVE BEEN MADE OBSOLETE BY THESE ALTERATIONS AND ADDITIONS AND IT IS IMPRACTICAL TO REMOVE SAME, CONTRACTOR SHALL:
   a. CUT CONDUITS OFF AT SLAB OR WALL LINE
   b. CAP ALL OBSOLETE CONDUIT.
9. WHERE THE EXISTING WIRING & CONDUIT SERVING ANY EXISTING ELECTRICAL EQUIPMENT IN AREA OF EXISTING BUILDING NOT BE ALTERED IS INTERFERED WITH, CONTRACTOR SHALL REROUTE AND RECONNECT ALL SUCH CONDUIT & WIRING.

NOTES RE: INSPECTING EXISTING BUILDING:

1. THE CONTRACTORS SHALL VISIT AND INSPECT THE EXISTING BUILDING AND SHALL THOROUGHLY FAMILIARIZE THEMSELVES WITH ACTUAL JOB CONDITIONS BEFORE SIGNING CONTRACTS. NO EXTRAS WILL BE ALLOWED FOR WORK WHICH MIGHT HAVE BEEN REASONABLY FORESEEN BY AN INSPECTION OF THESE PREMISES.
2. WHILE THE SIZE AND LOCATION OF NEW WORK AND EQUIPMENT IN THE EXISTING BUILDING HAS BEEN INDICATED ON THE DRAWINGS AS ACCURATELY AS POSSIBLE, CONTRACTOR SHALL ADJUST HIS WORK AS REQUIRED TO AVOID EXISTING DUCTS, PIPES, CONDUITS AND BEAMS NOT SHOWN ON PLANS. CONTRACTOR SHALL ADAPT HIS WORK TO MEET ALL ACTUAL CONDITIONS ON THE EXISTING PREMISES.
3. CONTRACTOR SHALL INSPECT THE PREMISES AND MAKE A DETAILED EXAMINATION OF ALL LOCATIONS WHERE NEW WORK IS TO BE INSTALLED AND SHALL EXAMINE EXISTING PIPING, CONDUITS, STRUCTURAL SUPPORTING BEAMS, ETC.
4. CONTRACTOR AFTER INSPECTING THE PREMISES AND THE DRAWINGS SHALL CALL TO THE ATTENTION OF THE ARCHITECT ANY LACK OF ANY NECESSARY SPACE OR CLEARANCE REQUIRED BY THE VARIOUS EQUIPMENT BEFORE CONTRACT IS SIGNED. CONTRACTOR SHALL BE RESPONSIBLE FOR ALL CHANGES NECESSARY IF HE NEGLECTS TO DO SO.

NOTE:
ALL DEVICES SHOWN DOTTED, DASHED, OR INDICATED WITH A PLAN NOTE (INDICATING REMOVAL) ARE EXISTING TO BE REMOVED. ALL DEVICES SHOWN SOLID ARE EXISTING TO REMAIN. IF THE CONTRACTOR DEEMS IT NECESSARY FOR A DEVICE TO BE REMOVED, THEY SHALL COORDINATE IN FIELD WITH THE ARCHITECT/ENGINEER FOR APPROVAL.

ELECTRICAL DEMOLITION PLAN NOTES:

1. LIGHT FIXTURE TO BE DISCONNECTED AND REMOVED. RETAIN FOR REINSTALLATION. ANY LIGHT FIXTURES THAT ARE NOT RE-USED FOR NEW CONSTRUCTION SHALL BE TURNED OVER TO THE OWNER AT THEIR DISCRETION, OTHERWISE DISPOSE OF AS REQUIRED. DISCONNECT AND REMOVE CONDUIT AND WIRE BACK TO NEAREST UNAFFECTED JUNCTION BOX. BYPASS WIRING AS REQUIRED TO KEEP REMAINING DEVICES OPERATIONAL.
   FOLLOW ALL E.P.A. REQUIREMENTS FOR DISPOSAL OF LAMPS AND BALLASTS. HAUL LAMPS AND BALLASTS TO E.P.A. APPROVE DISPOSAL SITE. UTILIZE D.O.T. APPROVED CONTAINMENT FOR TRANSFER OF LAMPS AND BALLASTS. PROVIDE PROPER PAPER WORK TO THE ARCHITECT SHOWING LEGAL DISPOSAL OF LAMPS AND BALLASTS. DISPOSE OF FIXTURE HOUSING AS REQUIRED.
2. OCCUPANCY SENSOR AND ASSOCIATED POWER PACKS TO BE DISCONNECTED AND REMOVED. RETAIN FOR REINSTALLATION. DISCONNECT AND REMOVE CONDUIT AND WIRE BACK TO FIXTURES SERVING COMPLETE.
3. LIGHT SWITCHES TO BE DISCONNECTED AND REMOVED. DISCONNECT AND REMOVE CONDUIT AND WIRE BACK TO DEVICES SERVING COMPLETE. PATCH WALL AS REQUIRED. COORDINATE WITH THE ARCHITECT.
4. RECEPTACLE TO BE DISCONNECTED AND REMOVED. DISCONNECT AND REMOVE CONDUIT AND WIRE BACK TO NEAREST UNAFFECTED JUNCTION BOX. BYPASS WIRING AS REQUIRED TO KEEP REMAINING DEVICES OPERATIONAL.
5. EXISTING FLOOR BOX TO REMAIN. RECEPTACLES AND DATA/VOICE JACKS AND CABLING TO REMAIN. A/V CABLING AND SOUND SYSTEM WIRING RELATED TO CEILING PROJECTOR AND CEILING SPEAKERS TO BE REMOVED COMPLETE.
6. CEILING MOUNTED PROJECTOR AND RELATED MOUNT TO BE DISCONNECTED AND REMOVED. TURN OVER TO THE OWNER. CEILING RECEPTACLE AND POWER CONDUIT AND WIRING TO BE DISCONNECTED AND REMOVED BACK TO NEAREST UNAFFECTED JUNCTION BOX. BYPASS WIRING AS REQUIRED TO KEEP REMAINING DEVICES OPERATIONAL. A/V CABLING AND DATA CABLING TO BE DISCONNECTED AND REMOVED COMPLETE. TURN OVER A/V CABLING TO THE OWNER AT THEIR DISCRETION.
7. CEILING MOUNTED SOUND SYSTEM SPEAKERS TO BE DISCONNECTED AND REMOVED. TURN OVER TO THE OWNER. DISCONNECT AND REMOVE RELATED WIRING COMPLETE. REMOVE AMPLIFIER ABOVE CEILING COMPLETE. TURN OVER TO THE OWNER.
8. FIRE ALARM DEVICE TO BE DISCONNECTED AND REMOVED. RETAIN FOR REINSTALLATION. DISCONNECT AND REMOVE CONDUIT AND WIRE BACK TO NEAREST UNAFFECTED JUNCTION BOX. BYPASS WIRING AS REQUIRED TO KEEP REMAINING DEVICES OPERATIONAL.
9. FURNITURE POWER AND DATA FEEDS TO BE DISCONNECTED AND REMOVED. DISCONNECT AND REMOVE FLEXIBLE FEED FROM FURNITURE BACK TO WALL. DISCONNECT AND REMOVE WALL BOX AND RELATED CONDUIT AND WIRE BACK TO NEAREST UNAFFECTED JUNCTION BOX. BYPASS WIRING AS REQUIRED TO KEEP REMAINING DEVICES OPERATIONAL. PATCH AND PAINT WALL AS REQUIRED. COORDINATE WITH THE ARCHITECT.
   DATA CABLING TO BE DISCONNECTED AND REMOVED BACK TO DATA RACK SERVING COMPLETE. DISCONNECT AND REMOVE WALL BOX AND CONDUIT UP TO CEILING COMPLETE.PATCH AND PAINT WALL AS REQUIRED. COORDINATE WITH THE ARCHITECT.
10. RECEPTACLE IN STOREFRONT WALL TO BE DISCONNECTED AND REMOVED. RETAIN FOR REINSTALLATION. DISCONNECT AND REMOVE CONDUIT AND WIRE BACK TO POINT FOR RECONNECTION TO RECEPTACLES REINSTALLED ONCE WALL IS MOVED. BYPASS WIRING AS REQUIRED TO KEEP REMAINING DEVICES OPERATIONAL.
11. FLOOR RECEPTACLE TO BE DISCONNECTED AND REMOVED. DISCONNECT AND REMOVE CONDUIT AND WIRE BACK TO NEAREST UNAFFECTED JUNCTION BOX. BOXES TO BE ABANDONED IN PLACE. BYPASS CONDUIT AND WIRING AS REQUIRED TO KEEP REMAINING DEVICES OPERATIONAL. PATCH FLOOR AS REQUIRED AND LEVEL WITH THE REST OF THE FLOOR. COORDINATE WITH THE ARCHITECT.

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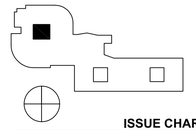


ISSUE CHART

MARK	ISSUE	DATE
1	ISSUE FOR BID	07MAY18

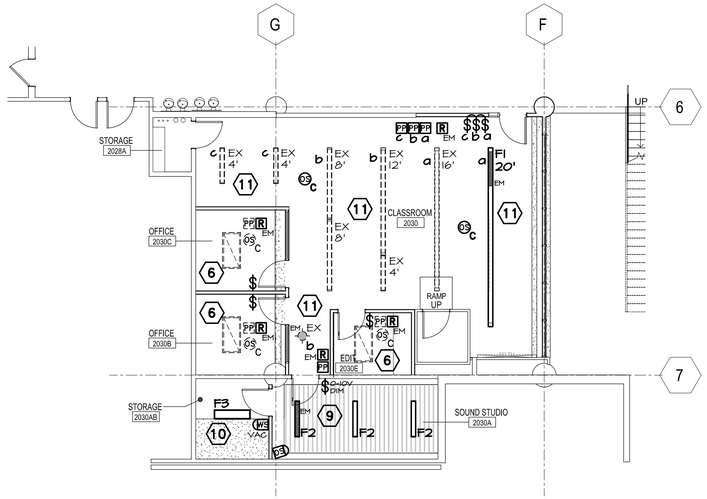
Job Number	024303.009
Drawn	JD
Checked	MC
Approved	MC

TITLE

ELECTRICAL DEMOLITION FLOOR PLANS

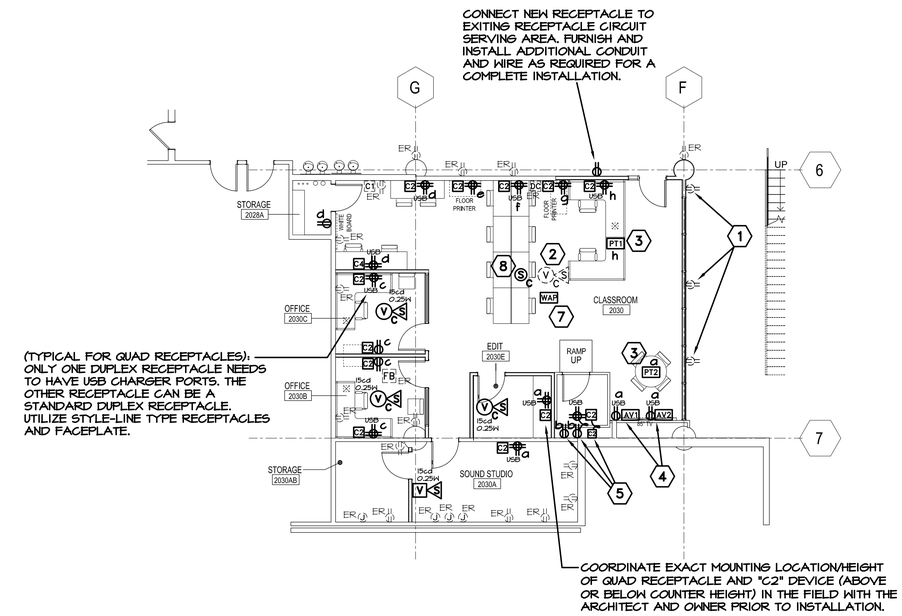
SHEET NUMBER

E04-01



2 LEVEL 02 LIGHTING NEW WORK

1/8" = 1'-0"



ALL NEW RECEPTACLES TO BE CONNECTED TO EXISTING POWER PANEL "NEP-L2" IN ELECTRICAL CLOSET 2036A. REFER TO SHEET "E11-02" FOR LOCATIONS. FURNISH AND INSTALL 1P/20A BREAKERS FOR EACH CIRCUIT INDICATED. LETTERS NEXT TO RECEPTACLES (i.e. "a") INDICATE CIRCUIT SEQUENCING/GROUPING OF RECEPTACLES. UPDATE PANEL CARD DIRECTORY.

ALL NEW DEVICES SHALL BE INSTALLED FLUSH MOUNTED IN WALLS. CUT AND PATCH AND PAINT EXISTING WALLS AS REQUIRED FOR INSTALLATION OF WORK. MATCH EXISTING WALL FINISH. COORDINATE WITH THE ARCHITECT.

1 LEVEL 02 ELECTRICAL NEW WORK

1/8" = 1'-0"

ELECTRICAL NEW WORK PLAN NOTES:

1. REINSTALL EXISTING RECEPTACLES AT PREVIOUS LOCATIONS IN STOREFRONT WALL. RECONNECT TO EXISTING RECEPTACLE CIRCUIT(S) PREVIOUSLY ON. FURNISH AND INSTALL ADDITIONAL CONDUIT AND WIRE AS REQUIRED FOR A COMPLETE INSTALLATION.

2. REINSTALL EXISTING FIRE ALARM DEVICE AT NEW LOCATION. FURNISH AND INSTALL CEILING MOUNTING BRACKET AS REQUIRED. RECONNECT TO EXISTING FIRE ALARM CIRCUITS PREVIOUSLY SERVING AREA. FURNISH AND INSTALL ADDITIONAL CONDUIT AND WIRE AS REQUIRED FOR A COMPLETE INSTALLATION. TEST DEVICE FOR PROPER OPERATION. REPLACE WITH NEW TO MATCH EXISTING IF FOUND DEFECTIVE.

3. NEW POKE THRU. COORDINATE EXACT LOCATION IN THE FIELD WITH THE ARCHITECT PRIOR TO INSTALLATION. CORE FLOOR AS REQUIRED FOR INSTALLATION. FIREPROOF CORE AS REQUIRED. CONTRACTOR SHALL PROTECT EQUIPMENT AND FURNITURE ON FLOOR BELOW DURING CORING OF FLOOR. CONNECT TO POWER CIRCUIT AS INDICATED. DATA CABLES TO BE ROUTED BACK TO DATA RACK ON FIRST FLOOR. REFER TO DETAILS FOR ADDITIONAL INFORMATION.

4. "AV1" AND "AV2" FOR NEW WALL MONITOR. "AV1" TO BE MOUNTED AT 18" AFF. "AV2" MOUNTING HEIGHT TO BE COORDINATED IN THE FIELD WITH THE ARCHITECT AND OWNER AND WITH THE MONITOR MOUNTING BRACKET LOCATION. DEVICE SHALL BE LOCATED BEHIND THE MONITOR. RECEPTACLES INDICATED WITH THE DEVICES SHALL BE INCORPORATED INTO THE SAME BOX AS THE A/V-DATA JACKS WITH BARRIERS. REFER TO DETAILS FOR ADDITIONAL INFORMATION.

5. ISO BOOTH/WHISPER ROOM.
   FURNISH AND INSTALL DUPLEX RECEPTACLE ON WALL BEHIND BOOTH. FURNISH AND INSTALL (1) DUPLEX RECEPTACLE AND (1) USB CHARGING DUPLEX RECEPTACLE (QUAD CONFIGURATION) IN A SURFACE MOUNTED BACK BOX INSIDE BOOTH WITH CORD AND PLUG ON BOX SO AS TO PLUG INTO RECEPTACLE ON WALL.
   FURNISH AND INSTALL "C2" DATA JACKS ON WALL BEHIND BOOTH. FURNISH AND INSTALL "C2" DATA JACKS IN SURFACE MOUNTED BACK BOX INSIDE OF BOOTH WITH DATA CABLE UMBILICAL CORD WITH MALE JACKS ON ENDS OF CORDS SO AS TO PLUG INTO "C2" ON WALL. CABLES TO BE WRAPPED TOGETHER WITH MESH WRAP. FLEXIBLE CORD AND PLUG AND DATA CABLES TO BE ROUTED OUT OF BOOTH THROUGH CUT-OUTS PROVIDED BY THE BOOTH MANUFACTURER. REFER TO BOOTH SPECIFICATIONS FOR ADDITIONAL INFORMATION.
   FURNISH AND INSTALL DUPLEX RECEPTACLE ON WALL BEHIND BOOTH FOR ISO BOOTH VENTILATION FAN. VENTILATION FAN UNIT IS SUPPLIED WITH A CORD AND PLUG AND A REMOTE PLUG-IN WIRELESS RECEIVER UNIT. PLUG REMOTE UNIT INTO RECEPTACLE.
   BOOTH LIGHT FIXTURE(S) ARE SUPPLIED WITH A CORD AND PLUG CONNECTION. CONNECT LIGHT FIXTURES INTO QUAD RECEPTACLE MOUNTED INSIDE OF BOOTH.

6. REINSTALL EXISTING LIGHT FIXTURE AT NEW LOCATION. CONNECT TO EXISTING LIGHTING CIRCUIT AND EMERGENCY CIRCUIT PREVIOUSLY SERVING AREA. FURNISH AND INSTALL NEW CONTROL SWITCH AS INDICATED. REINSTALL EXISTING CEILING OCCUPANCY SENSORS AND RELATED POWER PACK AND NEW "EM" RELAYS AND CONNECT TO LIGHT FIXTURES AS REQUIRED FOR CONTROL OF FIXTURES. FURNISH AND INSTALL ADDITIONAL BOXES, CONDUIT AND WIRE AS REQUIRED FOR A COMPLETE INSTALLATION. COORDINATE LOCATION OF SENSORS IN THE FIELD SO AS NOT TO DETECT MOVEMENT OUTSIDE OF SPACE INSTALLED.
   CONTRACTOR SHALL CLEAN FIXTURES HOUSING AND LAMPS AND SENSOR. REFER TO LIGHTING CONTROL DETAIL ON SHEETS "E00-03" & "E00-04". CONTRACTOR SHALL REPLACE ANY NON-OPERATIONAL LAMPS, BALLASTS, SENSORS, POWER PACKS, ETC... WITH THE SAME TO MATCH EXISTING.

7. NEW WIRELESS ACCESS POINT "WAP" DEVICE. FURNISH AND INSTALL (1) DATA CABLE AND JACK WITH 25'-0" OF SLACK CABLE COILED UP ABOVE CEILING AT LOCATION. SUPPORT CABLE TO STRUCTURE WITH J-HOOKS AS REQUIRED. COORDINATE EXACT LOCATION IN THE FIELD WITH THE OWNER PRIOR TO INSTALLATION. LABEL CEILING TILE GRID BELOW CABLE DROP WITH DATA JACK/CABLE INFORMATION.

8. PAGING SPEAKER. COORDINATE INSTALLATION WITH THE OWNER.
   FURNISH AND INSTALL NEW CEILING MOUNTED PAGING SPEAKER. CONNECT TO EXISTING PAGING CIRCUIT SERVING AREA. SPEAKER TO BE VALCOM #V-9021 12"x24" LAY-IN ANALOG SPEAKER TO MATCH EXISTING SPEAKERS. FURNISH AND INSTALL MOUNTING BRACKETS AS REQUIRED FOR A COMPLETE INSTALLATION. FURNISH AND INSTALL ADDITIONAL BOXES, CONDUIT AND WIRE AS REQUIRED FOR A COMPLETE INSTALLATION. TEST SPEAKER FOR OPERATION AND SET LOUDNESS LEVEL PER OWNER'S DIRECTION.

9. FURNISH AND INSTALL NEW LIGHT FIXTURES AS INDICATED. PENDANT MOUNT FIXTURES DOWN SO THAT TOP OF FIXTURES IS AT THE SAME HEIGHT AS THE BOTTOM OF THE CEILING BAFFLES. COORDINATE EXACT HEIGHT IN THE FIELD WITH THE ARCHITECT PRIOR TO INSTALLATION.
   CONNECT TO EXISTING LIGHTING CIRCUIT AND EMERGENCY CIRCUIT PREVIOUSLY SERVING AREA. FURNISH AND INSTALL NEW DIMMER SWITCH AS INDICATED. FURNISH AND INSTALL NEW WALL MOUNT OCCUPANCY SENSOR AND RELATED POWER PACK AND "EM" RELAY AND CONNECT TO LIGHT FIXTURES AS REQUIRED FOR CONTROL OF FIXTURES. INSTALL POWER PACK AND EM RELAY ABOVE CLASSROOM 2030 CEILING SO AS TO LIMIT NOISE FROM DEVICES IN THE SOUND STUDIO. FURNISH AND INSTALL ADDITIONAL BOXES, CONDUIT AND WIRE AS REQUIRED FOR A COMPLETE INSTALLATION. COORDINATE LOCATION OF SENSOR IN THE FIELD SO AS NOT TO DETECT MOVEMENT OUTSIDE OF SPACE INSTALLED. REFER TO LIGHTING CONTROL DETAILS ON SHEETS "E00-03" & "E00-04".

10. FURNISH AND INSTALL NEW LIGHT FIXTURE AS INDICATED. CONNECT TO EXISTING LIGHTING CIRCUIT SERVING AREA AND NEW WALL SWITCH VACANCY SENSOR. FURNISH AND INSTALL ADDITIONAL CONDUIT AND WIRE AS REQUIRED FOR A COMPLETE INSTALLATION. REFER TO LIGHTING CONTROL DETAILS ON SHEETS "E00-03" & "E00-04".

11. CLASSROOM 2030:
    REINSTALL EXISTING LIGHT FIXTURE SECTIONS AT LOCATIONS INDICATED. REINSTALL EXISTING CAN LIGHT FIXTURE AT NEW LOCATION INDICATED. FURNISH AND INSTALL NEW LIGHT FIXTURE (FI 20') AT LOCATION INDICATED. RECONNECT TO EXISTING LIGHTING CIRCUIT AND EMERGENCY CIRCUIT PREVIOUSLY SERVING AREA. FURNISH AND INSTALL NEW CONTROL SWITCHES AS INDICATED. FURNISH AND INSTALL NEW CEILING MOUNTED OCCUPANCY SENSORS AND RELATED POWER PACKS AND "EM" RELAY AND CONNECT TO LIGHT FIXTURES AS REQUIRED FOR CONTROL OF FIXTURES. FURNISH AND INSTALL ADDITIONAL BOXES, CONDUIT AND WIRE AS REQUIRED FOR A COMPLETE INSTALLATION. COORDINATE LOCATION OF SENSORS IN THE FIELD SO AS NOT TO DETECT MOVEMENT OUTSIDE OF SPACE INSTALLED. REFER TO LIGHTING CONTROL DETAILS ON SHEETS "E00-03" & "E00-04".

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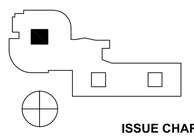
KEYPLAN



ISSUE CHART

MARK	ISSUE	DATE
1	ISSUE FOR BID	07MAY18

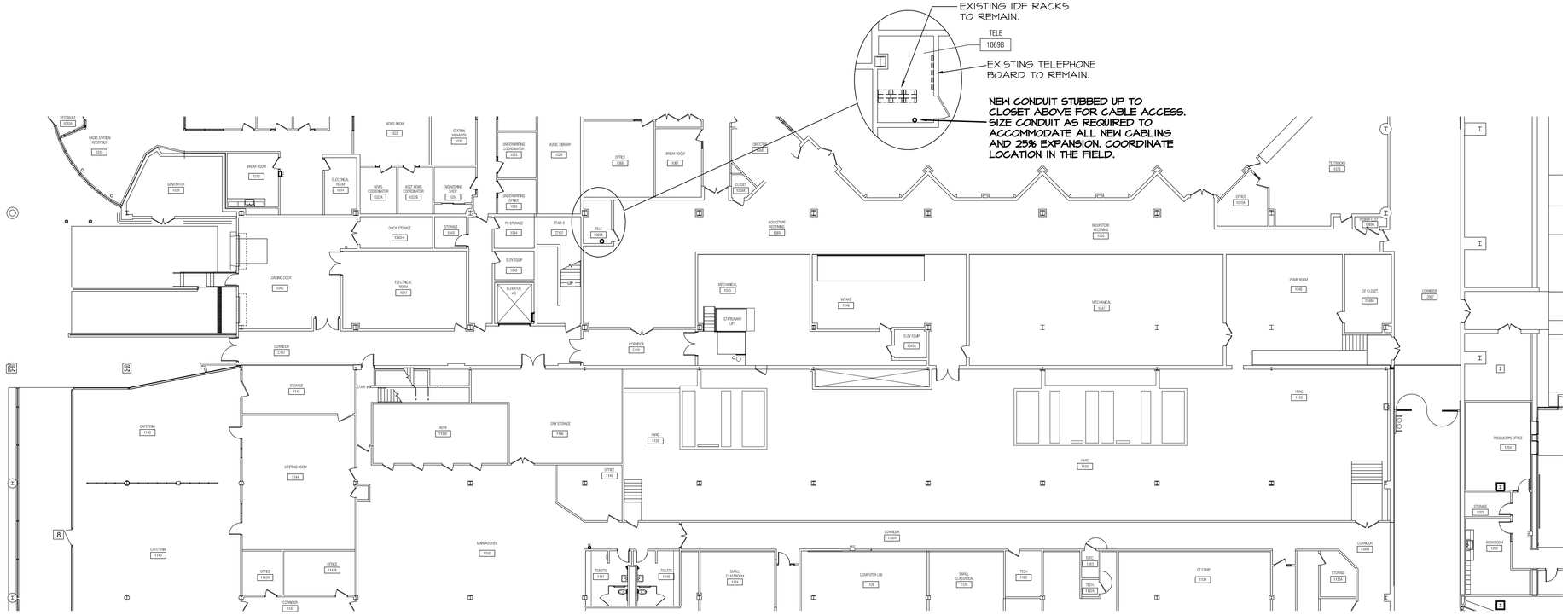
Job Number	024303.009
Drawn	JD
Checked	MC
Approved	MC

TITLE

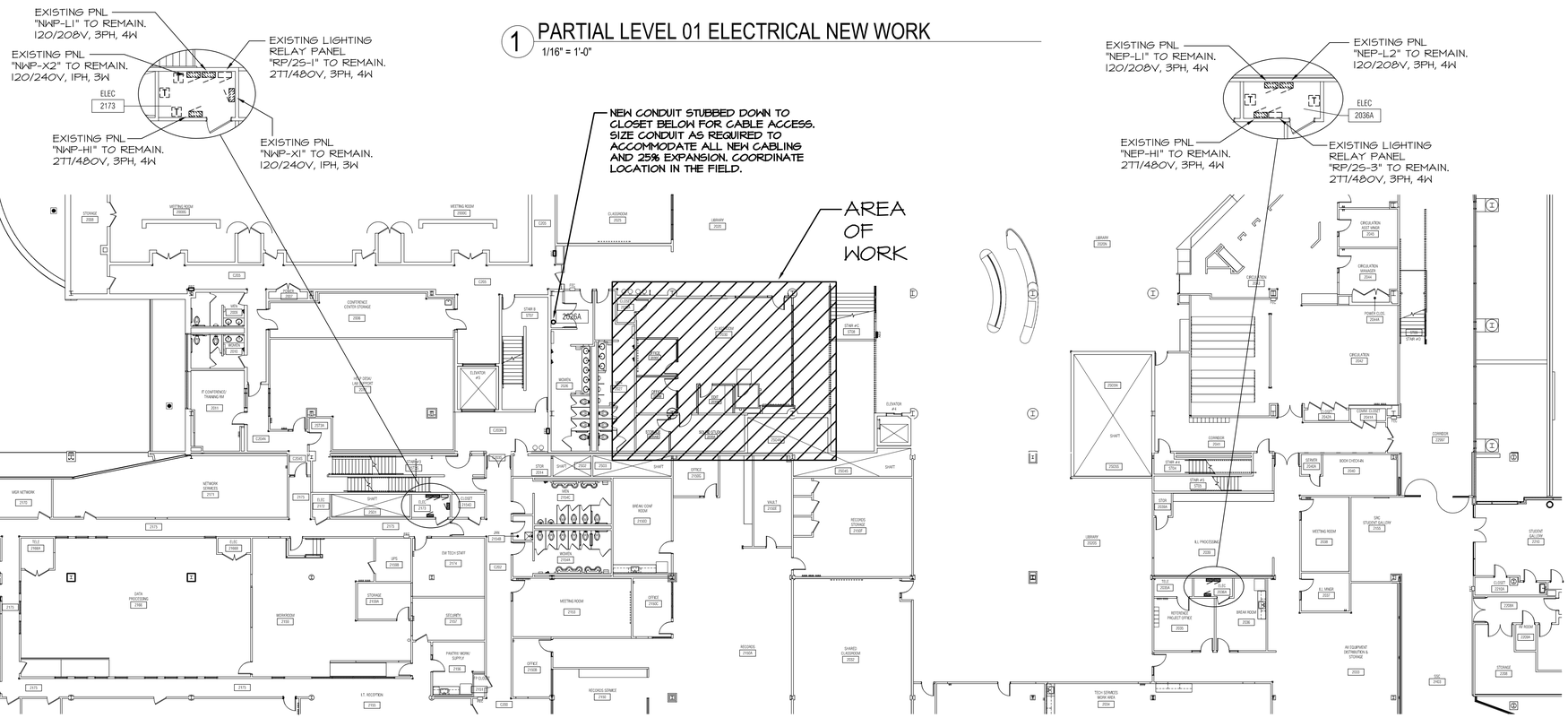
ELECTRICAL NEW WORK FLOOR PLANS

SHEET NUMBER

E11-01



1 PARTIAL LEVEL 01 ELECTRICAL NEW WORK
1/16" = 1'-0"



2 PARTIAL LEVEL 02 ELECTRICAL NEW WORK
1/16" = 1'-0"

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ISSUE CHART

MARK	ISSUE	DATE
1	ISSUE FOR BID	07MAY18
Job Number		024303.009
Drawn		JD
Checked		MC
Approved		MC

TITLE

ELECTRICAL NEW WORK FLOOR PLANS

SHEET NUMBER

E11-02

EXHIBIT C – PREVAILING WAGE FORM

College of DuPage

Prevailing Wage Form

In an effort to meet the Prevailing Wage Survey requirements of the State of Illinois, the College of DuPage has established the Prevailing Wage Form that will assist in reporting Prevailing Wage information. Please complete the information below and return to the College of DuPage Project Manager.

Project Name: _____

Project Bid/RFP#: _____

Contractor Information:

Company Name _____

Address: _____ Suite/Floor _____

City: _____ ST ___ Zip Code _____

Phone: _____ Fax: _____

Contractor Contact Information:

First Name _____ MI ___ Last Name _____

Title _____ Email _____

City _____ ST ___ Zip _____

Primary Phone: _____

College of DuPage Project Manager: _____ Date: _____

EXHIBIT D – SAMPLE SMALL PROJECTS AGREEMENT

COLLEGE OF DUPAGE
SMALL PROJECTS AGREEMENT FOR SRC LIBRARY MEDIA ROOM PROJECT
BETWEEN COMMUNITY COLLEGE DISTRICT 502 AND CONTRACTOR

THIS AGREEMENT ("**Agreement**") is made as of June 2018 by and among Community College District 502 (COLLEGE OF DuPAGE), ("**COD**") and _____ ("**Contractor**").

COD and Contractor desire to enter into this Agreement, pursuant to which Contractor shall perform certain work in connection with the Project, as hereinafter provided. In consideration of the performance of work by Contractor and the payment for such work by COD, the parties agree as follows:

1. Scope of Project. Contractor shall perform work for COD in connection with the Project, including specifically, the matters set forth on Exhibit 1. Contractor shall perform all work with the highest standards of workmanship and materials. Contractor shall maintain a sufficient staff to perform all work in the most expeditious manner consistent with the interests of COD. Contractor shall promptly notify COD immediately in writing: (i) of any information required from COD so Contractor can complete its work in a timely manner; and (ii) of any work requested by COD that is not included in the scope of work provided in Exhibit 1.

The Contractor understands that COD may engage other Contractors or COD personnel to work in areas near the Contractor's work. Contractor shall cooperate with such others so that work is not disrupted or delayed.

The Contractor shall be solely responsible for means and methods selected in performing the Work. Contractor shall supervise all work so that it is performed in a safe and expeditious manner. Contractor shall be solely responsible for the safe work of its employees and its subcontractor's employees.

The work shall be completed Prior to September 2018. Time is of the essence under this Agreement.

2. Payment to Contractor. COD shall pay Contractor for Contractor's work properly performed under this Agreement. Contractor's work shall be billed as set forth in Exhibit 2 and in no event shall the total amount due to Contractor under this Agreement exceed the total contract sum following, without COD's prior written approval:
Total Contract Sum: $ TBD (numbers and words)

3. Defective Work and Guarantee. Contractor shall promptly correct any defective work. Payment by COD for any work otherwise determined to be defective shall not relieve Contractor of its obligation to correct. Contractor shall warrant and guarantee all work to be free from defect for one year following substantial completion of the work.

4. Indemnification and Insurance. Contractor hereby agrees to indemnify and hold COD, its trustees, officers, agents, employees and any other parties designated by COD (COD, its trustees, officers, agents, employees any other parties designated by COD hereinafter collectively called the "**Indemnitees**") harmless from all losses, claims, liabilities, injuries, damages and expenses, including but not limited to, all attorneys' fees, defense and court costs and expenses, that the Indemnitees may incur arising out of, or occurring in connection with, the acts, omissions, or breaches by Contractor of its duties and obligations under or pursuant to this Agreement. This indemnification obligation shall not be limited by a limitation on amount or type of damages, compensation or benefits payable by or for the Contractor or a Subcontractor under workers' or workmen's compensation acts, disability benefit acts or other employee benefit acts. Contractor shall procure, at no expense to COD, the insurance coverages set forth in Exhibit 3. Contractor shall adhere to all provisions of Exhibit 3.

5. Performance and Payment Bond. For every Small Project greater than Five Thousand Dollars ($5,000), Contractor shall procure, a performance and payment bond with a surety with a Best Rating of A, VI. Prior to commencement of any work on the Project, Contractor shall submit insurance and bonds. Any provisions contained within the bonds abrogating COD's rights or remedies, otherwise available in contract or law, are void.

6. Termination. COD may terminate this Agreement at any time, in whole or in part, with or without cause, upon written notice to Contractor. In the event this Agreement is terminated for convenience, Contractor shall be compensated for work properly rendered through the date of termination, as can be documented to the reasonable satisfaction of COD. COD shall have no liability to Contractor beyond the date of termination. In no event shall contractor be compensated for anticipated profit or lost opportunity.

7. Liens. Upon COD's request, contractor shall submit mechanics' lien waivers in form acceptable to COD with each statement for work rendered or request for payment. Should liens be placed on the project by any subcontractor, contractor shall indemnify COD for all costs, expenses and attorneys fees incurred in the defense of such lien.

8. Materials. All materials incorporated into the work shall be new and of high quality. Contractor shall adhere to all manufacturer's recommendations. If requested by COD or otherwise set out in the contract documents, Contractor shall, before purchase of such material, submit to COD for COD's review, and in a format acceptable to COD, all product data and literature. All manufacturer's warranties shall be forwarded to COD prior to substantial completion of the work.

9. Changes in Scope of Work. COD may, without invalidating this Agreement, request changes in the scope of the work, whether taking the form of additions, deletions, or other revisions. No such work shall be performed unless and until such change is agreed in writing by COD and Contractor. If the change in work will result in a change in contract price, the change in price shall be calculated by 1) lump sum, 2) agreed unit rates, or 3) time and material reimbursable plus mark-up. COD shall solely select the method of pricing.

10. Successors and Assigns. Contractor shall not assign any rights under or interest in this Agreement without the prior written consent of the COD. This Agreement shall be binding upon and inure to the benefit of the parties hereto and their respective successors and assigns.

11. Controlling Law. This Agreement is to be governed by the laws of the State of Illinois. Each party has reviewed and approved this Agreement and the rule of construction that resolves ambiguities against the drafting party shall not be employed in the interpretation of this Agreement.

12. Entire Agreement; Conflict. This Agreement incorporates COD's bid instruction and request documents and Contractor's bid. This Agreement represents the entire agreement between Contractor and COD and supersedes all prior negotiations or agreements, written or oral, which are not included herein. This Agreement may only be amended by written instrument executed by COD and Contractor. In the event of a conflict between this Agreement and a proposal from Contractor or any exhibits hereto, this Agreement shall control, followed by COD's bid instruction and request documents, and finally, by Contractor's bid.

13. Prevailing Wage Act. To the extent required by law, contractor shall not pay less than the prevailing wage as established pursuant to an Act Regulating The Wages of Laborers, Mechanics, and Other Workman employed under Contract for Public Workers 820 ILCS 130/1 *et seq*.

14. Human Rights Act. To the extent required by law, contractor shall abide by the Illinois Human Right Act, 775 ILCS 10/0.01 *et seq*.

15. Drug Free Workplace. To the extent required by law, contractor shall abide with the requirements of the Drug Free Workplace Act 30 ILCS 580.1 *er seq*.

16. Sexual Harassment Policy. Contractor represents by the signing of this Agreement that it has a written sexual harassment policy that is in accordance with 775 ILCS 5/2-105 (A)(4).

This Agreement has been executed the day and year provided above.

COLLEGE OF DUPAGE	Contractor:
By:_____	By:_____
Name: Dr. Brian Caputo	Name:_____
Title:VP Administration, CFO	Title:_____

EXHIBIT 1

SCOPE OF WORK

[List BID Package and any addendums

Contractor shall submit monthly statements for work rendered. The statements will be based upon Contractor's work completed at the time of billing on the basis of actual work performed. COD shall make payments to Contractor sixty (60) days after receipt of Contractor's statements properly submitted. Monthly statements shall detail Amount Currently Due, Previous Amount Billed, and Balance of Contract Outstanding. In the event of termination for convenience by COD as herein provided, Contractor shall be paid for work properly rendered prior to termination, or as otherwise provided herein.

Requests for Payment shall be submitted no more than once per month in a format acceptable to COD.

Any terms or payment provisions, such as penalties or interest, contained on Contractor's invoices shall be of no effect.

COD may withhold payment from monies otherwise due to the Contractor to compensate the COD for the cost of repairing defective work or completing incomplete work in case of Contractor default.

If COD selects agreed unit rates as the method of payment for base scope work or change order work, the agreed unit rates are as set forth below:

UNIT RATE SCHEDULE

Description	Unit	Rate ($)
NA		

Contractor shall be allowed 10% mark-up on change order work when time and material reimbursable method of pricing is selected.

EXHIBIT 3

CONTRACTOR'S LIABILITY INSURANCE

The Contractor shall not commence work under this contract until all insurance required herein is obtained and approved by the Owner. Nor shall the Contractor allow any subcontractor to commence work until all similar insurance required of the subcontractor has been so obtained.

The Contractor shall furnish the College of DuPage with a Certificate of Insurance, with Community College District 502, its trustees, officers, agents, employees, and any other parties designated by COD named as an additional insured for Commercial General and Automobile Liability, showing the minimum coverage indicated below. Insurance companies must have a Best Rating of at least A VI and otherwise be acceptable to the College. Workers' compensation insurance shall include a waiver of subrogation in favor of the College of DuPage. The College will also be shown as the certificate holder. Further, the Certificate of Insurance shall state that coverage provided is primary to any other coverage available to College of DuPage. An endorsement page showing coverage must accompany the certificate of insurance. The foregoing certificate shall contain a provision that coverage afforded under the policies will not be cancelled or non-renewed until at least sixty (60) days prior written notice has been given to College of DuPage.

TYPE OF INSURANCE	**MINIMUM INSURANCE COVERAGE** Combined Single Limit Per Occurrence/Aggregate
Commercial General Liability including: 1. Premises – Operations 2. Explosion, Underground and Collapse Hazard 3. Products/Completed Operations 4. Contractual Insurance 5. Broad Form Property Damage 6. Independent Contractors 7. Bodily Injury	$1,000,000 / $2,000,000
Automobile Liability Owned, Non-owned, or Rented	$1,000,000 / $2,000,000
Workers' Compensation and Employers' Liability	As Required by Applicable Laws.
Professional Liability	If Performance Specifications are Required by the Contract